DESIGN DIRECTIVES

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
ENGINEERING DIVISION

November 2014

With updates through November 2020

DD NUMBER **DESCRIPTION** **DD EFFECTIVE DATE**

SECTION 100 - ADMINISTRATIVE

SECTION 200 - COORDINATION/ENVIRONMENTAL

Coordination 200 – 249

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SECTION 300 - RIGHT OF WAY/UTILITIES

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SECTION 700 - PLAN PRESENTATION

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-101
CORRESPONDENCE
June 18, 2014

This Design Directive will describe the West Virginia Department of Transportation, Division of Highways' policy on "Correspondence".

The following procedures have been established for the addressing and subject reference information for all correspondence prepared by West Virginia Division of Highways Responsible Divisions, and all letters prepared by Consultants for submission to the Division of Highways.

Attachment

CORRESPONDENCE

I. All correspondence pertaining to Engineering Agreements/Project Submittals and work thereunder shall be addressed as follows:

For letters dealing with ***administrative*** and ***technical*** matters,

Original copy to:

Manager: "Responsible Division"*
Address: "Responsible Division"*

Additional copies to:

Mr. C. Elwood Penn IV, P.E.
Director, Planning Division
West Virginia Department of Transportation
Division of Highways
Building Five, Room A-740
1900 Kanawha Boulevard, East
Charleston, WV 25305-0430

and

Eva M. Melancon, P.E.
Director - Programming Division
West Virginia Department of Transportation
Division of Highways
1900 Kanawha Boulevard, East
Building 5, Room A-450
Charleston, West Virginia 25305

These copies are to be mailed directly to the addressee.

*NOTE: A listing of "Responsible Divisions", with their associated addresses, is contained in Appendix A of this Directive.

II. All letters prepared by West Virginia Division of Highway Responsible Divisions, and all letters prepared by Consultants for submission to the Division of Highways, shall have a subject reference which shall contain the following information:

A. Project Number (State and Federal where applicable),

B. Route Number (and Bridge Number where applicable),

C. Description of Project and Section or Contract Number, if applicable,

D. Subject of Letter (condensed), and

E. County or Counties in which project is located.

Item A shall be the project number for engineering as programmed by the Division and shown on the Engineering Agreement. If the letter has particular reference to other phases of work, e.g., right of way or construction, these project numbers may also be shown following the engineering number but shall be properly identified by "Construction" or "Right of Way."

Item B will be the route number as designated by the Division on Interstate Projects, the project number renders sufficient identification of route so that no further clarification is needed on all but Interstate Projects.

Item C shall give the description name of the project or project termini, i.e. US 52 Location and Design Studies, or Greenbrier Street Lighting.

Item D shall give the subject of the letter, i.e. Drainage.

Typical presentation is shown as follows:

Mr. Raymond J. "R.J." Scites, P.E.
Director, Engineering Division
West Virginia Department of Transportation
Division of Highways
1334 Smith Street
Charleston, West Virginia 25301

State Project S325-250-6.22
Federal Project BRF-0250(036)
Watson Bridge Replacement
Supplemental Agreement #1
Marion County

APPENDIX A

Division	Address
Contract Administration Division	Mr. Jason Boyd, P. E. Director, Contract Administration Division West Virginia Department of Transportation Division of Highways Building 5, Room 840 1900 Kanawha Boulevard, East Charleston, West Virginia 25305-0430
Engineering Division	Mr. Raymond J. "R.J." Scites, P. E. Director, Engineering Division West Virginia Department of Transportation Division of Highways 1334 Smith Street Charleston, West Virginia 25301
Materials Control, Soils & Testing Division	Mr. Ron L. Stanevich, P. E. Director, Materials Control, Soils & Testing Division West Virginia Department of Transportation Division of Highways 190 Dry Branch Road Charleston, West Virginia 25306
Operations Division	Mr. Jacob M. Bumgarner, P. E. Director, Operations Division West Virginia Department of Transportation Division of Highways Building 5, Room 350 1900 Kanawha Boulevard, East Charleston, West Virginia 25305-0430
Planning Division	Mr. C. Elwood Penn IV, P. E. Director, Planning Division West Virginia Department of Transportation Division of Highways Building 5, Room 740 1900 Kanawha Boulevard, East Charleston, West Virginia 25305-0430

Division	Address
Programming Division	Eva M. Melancon, P.E. Director - Programming Division West Virginia Department of Transportation Division of Highways 1900 Kanawha Boulevard, East Building 5, Room A-450 Charleston, West Virginia 25305
Right of Way Division	Mr. Ward Lefler Director, Right of Way Division West Virginia Department of Transportation Division of Highways Building 5, Room 820 1900 Kanawha Boulevard, East Charleston, West Virginia 25305-0430
Traffic Engineering Division	Mrs. Cindy L. Cramer, P. E. Acting Director, Traffic Engineering Division West Virginia Department of Transportation Division of Highways Building 5, Room 550 1900 Kanawha Boulevard, East Charleston, West Virginia 25305-0430

DISTRICT ADDRESSES

DISTRICT ONE
Travis Knighton, P.E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 1
1340 Smith Street
Charleston, West Virginia 25301

DISTRICT TWO
Mr. Scott Eplin
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 2
Post Office Box 880
Huntington, West Virginia 25712-0880

DISTRICT THREE
Justin B. Smith, P. E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 3
624 Depot Street
Parkersburg, West Virginia 26101

DISTRICT FOUR
Michael Cronin, P.E.
(Acting) District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 4
Post Office Box 4220
Clarksburg, West Virginia 26302-4220

DISTRICT FIVE
J. Lee Thorne, P. E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 5
Post Office Box 99
Burlington, West Virginia 26710

DISTRICT SIX
Tony E. Clark, P. E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 6
1 DOT Drive
Moundsville, West Virginia 26041

DISTRICT SEVEN
Brian K. Cooper, P.E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 7
Post Office Drawer 1228
Weston, West Virginia 26452

DISTRICT EIGHT
James Rossi, P.E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 8
Post Office Drawer 1516
Elkins, West Virginia 26241

DISTRICT NINE
Steven B. Cole, P. E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 9
146 Stonehouse Road
Lewisburg, West Virginia 24901

DISTRICT TEN
Joseph M Pack, P.E.
(Acting) District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 10
270 Hardwood Lane
Princeton, West Virginia 24740

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-102
SHOP DRAWINGS AND CATALOG SHEETS
January 9, 2009

Shop drawings and catalog sheets are required for all items of work that are not sufficiently detailed on the contract plans to construct in the field or shop.

There are two shop drawing and catalog sheet approval methods. One is the “Contractor approval method” and the second is the “Division approval method”. The attached flow charts show these two methods and indicate the routing method which is to be used for shop drawings or catalog sheets.

Items of work referenced to the "Standard Detail Book Volume 1, Drainage, Guardrail, Pavement, Fence, and Markers," "Standard Details Book, Volume II Signing, Signals, Lighting and Marking," or Standard Details added to the plans do not require the submittal of shop drawings unless a note is shown on the plans that modifies them or the contractor proposes a modification. If shop drawings are required for items in these Standard Details Books, they should be submitted according to the “Contractor approval method.” If a vendor wishes to submit shop drawings for “blanket” approval the “Division approval method” is to be used and the review drawings are to be sent to the responsible Division with a letter of requests stating their intention.

When shop drawings are to be approved by the Division the attached approval note or stamp shall be used by all the Divisions of the West Virginia Department of Transportation, Division of Highways, in approval of shop drawings or catalog sheets which are checked by that Division. All Consultants working for the Division and approving shop drawings for the Division should use this stamp unless they have been advised by their attorney to use slightly different wording.

A catalog sheet is required when a manufactured item is identified on the plans by trade name or generic description and the item has no further testing or inspection specified.

Each submission shall have each sheet stamped and signed. All sheets of a revision to shop drawings shall be stamped and signed.

The Division shall verify that each copy of each page/sheet is signed by the same engineer, contains the same date and has the appropriate certification. If this requirement can be verified then the Division shall distribute the approved drawings. If these requirements can not be verified then the drawings shall be rejected and returned to the appropriate certifier for correction.

The following special provisions are required for all projects 101.99, 105.2, 603.4.1, 603.4.3, 603.4, 615.2, 615.2.2, 615.5, 615.6, 622.4 and 625, dated July 27, 2007.

Division approval method

The "Division approval method" is to be used on all major structural items that are to remain in place after the construction project has been completed. The following is a list of item classified as major structural items.

Bridge Girders or Box Beams (except standard Adjacent Concrete Box Beams shown in the Standard Detail Book Volume 3)
Permanent Cross Frames
Diaphragms
Bridge Bearings (except "Elastomeric bearings" less than 4 inches in total thickness)
Expansion Dams (except "Strip Seals")
Precast Box Culverts that are not shown in the standard design tables in the AASHTO specifications.
Lighting Items
Signal Items
Sign Items (Including Lighting and Structures)
Traffic Control Plans
Value Engineering Plans
MSE Walls exceeding 10 feet in height
Architectural Items
Building Facility Items (i.e. Maintenance Building, Rest Area Building, ect.)
Pipes over 108 Inches in diameter
Manholes greater than 20 feet in depth
Inlets greater than 20 feet in depth
Junction Boxes with more than 20 feet of cover or larger than 15 feet in any direction.
Main Critical items in Special Complex Structures (i.e. Cable Stay Bridges, Suspension Bridges, Segmental Concrete Bridges, Tied Arch Bridges, ect.)
Other Items as indicated in the Contract Documents

The Division has 14 calendar days from the date received to review, approve or reject the Contractors submission of plans.

The Division has 7 calendar days from the date received to verify and distribute the approved plans.

<u>Contractor approval method</u>

The Contractor approval method is to be used on items of work that are minor structural items, miscellaneous items or temporary items of work and shall be used on all items not listed under the “Division approval method.” The contractors’ means and methods for construction are also included in the Contractor approval method.”

The Contractors’ authorized representative may sign and approve catalog sheets when the item on the catalog sheets is identical in every way to the item identified in the approved contract plans. If the item is not identical then the catalog sheets must be signed by a Professional Engineer Registered in the State of West Virginia

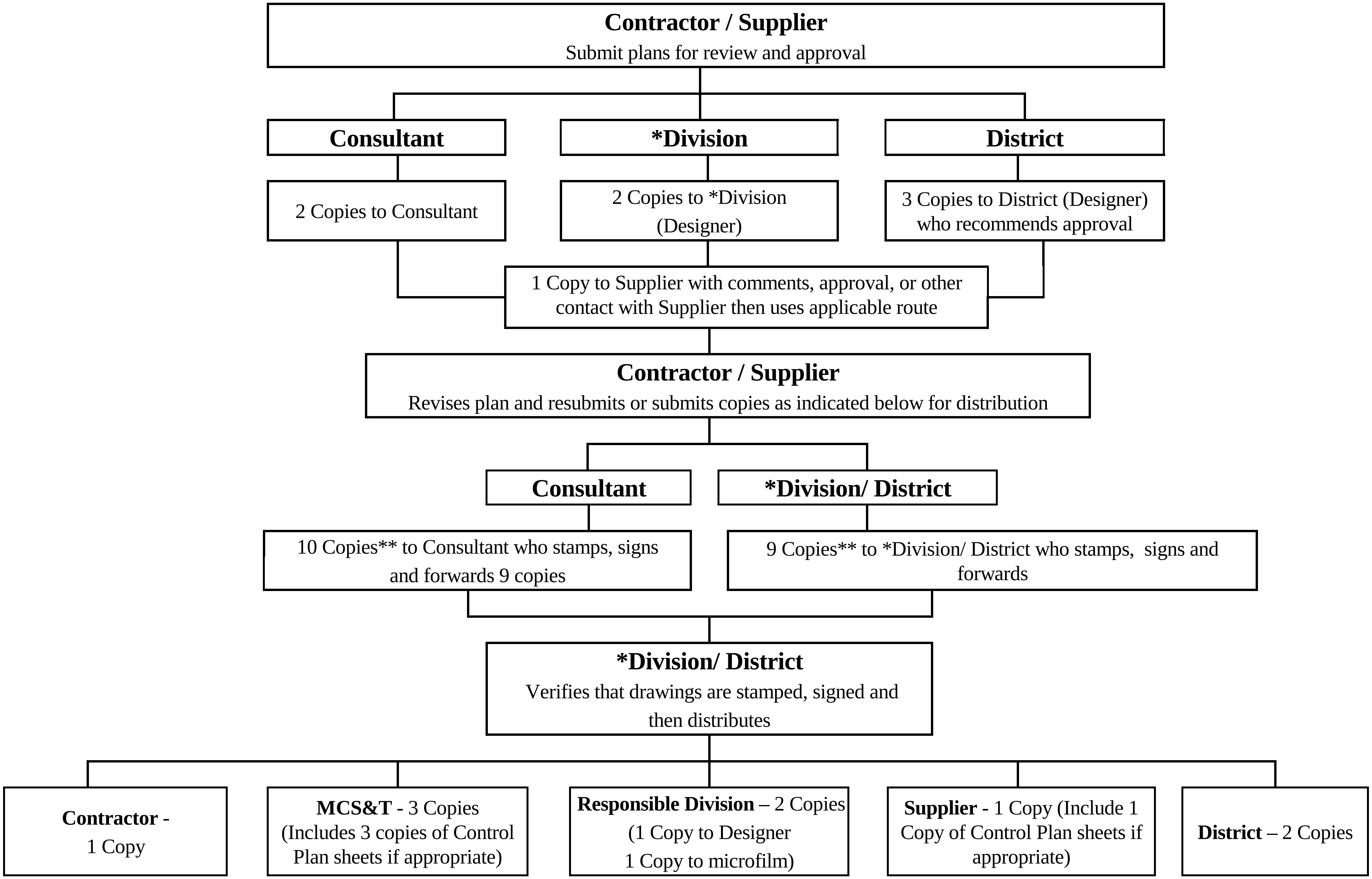
The Division has 7 calendar days from the date received to verify and distribute or reject the Contractor approved plans.

The Division shall conduct periodic audits of the “Contractor Approval Method” to ensure adequacy of the contractor approved drawings and the approval process. In no way shall this audit delay the contract or the verification and distribution of the plans.

Attachment

FLOW CHART FOR DIVISION APPROVED SHOP DRAWINGS AND CATALOG SHEETS

Supplier / Contractor Uses Applicable Route (Dependent Upon Designer)



*RESPONSIBLE DIVISION - Engineering Division and/or Traffic Engineering Division.

**For prestressed concrete beams include 4 copies of supplemental control plan sheets.

<u>DIVISION</u> APPROVAL STAMP FOR SHOP DRAWING OR CATALOG SHEETS

SHEETS of
APPROVED FOR GENERAL CONFORMITY TO PLANS AND SPECIFICATIONS. DETAIL DIMENSIONS AND QUANTITIES NOT COMPLETELY CHECKED. CONTRACTOR'S FULL RESPONSIBILITY IS IN NO WAY RELIEVED BY THIS APPROVAL. ____________________________________ DATE SIGNATURE (Name)

FLOW CHART FOR CONTRACTOR APPROVED SHOP DRAWINGS AND CATALOG SHEETS

Contractor / Supplier
Submit 9 copies** of stamped "approved", and signed drawings per Specification Section 105.2.1

***Division / District**
Verifies that drawings are properly certified and signed then distributes

Contractor - 1 Copy

PM - 3 Copies (includes 3 copies of Control Plan sheets if appropriate)

Responsible Division – 2 Copies
(1 Copy to Designer
1 Copy to microfilm)

Supplier - 1 Copy (include 1 copy of Control Plan sheets if appropriate)

District - 2 Copies

*RESPONSIBLE DIVISION - Engineering Division and/or Traffic Engineering Division.
**For prestressed concrete beams include 4 copies of supplemental Control Plan sheets.

CONTRACTOR APPROVAL CERTIFICATION FOR SHOP DRAWING SHEETS

I do hereby certify (P. E. SEAL NOT TO BE USED) that the details, materials, methods, and dimensions shown on this document meet the requirements for general arrangement and comply with the contract documents provided by the West Virginia Department of Transportation, Division of Highways for this project.

This certification by the Contractor in no way shall relieve the Manufacturer, Supplier, Fabricator or Sub Contractor of their full responsibility for the product or service provided.

______________________	__________	______
Name	Reg. No.	Date

CONTRACTOR APPROVAL CERTIFICATION FOR CATALOG SHEETS

APPROVAL CERTIFICATION FOR CATALOG SHEETS WHEN AN ENGINEER IS THE APPROVING AGENT

I do hereby certify that this product complies with the contract documents provided by the West Virginia Department of Transportation, Division of Highways for this project.

This certification by the Contractor in no way shall relieve the Manufacturer, Supplier, Fabricator or Sub Contractor of their Full Responsibility for the product or service provided.

______________________	__________	______
Name	Reg. No.	Date

APPROVAL CERTIFICATION FOR CATALOG SHEETS WHEN CONTRACTORS' AUTHORIZED REPRESENTATIVE IS THE APPROVING AGENT

I do hereby certify that this product complies with the contract documents provided by the West Virginia Department of Transportation, Division of Highways for this project and is the identical item shown in the approved plans.

This certification by the Contractor in no way shall relieve the Manufacturer, Supplier, Fabricator or Sub Contractor of their Full Responsibility for the product or service provided.

______________________	__________	______
Name	Title	Date

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-104
PRE-BID MEETINGS
January 23, 2019
SUPERSEDES July 1, 2006

This Design Directive outlines the procedure that has been accepted by the Division for the requesting and scheduling of pre-bid meeting. The criteria used to establish the need for a pre-bid meeting are listed below:

1. Projects that consist of unique design, construction procedure, or new technology with which the contractors may not be familiar.
2. Projects where it is felt that commitments made by the Division of Highways, with respect to environmental issues, other agency issues, local issues, etc., need to be stressed or explained to the contractors.
3. Projects that are felt to be complex in nature with respect to coordination with utilities and other contractors that will be working in the area. This may include those projects that have numerous intermediate completion dates.
4. Projects which have a contract completion date which may require extraordinary efforts such as working around the clock, multiple equipment spreads, non-traditional work during winter months, etc.

Request for Mandatory Pre-bid Meeting

Prior to the PS&E submission, the Project Manager must submit via e-mail a mandatory pre-bid meeting request to the Deputy State Highway Engineer – Development and Construction, for approval. The request should include the reason for the pre-bid meeting and the suggested meeting location. Include the following e-mail subject "Request for Mandatory Pre-bid Meeting, Contract ID, Project Name" and include courtesy copy e-mail to the Director of the Division or the Engineer/Manager of the District requesting the mandatory pre-bid meeting.

Scheduling Approved Mandatory Pre-bid Meeting

Once approved, Contract Administration will work with the Project Manager to schedule the mandatory pre-bid meeting. The mandatory pre-bid meeting should be held at least three weeks prior to the scheduled letting date. Contract Administration will add pre-bid meeting details to the proposal and Bidx.

Mandatory Pre-bid Meeting

The originating Division/District is in charge of facilitating the pre-bid meeting. The Design Project Manager, with assistance from the District or Regional Construction Engineer, will lead the meeting. They are responsible for: presenting the reason for the pre-bid meeting, answering questions, recording notes, and collecting contact information from attendees of the meeting. Prospective bidders shall be represented by a bona fide employee of that firm.

At the conclusion of the meeting, and within 24 hours, the completed sign-in sheet (blank copy attached) shall be e-mailed to the Contract Administration Division at this e-mail address: DOHContractProcure@wv.gov using the following subject: Mandatory Pre-bid Sign in Sheet, Contract ID, Call Number, Letting Date

DATE: ____________ **MANDATORY PRE-BID MEETING** **SIGN IN SHEET**

State Project Number: ______________ Federal Project Number: ______________ ______________ County, WV

Contract ID: ______________ Call No. ______________ Letting Date: __________

NAME	ORGANIZATION/COMPANY	PHONE NUMBER	E-MAIL

NOTE 1– A copy of the sign-in sheet must be e-mailed to Contract Administration Division at: DOHContractProcure@wv.gov using the following subject: *Mandatory Pre-bid sign in sheet, Contract ID, Call Number, Letting Date*.
NOTE 2– A representative of a prospective bidder must be bona fide employee of that firm.

DD-104

SUGGESTED AGENDA

Mandatory Pre-Bid Meeting

State Project [number] [name of project]
Federal Project [number] [county] County
[date and time of meeting]
[location of meeting (e.g. dist. HQ address & rm #, Bldg 5 & rm #, on-site & address or coordinates)]

Circulation of sign-in sheet(s)

Introduction of DOH Personnel [meeting chair, design project manager, construction engineer, right-of way personnel, environmental coordinator, others]

Introduction of Consulting Engineer and Quality Assurance Manager, if any

Announcement of Other Agencies in Attendance [if any, e.g. DNR, DEP, SHPO, FHWA, USFS, FWS]

General Remarks [see next page]

Brief Summary of the Project [Explain what it is that makes this project unique enough to warrant a mandatory pre-bid meeting.]

Environmental [cover any environmentally sensitive issues, areas, or commitments]

Asbestos Inspections/Reports [cover any significant/special issues]

Permits [404, NPDES, Forrest Service, others]

Right-of-way [cover any significant/special issues]

Utilities/Railroad [cover any significant/special issues]

Project Specific Special Provisions [mention each one, briefly address why it is needed]

Special Details [mention each one, briefly point out what makes it different from any corresponding/similar standard detail]

Waste and Borrow Sites [mention any DOH mandated sites, or restrictions on contractor selected sites]

Plan Revisions as Part of an Upcoming Amendment [cover any known revisions]

Completion Date

Questions

NOTE: All questions not answered today may be re-asked through the Question and Answer feature of BidX. All future questions must also be submitted through BidX.

SUGGESTED

PRE-BID MEETING GENERAL REMARKS

This meeting is strictly informal. No official minutes of this meeting will be taken.

The purpose of this meeting is to give the DOH the opportunity to emphasize and illuminate important aspects of the project and to allow you, the prospective bidders, an opportunity to make comments or ask questions concerning the contract documents.

Any comments or questions which necessitate a change in the contract documents will be incorporated into an amendment. If the response to any comment or question does not appear in the amendment, then the bidder should bid the plans as they are amended. Any amendments should be posted to BidX one week prior to bids.

A sign-in sheet is currently going around the room. IF YOU REPRESENT A PROSPECTIVE BIDDER, BE SURE THE NAME OF THE BIDDER YOU REPRESENT IS SHOWN ON THE SIGN-IN SHEET. A BIDDER'S REPRESENTATIVE MUST BE A BONA FIDE EMPLOYEE OF THAT FIRM.

A copy of the sign-in sheet will be available on BidX in the next few days.

The letting date for this project is ________________________________.

Any questions not asked or answered here, may be asked/answered at the Question and Answer feature of BidX.

Pre-bid Meeting Suggested Attendees

The reason/need to have a mandatory pre-bid meeting is because some aspect of the project is unique compared to most other projects. There may be a commitment in a court settlement, an agreement with the town council, unusual environmental commitments, severe right-of-way constraints, new or high-tech construction techniques required. The list of possible reasons for a pre-bid meeting is large. But, just because a meeting is called for one purpose, does not mean the prospective bidders will not ask questions about topics unrelated to the prime reason for the meeting. The chair of the meeting must have experts in many aspects of the project available or be prepared to answer the questions him/herself. It is also important that the DOH's project developers communicate well with the DOH's project constructors.

Attendees should include (as applicable):

Design Project Manager – the Design PM is usually the chair,

Primary Roadway Designer (DOH or Consultant),

Primary Structure Designer (DOH or Consultant),

Construction Project Engineer or Quality Assurance Manager,

Area/District/Regional Construction Engineer, as appropriate, and all three may be appropriate,

Traffic Engineering Division Representative(s) or District Traffic Engineer,

Environmental Section Representative(s)/ Environmental Coordinator,

Right-of-way Section/Division Representative(s),

Utilities Section/Unit Representative(s),

Equal Employment Opportunity Division representative(s),

Federal Highway Administration Area Engineer,

State/Federal regulatory agency representative(s),

Any other person who is particularly knowledgeable about the features of the project that make the project singularly unique,

Any other person the meeting chair believes might be needed at the meeting.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-105
SPECIFICATION, PUBLICATION, AND MATERIAL PROCEDURES APPROVAL
August 1, 2019
Supersedes February 12, 2009

This Design Directive outlines the procedure that has been accepted by the Division for preparing and processing proposed Specifications and Special Provisions, Publications, and Material Procedures for approval.

10. Specifications

The general processing of Specifications and Special Provisions is administered through the Contract Administration Division by the Specification Engineer.

Standard Specifications will be issued periodically as the need dictates. Supplemental Specifications to accompany the Standard Specifications are issued annually on January 1st and are effective on all projects let to contract thereafter. Each new Supplemental Specification replaces the previous one and incorporates changes from all previous supplemental specifications.

A searchable version of the Standard Specifications book and Supplemental Specifications is available from the Specifications webpage, located online at http://transportation.wv.gov/highways/contractadmin/specifications/

10.1 Procedure for Processing Specification Changes

Permanent specifications changes to the Standard Specifications or Supplemental Specifications should be submitted electronically to DOHSpecifications@wv.gov by the 'champion'. The originating Division will prepare the specification changes in a format conforming to Design Directive 820. A brief overview of the item and background information with reason for the changes should accompany the request.

The Specifications Engineer will review all recommendations received and transmit to the Specifications Committee for action. The champion should attend all committee meetings pertaining to their respective specification. A proposed specification must be presented at two committee meetings before it can be recommended or rejected by the Specifications Committee.

10.2 Procedure for Processing Special Provisions for Individual Projects

There may be a need to use an innovative product or an experimental procedure to address unique demands of a project. Often, these items are not covered by existing specifications, so they may require new or modified specifications to describe their material requirements, construction requirements and payment. Special Provisions (SPs) are written to address these situations.

Before drafting a SP, check with the Specifications Engineer (or ProjectWise folder: Approved Project Specific Provisions (PDF)) to determine if a SP already exists that meets the needs of the project.

SPs are processed as outlined above in 10.1. In general, the originating Division should submit proposed SP at least six months prior to their project's PS&E submission. This provides adequate time to process and resubmit any changes that may be requested by the committee.

When time does not permit this procedure, the following procedures should be followed:

a. The originating Division will prepare the draft Special Provision in a format conforming to Design Directive 820, coordinating with the Contract Administration Division, Specifications Engineer for review, comment, assignment of an appropriate section number and/or pay item number.
b. The originating Division will secure the approval of the Applicable Deputy State Highway Engineer and the Federal Highway Administration as appropriate for that project. The approval of the Special Provision would only apply to the specific project. The submission for approval shall follow Design Directive 202 and may only encompass the PS&E package for advertising the project.

There are Project Specific Special Provisions that require management approval prior to their use on projects. These are listed in ProjectWise subfolder title "Requires Management Approval". The Project Manager shall provide justification of why SP is needed to the Deputy State Highway Engineer – Construction & Development for approval.

10.3 Specifications Committee

The Specifications Committee review and recommend actions to proposed Specifications and Special Provisions. The committee meets on call by the Specifications Engineer with regular meetings scheduled every other month and follow the Open Government Meeting Act. Details of this act are available at: https://ethics.wv.gov/openmeetings/Pages/default.aspx.

The Specifications Committee consists of voting and non-voting members who provide expertise to review and recommend action of the proposed Specifications and Special Provisions. The committee requests comments on the provisions in the meeting agenda; and review/discuss them during the meeting. The committee meeting agenda will designate the items that are up for approval and dependent upon comments/discussion/changes the Specifications Engineer has the right to call for a vote on the final version.

The voting members consist of one representative from each of the following Divisions:

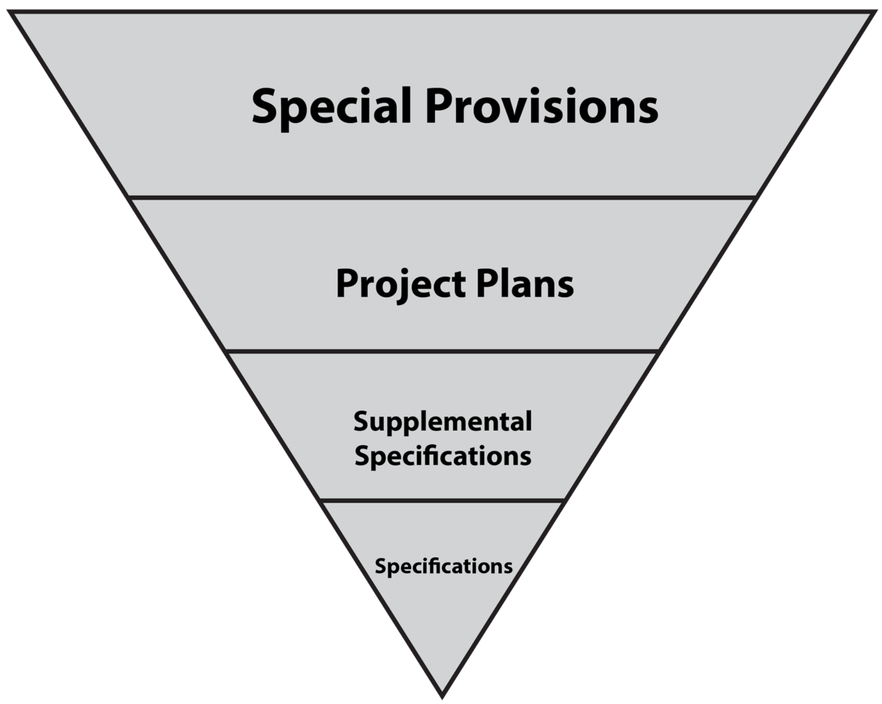
- Engineering Division
- Materials Control, Soil and Testing Division
- Traffic Engineering Division
- Maintenance Division
- Contract Administration Division

A quorum of 3 voting members must exist for the meeting to be valid. A majority of the present voting members is required to pass the proposed item. The Specifications Engineer shall have the authority to cast the deciding vote when a tie occurs. All approved specification changes will be sent to FHWA for comment and concurrence.

The non-voting members consist of one or more representatives from the following agencies: Federal Highway Administration, Contractors Association of West Virginia, ACEC – WV, Asphalt Pavement Association of West Virginia, American Concrete Pavement Association, Builders Supply Association of West Virginia, various vendors, and anyone from the Division or Industry that has knowledge of the specifications being discussed.

10.4 Coordination of Specifications, Special Provisions, and Project Plans

The Specifications, Supplemental Specifications, Special Provisions, and project plans are essential parts of the Contract; and a requirement occurring in one is as binding as though occurring in all. In case of discrepancy, Supplemental Specifications will govern over Specifications; Plans will govern over Specifications and Supplemental Specifications; Special Provisions will govern over Specifications, Supplemental Specifications, and Plans as prescribed in Section 105.4 of the Standard Specifications. Below is a graphic display of the hierarchy of contract documents; where the items shown above, govern over items below it.



Project plans or plan notes should not be used to change specifications. The procedure outlined in this Design Directive should be utilized when this is necessary.

20. Publications

The general processing of Publications is administered through the Technical Section of the Engineering Division by the Standards/Publications Unit Leader.

Publications will be issued periodically as the need dictates. Each revised Publication supersedes the previous one and incorporates changes from all previous Publications.

Publications are available in electronic format on the Division of Highways' Engineering Division Publications webpage, located online at https://transportation.wv.gov/highways/engineering/Pages/publications.aspx.

20.1 Procedure for Processing Publication Changes

Proposed changes to any of the Division of Highways' Publications should be submitted electronically to the Engineering Division's Standards/Publications Unit Leader. The originating Division will prepare the Publication changes in a format conforming to that particular Publication. A brief overview of the Publication and background information with reasons for the changes should accompany the request.

The Standards and Publications Unit Leader will review all recommendations received and transmit them to the Publications Committee for action. A proposed Publication or Publication revision must be presented at two committee meetings before it can be recommended or rejected by the Publications Committee, unless considered by the committee to be a minor change.

20.2 Publications Committee

The Publications Committee will review and recommend actions to proposed Publications/Publication revisions. The committee meets on call by the Standards/Publications Unit Leader with regular meetings scheduled every other month (and as needed) and follow the Open Government Meeting Act. Details of this act are available at: https://ethics.wv.gov/openmeetings/Pages/default.aspx.

The Publications Committee consists of voting and non-voting members who provide expertise to review and recommend action of the proposed Publications/Publication revision. The committee requests comments on the Publications/Publication revisions in the meeting agenda; and reviews/discusses them during the meeting. The committee meeting agenda will designate the items that are up for approval and dependent upon comments/discussion/changes the Standards/Publications Unit Leader has the right to call for a vote on the final version.

The voting members consist of one representative from each of the following Divisions:

- Engineering Division
- Materials Control, Soil and Testing Division
- Traffic Engineering Division
- Maintenance Division
- Contract Administration Division

A quorum of 3 voting members must be present for the meeting to be valid. A majority of the present voting members is required to pass the proposed item.

. The Standards and Publications Unit Leader shall have the authority to cast the deciding vote when a tie occurs.

The non-voting members consist of one or more representatives from the following agencies: Federal Highway Administration, Contractors Association of West Virginia, ACEC – WV, Asphalt Pavement Association of West Virginia, American Concrete Pavement Association, Builders Supply Association of West Virginia, various vendors, and anyone from the Division or Industry that has knowledge of the Publications being discussed.

30. Material Procedures

The Material Procedures (MP) are updated on a four (4) year cycle unless the need dictates otherwise, as determined by the Materials Control Engineer who is the Chairperson of this committee. This person is referred to as "Chairperson" throughout the rest of this section. The MP Committee shall be modeled after AASHTO's Committee on Materials and Pavements (COMP); specifically, how this committee reconfirms various AASHTO procedures and processes. The Chairperson is the default Champion for the updating of these MPs, though the Chairperson may assign a Champion for a particular MP or accept a volunteer Champion.

A new MP may also be submitted by a Champion to the Committee.

30.1 Material Procedures Committee

The Material Procedures Committee consists of voting and non-voting members who provide expertise to review and recommend action on the proposed additions or changes.

The Material Procedures Committee meets on call by the Chairperson with regular meetings usually scheduled on a four (4) to eight (8) week basis.

A quorum of 3 voting members must exist for the meeting to be valid. A majority of present voting members at any meeting shall be required for approval. The Chairperson shall have the authority to cast the deciding vote when a tie occurs.

The voting members consist of one (1) representatives from the following:

- Engineering
- Materials Control, Soil and Testing
- Traffic Engineering
- Maintenance
- Contract Administration

The non-voting members consist of one or more representatives from the following agencies: Federal Highway Administration, Contractors Association of West Virginia, ACEC – WV, Asphalt Pavement Association of West Virginia, American Concrete Pavement Association, Builders Supply Association of West Virginia, Various Venders, and anyone from the Division or Industry that has knowledge of the MP being discussed.

30.2 Procedure for Adding a New MP

All proposals are to be submitted by the Champion to the Chairperson. The purpose for the changes or reason(s) for the new MP should accompany the request. These changes shall be submitted within fourteen (14) calendar days prior to the next meeting to be considered at the meeting. The Champion must be present for all meetings pertaining to their respective MP or the MP will be pushed back to the next meeting that the Champion can be present. This requirement can be waived at the discretion of the Chairperson.

A proposed MP must be presented at two (2) Committee Meetings before it can be recommended or rejected by the Committee. All Committee members must receive a copy for comment fourteen (14) calendar days in advance of the meeting. These comments should be returned to the Chairperson seven (7) calendar days prior to the Committee meeting to give the Champion time to review them.

If a proposed MP is designated as minor or inconsequential in its intent, only one (1) Committee Meeting will be required for a vote of recommendation or rejection. Any voting member, or the FHWA representative may veto this designation as minor or inconsequential.

30.3 Procedure for Changing an Existing MP

A proposed MP change must be presented by the Champion at Two (2) Committee meetings before the MP can be recommended or rejected by the Committee. All Committee members should receive a copy of the MPs on the agenda for comment fourteen (14) calendar days in advance of the meeting. These comments should be returned to the Chairperson seven (7) calendar days prior to the Committee meeting to give the Champion time to review them.

If a proposed MP change is designated as minor or inconsequential in its intent, only one (1) Committee meeting will be required for a vote of recommendation or rejection. Any voting member, or the FHWA representative may veto this designation as minor or inconsequential.

30.4 Procedure for Submission of Recommended Approvals

Pending the recommendation for approval from the committee, the Chairperson will forward the Provisional MP through the chain of command to FHWA.

A minor or inconsequential MP will not require the approval of FHWA, but will be forwarded through the chain of command at the DOH for approval. The FHWA representative for the MP Committee Meeting shall be given a chance to veto the minor or inconsequential status of the MP.

Upon receiving comment and approval by FHWA (if applicable), the updated or new MP will be published on the MCS&T webpage and be distributed to District Materials Supervisors and other interested parties.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-106
APPROVAL FOR PATENTED OR PROPRIETARY PRODUCTS
August 21, 2015

This document provides general information and guidance regarding how to obtain approval to use a patented or proprietary product on Federal-Aid construction projects let to bid by the West Virginia Department of Transportation, Division of Highways. It is to be a reference for DOH employees in disciplines such as design, construction, traffic engineering, utilities, right of way, and environmental.

10. INTRODUCTION

(Note: most of the following has been quoted directly from the FHWA website).

The FHWA regulation in 23 CFR 635.411, "Material or Product Selection" prohibits the expenditure of Federal-aid funds on a Federal-aid highway project "for any premium or royalty on any patented or proprietary material, specification, or process" (referred to hereafter as "proprietary product"), unless specific conditions are met. This regulation is intended to ensure competition in the selection of materials, products, and processes while also allowing the opportunity for innovation where there is a reasonable potential for improved performance.

20. DEFINITION OF PATENTED OR PROPRIETARY PRODUCTS

A Patented or Proprietary Product is a product, specification, or process identified in the plans or specifications as a "brand" or trade name (e.g. 3M, Corten). However, it may also be a product so narrowly specified that only a single provider can meet the specification. A proprietary product must meet one of the conditions listed under 23 CFR 635.411(a) or (c) for Federal funds to participate in its use on a Federal-aid highway construction project. For purposes of this guidance, any reference to "proprietary product" shall mean "patented or proprietary product."

30. POLICY

The following was taken from "CFR § 635.411 Subpart D - General Material Requirements. Material or product selection" and defines the Federal Highways Administration's policy regarding patented or proprietary materials. This will be considered the West Virginia Department of Transportation, Division of Highways' policy.

a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

   (1) Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable unpatented items (a minimum of three competing, equally suitable unpatented items should be listed in the plans as alternates if possible – see Item 30 (b) below for more requirements); or

   (2) The State transportation department certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or

   (3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. If certification is for experimental purposes, then an Experimental Work Plan must be developed and submitted to FHWA.

A sample Experimental Work Plan is available at the following FHWA web address: http://www.fhwa.dot.gov/construction/contracts/pnpapprovals/samplewp.cfm, and a sample Division of Highways' Work Plan is attached to this DD.

b) When there is available for purchase more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State transportation department wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

c) A State transportation department may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case, Federal-aid participation will be based on the lowest price so established.

d) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.

e) In the case of a design-build project, the following requirements apply: Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the Request for Proposals document unless the conditions of paragraph (a) of this section are applicable.

f) State transportation departments (State DOTs) shall have the autonomy to determine culvert and storm sewer material types to be included in the construction of a project on a Federal-aid highway.

40. PROCEDURE

If the designer proposes the use of a proprietary or patented product on any Federal-Aid project, the designer must obtain the approval of the State Highway Engineer to use the product. The following steps should be followed to gain approval:

a) The certification will be in memo form, and be routed from the Director of the Division requesting the approval, to the State Highway Engineer, through the Deputy State Highway Engineer – Construction and Development. Examples of this certification memo are provided with this Design Directive.

b) The certification must include the project information (State and Federal Project Numbers, Project Name, and County the project is in),
c) A short description of the proprietary or patented item(s) being proposed,
d) Whether the proprietary or patented product is project-specific, will be used in multiple projects, used in a specific region/District or Statewide, or will programmatic with a sunset date,
e) A justification for the use of that item, to include a description of the unique need being addressed, why other available products are insufficient to meet the Division's needs, estimates or any additional costs associated with the proprietary or patented product, and any other pertinent information as may be required such as prior Division experience with the product,
f) Any catalog cut sheets from the manufacturer describing technical, use, and safety data for the product,
g) A certification statement with either of the following language, depending on whether the product is used because no equally suitable alternative for the item exists, or it is required for synchronization with existing facilities:

"I (name of certifying official), (position title), of the (Name of contracting agency), do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2), that this patented or proprietary item is essential for synchronization with existing highway facilities", or

"I (name of certifying official), (position title), of the (Name of contracting agency), do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2), that that no equally suitable alternative exists for this patented or proprietary item."

h) Signature lines indicating Approval or Disapproval by the State Highway Engineer, and the date action was taken will be included at the bottom of the letter,
i) The Federal Highway Administration will be included as a recipient on the distribution list for receiving approved certifications and will provide concurrence in the Division's approval.

It should be noted that if the product is being used as an Experimental Product, an Experimental Work Plan as discussed under Section 30 "**POLICY**", must be included with the certification. A sample Experimental Work Plan is included with this Design Directive.

All proprietary item certifications are to be placed on the AASHTO website at the following address: http://apel.transportation.org/all_certified_products.aspx. Other states that use this site are Arizona, Colorado, Connecticut, Maine, Maryland, Montana, New York, & Ohio.

Also, these approved certifications will be placed on the Division's website in a Division

Approved Source/Product Listing on the Materials Control, Soils, and Testing Division's page.

50. DEFINITIONS

As used in this document:

Patented or Proprietary Product: A product, specification, or process identified in the plans or specifications as a "brand" or trade name (e.g. 3M, Corten). However, it may also be a product so narrowly specified that only a single provider can meet the specification. A proprietary product must meet one of the conditions listed under 23 CFR 635.411(a) or (c) for Federal funds to participate in its use on a Federal-aid highway construction project. See Question and Answer #B1. For purposes of this guidance, any reference to "proprietary product shall mean" patented or proprietary product.

Certification: As used in 23 CFR 635.411(a)(2), the written and signed statement of an appropriate contracting agency official certifying that a particular patented or proprietary product is either:

a) Necessary for synchronization with existing facilities; or
b) A unique product for which there is no equally suitable alternative.

Synchronization: As used in 23 CFR 635.411(a)(2), providing a product that matches specific current or desired characteristics of a project. Synchronization may be based on:

a) Function (the proprietary product is necessary for the satisfactory operation of the existing facility),
b) Aesthetics (the proprietary product is necessary to match the visual appearance of existing facilities),
c) Logistics (the proprietary product is interchangeable with products in an agency's maintenance inventory), or any combination thereof.

In addition, it may be advisable to evaluate the following factors as they relate to synchronization:

a) Lifecycle (the relative age of existing systems that will be expanded and the remaining projected life of the proposed proprietary element in relation to the remaining life of the existing elements),
b) Size/extent of products and systems to be synchronized to/with, and the relative cost of the proprietary elements compared with replacing the elements requiring synchronization.

Experimental Product: As used in 23 CFR 635.411(a)(3), a patented or proprietary product used for research or for a distinctive type of construction on relatively short sections of road on an experimental basis.

Public Interest Finding (PIF): As used in 23 CFR 635.411(c), an approval by the FHWA Division Administrator, based on a request from a contracting agency, that it is in the public interest to allow the contracting agency to require the use of a specific material or product even though other equally acceptable materials or products are available.

State Department of Transportation (State DOT): The relevant department of any State charged by its laws with the responsibility for highway construction; also State Transportation Agency (STA), the "State".

Contracting Agency: Any entity administering a contract using Federal aid highway funds. Includes State DOTs, Local Public Agencies (LPAs), and other agencies that may be administering such contracts.

Local Public Agencies (LPAs): Any State DOT sub-recipient of Federal-aid highway funds.

60. REFERENCES

The following references were used to develop this Design Directive and are provided for further information and guidance for the designer:

http://www.gpo.gov/fdsys/pkg/CFR-2014-title23-vol1/xml/CFR-2014-title23-vol1-sec635-411.xml - CFR Title 23, Section 635.411 – Material or product selection, Date: April 1, 2014.

http://www.fhwa.dot.gov/programadmin/contracts/011106.cfm - Guidance on Patented and Proprietary Product Approvals, Date: January 11, 2006.

http://www.fhwa.dot.gov/programadmin/contracts/011106qa.cfm - Questions and Answers Regarding Title 23 CFR 635.411 – Material or product selection, Date: April 11, 2013.

All proprietary item certifications are to be placed on the AASHTO website at the following address: http://apel.transportation.org/all_certified_products.aspx.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division of Highways
1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • (304) 558-3505

Earl Ray Tomblin
Governor

Paul A. Mattox, Jr., P. E.
Secretary of Transportation/
Commissioner of Highways

September 11, 2014

MEMORANDUM

TO: CH

THRU: HD 5?/R

FROM: DD

SUBJECT: State Project S328-BLU/E-1.00 00
Federal Project STP-0160(003)D
Martin Luther King Jr. Memorial Bridge
Proprietary Items Request and Justification
Mercer County

This is in compliance to Title 23 CFR Section 635.411(a)(2) for the number of items specified in the Materials Section of the Special Provisions for the Ultra High Performance Concrete (UHPC) submitted for the above project. The following statements are clarification on the use of "proprietary items," whereby a specific manufacturer and product are stated for the proposed usage.

The proposed bridge uses Accelerated Bridge Construction methodology using prefabricated elements. The estimated construction time is 60 days after the closure of the existing bridge. Abutments and walls use prefabricated concrete elements in conjunction with drilled steel piles. The bridge superstructure uses a modular system that is composed of six concrete decked steel girder system elements. The connections for the modular superstructure use UHPC. UHPC is a high strength, ductile material formulated by combining Portland cement, silica fume, fine silica sand, and high range water reducer, water and steel fibers.

The material characteristics and experienced field representative requirements of the proprietary product (Lafarge Ductal) are required to assure the structural integrity and long-term performance of the field-cast connection between the modular deck beam

elements. Successful performance requires strict adherence to the material requirements prescribed in the special provision in addition to the proper forming, field batching – which includes the operation of specialized equipment and the proper dosage rate and sequencing of constituents, placement, and cure. The specification requires a Lefarge representative experienced with the coordination and oversight of these activities to be onside for all activities related to UHPC. At the time of this request, there are no other known U.S. UHPC suppliers who can provide experienced representatives with field installed UHPC for bridge applications.

I, Raymond J. Scites, Director of Engineering Division, do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2) that there is no equally suitable alternative exists for this proprietary item.

We request your concurrence in our proposal of material selection. If additional information is required, please contact Mr. Ahmed N. Mongi at (304) 558-9739.

RJS:Ad

REPLY

Approved: Gregory Bailey **Disapproved:** ____________________ **Date:** 9-15-2014

cc: DDI(ANM), DDR(TRP), DDM(AAS), DD(MF), DE/M-10, FHWA, DM, DC

Work Plan for Evaluation of the Project
State Project S320-64/77-14 SEC 00
Federal Project HFL-2012(553)D
I-64/77 Exit 97 Precast Concrete Slabs

The WVDOH is requesting the use of proprietary technology for the subject project. The proposed project has been designed in order to utilize Super-Slab® a proprietary precast concrete pavement system patented by the Fort Miller Company. The use of precast concrete pavement panels presents a new option to achieve a similar result as traditional rehabilitative and/or replacement techniques, but using a method that produces a prefabricated, cured concrete section that can be placed within a short time frame.

OBJECTIVE

This request is based on the WVDOH's lack of history in using any type of precast concrete pavement system and to do so in a strategic location that the WVDOH can evaluate for future applicability throughout the State. This pilot project will allow us an opportunity to evaluate the material and the construction process for full-depth repairs in a situation that presents modest challenges regarding maintenance of traffic and user delays, i.e., measured risk for deployment and evaluation. However, the work will still be performed under a practical, over-night closure and time restriction to help evaluate traditional methods using fast-setting concrete versus the pre-cast system. This will then allow the WVDOH an opportunity to learn from this project and consider the process for other major routes and arterials where many more challenges exist.

TEST SITE DESCRIPTION & LOCATION

Route: I-64/77 Exit 97, US 60W Midland Trail/Kanawha Boulevard – NB and SB ramps
Location: Charleston, Kanawha County
Project: S320-64/77-14 SEC 00, HFL-2012(553)D

The proposed project location is located in very close proximity to the WVDOH Headquarters and is situated directly between our Headquarters and Materials Control, Soils, and Testing Division.

PRODUCT DESCRIPTION (from manufacturer's product brochure)

The Super-Slab® System places precast slabs directly upon a fully engineered subgrade surface that provides nearly complete slab support immediately upon installation. After the slabs have been placed, they are structurally interlocked with a unique grouted load transfer system. Complete slab support is achieved when bedding grout is pumped into a bedding grout distribution system that is cast into the bottom of the slabs.

Super-Slab® is used for continuous and intermittent pavement replacement. Slabs are precisely cast to fit curved and super-elevated geometry specific to each location. This feature makes it possible to replace entire mainlines, ramps, intersections and even crosswalks in a series of 8 hour (or less) roadway closures.

BENEFITS

The advantages and benefits of using this process include:

- No field cure time
- Immediate use
- Fast installation – 8 hours or less

- Manufactured and cured in a controlled environment
- 50 year estimated life

EVALUATION METHODS

As per 23 CF 635.411, this project is intended to be used as an experimental project for evaluation of a proprietary system with traditional methods of concrete repair. Accordingly, the following steps have been taken for project layout, and will be taken during and after construction for a period of three years:

1. The experimental nature along with an introduction to the system will be discussed at a mandatory pre-bid meeting.
2. The project was designed with a break point to separate traditional repair methods as per Section 506 of the Standard Specs and precast repair methods as per Special Provision 518. This is clearly identified in the project plans.
3. Along with our required inspection and approval process for precast elements by personnel from MCS&T Division, and our required project inspection by District One Construction personnel, MCS&T personnel will also monitor the construction process. Comparisons of production rates versus costs will be able to be tracked and documented.
4. Perform manual pavement distress surveys in accordance with the methods being used in Special Provision 490, *Nine Year Pavement Performance Criteria*, which is being used for Nine Year Warranty Pavement Rehab Construction. This will help not only evaluate the precast system and traditional repairs, but will also help develop that Special Provision for potential application on new warranty pavement sections being considered.
5. Employ testing equipment from our MCS&T Roadway Analysis Section including smoothness vehicle and FWD to evaluate various pavement characteristics for comparison to manual surveys and pavement indexes that will be collected annually as per our WVDOH Pavement Management System.

REPORTING

Final project costs and production rates will be summarized and reported. The results of annual evaluations will be provided to WVDOH Management and to the FHWA, and a final summary report will be prepared by MCS&T and submitted at the conclusion of the three-year evaluation period. Although, it should be noted that monitoring will still continue to evaluate ultimate performance.

COSTS

Typical application cost of Pre-cast Pavements has ranged from $250 to $450 per SY nationally depending on work environments, time restrictions, and quantity of repair in individual contracts. Our case history of traditional full-depth repairs done with over-night closures and time restrictions has ranged from $325 per SY (US 119 Ashton Place – 2014) to as much as $430 per SY (US 119 Davis Creek to Oakwood Road - 2011).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-200
PROJECT DEVELOPMENT PROCESS
March 30, 2012

Attached is the West Virginia Department of Transportation, Division of Highways' Project Development Process Guidelines.

Attachment

PROJECT DEVELOPMENT PROCESS

The project development process is a complex and diversified task. This process begins with the inception of the project and concludes with the construction of the project. It includes initial engineering, preliminary engineering, final design, preparation of environmental documents, value engineering, right of way and utilities work, specifications and estimates.

The development of plans and related documents has become considerably more complicated. Some factors contributing to this increased complexity are environmental issues, cultural resources, increased public and agency involvement, and funding constraints.

The Division of Highways' project development process is shown on the attached flow chart. The project development process will vary in complexity, depending upon the size and scope of each individual project.

Environmental documentation will include the development of either an Environmental Impact Statement (EIS), Environmental Assessment (EA), or Categorical Exclusion (CE). The environmental documentation will be based on the scope, characteristics, location and initial engineering information of the project. This effort will vary from project to project and may involve outside agencies, individuals, and special interest groups. Early coordination with regulatory and resource agencies is required, in order to expedite the resolution of issues. The environmental document will meet the requirements of National Environmental Policy Act, Council of Environmental Quality Regulations, Federal Highway Administration guidance, Section 404 of the Clean Water Act, Section 106 of the National Historic Preservation Act, Section 4(f) of the Department of Transportation Act, Endangered Species Act, and other environmental and cultural resource concerns.

The mitigation phase will include work identified in the environmental and cultural resource mitigation portion of the environmental document, all necessary permits, and other issues identified in the environmental documentation phase.

Initial engineering is that work which is performed to define major project features. See Design Directive (DD) 202, "Field and Office Reviews for Initial Engineering, Preliminary Engineering and Final Design." It includes such aspects as location, profile, geometrics, major drainage features, geotechnical, identification of preliminary right of way needs, utilities, and the analysis of various alternates. Included in this phase are field and office reviews, public meetings/or hearings, estimate of costs for construction and right of way, and preparation of design report plans and narratives. See DD-205, "Guidance for Preparation of Design Reports and Studies" for more information concerning design reports.

Preliminary engineering is that work which is performed to further refine the preferred alternate identified during the environmental documentation phase. During the normal project process, Location and Design Approvals are given before a project proceeds to the Preliminary Engineering stage. In some cases, when additional environmental work is necessary, Location and Design Approval may be given during the Preliminary Engineering phase. See DD-206, "Guidance for Location and Design Approvals" for more information concerning this matter.

This work generally includes:

- NEPA clearance document,
- topographic surveys,
- geotechnical investigations,
- hydrologic analysis, hydraulic analysis,
- utility engineering, traffic studies,
- financial plans, revenue estimates,
- hazardous material assessments,
- general estimates of the types and quantities of materials.

Other design activities are allowed for the purposes of defining project alternates or completing the NEPA alternatives analysis and review process. These activities include but are not limited to complying with other related environmental laws and regulation such as:

- environmental justice analyses,
- supporting agency coordination public involvement and permit application,
- development of environmental mitigation plans,
- development of typical sections, grading plans, geometric alignment including any clearances necessary,
- noise wall analysis,
- temporary structure requirements, staged bridge construction requirements,
- structural design, retaining wall design, noise wall mitigation,
- bridge type, size, location studies
- design exceptions,
- guardrail length and layout,
- existing property lines and deed research,
- soil boring, cross sections, ditch designs, pavement design,
- intersection design, interchange design,
- storm or sanitary sewer design, culvert design,
- identification of removal items,
- quantity estimates,
- pavement details and preliminary traffic control plans.

Included in this phase is preliminary field review/value engineering review, geotechnical (slope) review, span arrangement submissions (to include pre-span arrangement submissions), and preliminary right of way plans (RW-2) necessary to identify property owners, utility verifications, and to start property abstracting. Again, reference is made to DD-202 for more information concerning Preliminary Engineering and Final Design activities.

No final design activities (regardless of funding sources) shall proceed until the following have been completed:

a) The action has been classified a PCE (Programmatic Categorical Exclusion)

b) The action has been approved as a CE, or

c) A Finding of No Significant Impact (FONSI) has been approved, or

d) A final EIS has been approved and available for the prescribed period of time and a record of decision has been signed.

Line and Grade Approval is obtained at the end of the Preliminary Engineering phase of project development, after Environmental Clearance is given, and is required before Final Design can proceed.

Final design is that engineering necessary to complete construction contract plans and related documents, prepare specifications, proposals, and cost estimates. The contract plans and related documents are the product upon which the contractor bases his bid, and provide the complete information necessary for the contractor to construct the project. Included in this phase, the final field review, TS&L approval, final office review, final bridge plans, final right of way plans, and utility relocation designs necessary for the acquisition of right of way.

Project Development Process

(Note: Line and Grade Approval is obtained only after environmental clearance is given.)

ROD
FONSI
CE Approval

Environmental Documentation | **Mitigation**

L&D Approval

Project Inception

Corridor Study

Design Report (Alignment Study)

Development of Preliminary Plans

Contract Plans Right of Way Acquisition

Construction

Initial Engineering – end result is Design Study Report

Preliminary Engineering
- obtain Location and Design approval.
- end result is a ROD, FONSI, CE Approval, then Line and Grade Approval

Final Design

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-201
PUBLIC INVOLVEMENT PROCESS
June 25, 2015

Attached is the Division of Highways policy on the "Public Involvement Process".

This document replaces the "Action Plan" dated 1979, DD-93 dated March 14, 1969, DD-93-1 dated September 20, 1991, DD-201 dated October 1, 2003 and DD-201 dated November 14, 2011. The "Public Involvement Process" will be used on both State and Federal Projects.

Attachment

PUBLIC INVOLVEMENT PROCESS

10. INTRODUCTION

This policy addresses the public involvement process for projects that require processing a National Environmental Policy Act (NEPA) environmental document. It is necessary for people to communicate. Communication is an interchange of ideas between individuals and groups. Maximizing communication is the responsibility of not only the Division of Highways (Division), but also the citizens. The citizen should be willing to listen, the Division should be willing to listen and both must react in a positive manner to what they have heard. The Division's listening and comment channels should be formally established so the citizen knows where and how to have his or her views heard and when to expect a response.

Generally Public Involvement is for any project that requires the acquisition of considerable amounts of right of way, requires a long and/or complex detour, substantially changes the layout or function of connecting roadways or of the facility being improved, has a sizeable impact on abutting property, or otherwise may result in substantial social, economic, environmental or other effects.

Additional public involvement opportunities may be initiated when the Division believes there is a substantial change in the project, an unusually long lapse of time since the last public involvement or the identification of a -substantial social, economic or environmental issue not previously considered at earlier public involvement opportunities.

20. PUBLIC INVOLVEMENT AND THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

NEPA requires public involvement on projects that have or may have a significant environmental effect. These projects normally require an “Environmental Impact Statement” (EIS), an “Environmental Assessment” (EA) or a “Categorical Exclusion” (CE). An EIS will require at least two public involvement opportunities. The first is for the “Project Scoping” and the second is after the Draft Environmental Impact Statement (DEIS) has been approved by the Federal Highway Administration (FHWA). An EA will also require at least two public involvement opportunities. The first is for the “Project Scoping” and the second is after the EA has been approved by FHWA. A CE normally does not require public involvement, however, public involvement may be conducted if the Division believes it is warranted or it is requested by the public.

30. PUBLIC INVOLVEMENT TYPES

Public involvement can take many forms. A public meeting is the most recognized by the public. However, other types can be just as valuable and effective such as notices in newspapers, mail, radio, television, billboards, road signs and the internet. All of these forms help keep the public involved in the project development process and provides the

Division with valuable information.

Public meetings provide a face to face interaction between the citizens of West Virginia and the Division in planning and design. There are three different types of public meetings the first is a public informational workshop, the second is a public hearing and the third is a combination of the two. All of these types of public meetings provide a face to face interaction with the public and provide the Division and the public with valuable information.

a) A public informational workshop is a forum for the free interchange of ideas and may or may not include a formal presentation. While general notes of the issues discussed are taken and considered during project development, written comments are encouraged and included in the public record.

b) A public hearing is the most formal type where a formal presentation is given and verbal comments, or testimony, are recorded after the presentation. A transcript of the presentation and testimony is prepared for the public record; however, written comments are encouraged and are also included in the public record.

c) The combination type will have a public information workshop that begins prior to a formal presentation and testimony is recorded following the presentation. A transcript of the presentation and testimony is prepared for the public record; however, written comments are also encouraged and are also included in the public record.

Other types of Public Involvement like newspaper ads, mail, radio, television, billboards, road signs and the internet can be just as useful as a Public Meeting depending on what information the Division is seeking and what information the Public wants. These types can be used alone or in combination with a Public Meeting. If the Division wants to get a sense of the public's concern about a highway project, distributing a Project Informational Flyer may be sufficient. However, if it is evident that there is a concern from the public about the project, a Public Meeting may be more appropriate and using one or more of the other methods to advertise the meeting would be typical.
Some projects may require a public hearing due to the type of environmental document being prepared. Due to the amount of public concern, the Division or the Federal Highway Administration (FHWA) may require a public hearing. A public hearing is generally required when the public is asked to comment on an approved DEIS or on an approved EA.

Anyone may request a Public Hearing or a Public Meeting for any project by contacting the Division in writing or by making a written comment on its website. The Division and FHWA will determine after the request has been received if the request is warranted in consideration of all of the comments received from the project.

40. PUBLIC INVOLVEMENT POLICIES

The Division's procedures for public involvement have been established to maximize citizen input in both location and design while complying with environmental requirements. These environmental requirements include NEPA, Section 404 of the Clean Water Act (CWA), Section 106 of the National Historic Preservation Act (NHPA), Section 7 of the Endangered Species Act (ESA), various Executive Orders, including 11988 (Floodplains), 11990 (Wetlands) and 12898 (Environmental Justice), Title IV of the Civil Rights Act and FHWA policy and regulations.

When the Division and FHWA determine that formal public involvement is necessary for a Federal-aid highway project, the Division will develop a public involvement plan in consultation with the FHWA Division office. The public involvement plan should include a summary of the agency and public involvement strategy for the entire NEPA process, as well as a project information distribution list. In addition, the public involvement strategy shall consider how to involve any affected person or persons that qualify under Title IV of the Civil Rights Act, Environmental Justice or the Americans with Disabilities Act of 1990. The distribution list should include federal, state and local agencies, federal, state and county elected officials, historic preservation groups who are active within the project area, as well as individuals who have requested project development information.

All Public Involvement is moderated by responsible officials in the Division. The Division furnishes individuals who are sufficiently familiar with the project to answer questions raised by the public. Alternative courses of action, alternative project locations and major features of the project are discussed along with environmental and other effects of the alternatives.

50. DETERMINING THE TYPE OF PUBLIC INVOLVEMENT TO BE USED

The Public Involvement for any project should consider what questions need to be answered and who the target audience is for the project. The target audience is typically the users of the highway in the area, property owners that are affected by the project, any interested party such as historic groups, metropolitan planning groups, and government officials. The target audience differs from project to project and not all types of public involvement are appropriate for all projects. Therefore, the type of public involvement must be tailored to the target audience.

If a project serves a very small community and has very little to no through traffic then the appropriate public involvement may be sending project flyers to the residents of the community and soliciting their comments. This method may also be appropriate if it is unclear if the public is interested in the project.

For a project in a populated area where the public is likely to be interested, a Public Informational meeting will be the best option. Public informational meetings are also useful on large projects where an initial meeting may assist with the identification of environmental issues and/or resources present within the project area, which would help determine what type of environmental document needs to be developed. This meeting type is also useful if the project has an approved environmental document, but does not have a lot of public controversy. During this type of meeting, it may be determined that an informal presentation is warranted.

For projects that have public controversy and have an approved NEPA Document, a Public Informational Meeting with a hearing component may be the best option. This meeting type will allow the public to ask questions and get responses during the informal part of the meeting and during the formal part of the meeting will allow comments to be recorded.

Public Hearings by themselves without an informal component have not been found to be helpful to the public and are not generally encouraged. However, the Division and FHWA may determine that this type of meeting is the best option.

60. PUBLIC MEETING PROCEDURE

When the Division determines that it has reached a stage in the development process at which a public meeting is recommended, the WVDOT Office of Communications will be notified by the section responsible for conducting the meeting.

a) NOTICE

When a public meeting is scheduled, notice in the form of a legal advertisement will be published in newspapers having general circulation in the vicinity of the proposed project. The newspaper notice shall contain the following:

1) Date and time of the meeting.
2) Location of the meeting.
3) A description of the project.
4) A link to a website where additional project information can be found.
5) A statement that a hearing may be requested.
6) A statement regarding the NHPA Section 106 consultation process and/or Section 4(f) determinations, if applicable.
7) If a formal presentation is being conducted, the time it will begin.
8) If a hearing is being conducted, the time it will begin.
9) If a NEPA document is being presented for comment, the notice will indicate that an electronic copy can be obtained on the Division's website and at the local library.

A statement regarding accommodations to allow persons with disabilities to obtain information and/or provide comments shall be included with the legal advertisement. The statement will be written as follows:

> "The West Virginia Department of Transportation will, upon request, provide reasonable accommodations including auxiliary aids and services necessary to afford an individual with a disability and equal opportunity to

participate in our services, programs, and activities. Please contact us at (304) 558-3931. Persons with hearing or speech impairments can reach all state agencies by calling (800) 982-8772 (voice to TDD) or (800) 982-8771 (TDD to voice), toll free." Add the name, phone number, and e-mail address of the current Director of the Office of Communications to complete the statement.

In addition to the legal advertisement, a project flyer will be distributed and will generally contain all of the same information as the legal advertisement.

A copy of the public notice will be mailed to all of the federal and state elected officials that serve the project area. The public notice will also be provided to the respective County Commission and historic preservation groups who are active within the project area.

b) PUBLICATION OF MEETING NOTICES

The WVDOT Office of Communications maintains a current list of newspapers that advertisements are to be placed in, based on the location of the project. All Public Meeting notices should appear in the newspaper and be posted on the Division's website at least 14 days prior to the meeting. In order to ensure that the public, in the area of the project, is informed about the meeting, a secondary type of advertisement is normally required and is developed to inform the local target audience. The secondary advertisement if required should be distributed and/or posted 7 days prior to the meeting. The secondary advertisement may include, but are limited to, the following:

1) Meeting advertisement fliers to be sent to the property owners and/or residents in the project vicinity.
2) Placing fliers in local stores and gathering areas.
3) A road sign to inform the traveling public about the meeting.
4) A paid advertisement in the local paper that is not in the legal section.
5) A billboard.

c) ENVIRONMENTAL DOCUMENTS

When an DEIS or EA is provided to the public and agencies for comment as a part of the public involvement process, the deadline date for comments will be 30 days after the public meeting. For DEIS documents, the comment deadline date will be at least 45 days from the date the Notice of Availability (NOA) for the document is published in the Federal Register. For EA documents, the deadline date for comments should be no less than 30 days from the date the document was mailed to the agencies or placed on the Division's website. The Division shall advise of the comment deadline date and where the document is available for public review. The Division will work with FHWA to approve any written request to extend the deadline date for comments, if it is received prior to the advertised deadline date.

d) OTHER NOTICES

In addition to the formal newspaper legal advertisement, a press release concerning the meeting and/or hearing may be prepared and distributed by the WVDOT Office of Communications.

e) MEETING AND/OR HEARING FORMAT

1) Meetings and/or hearings will be moderated by an official of the Division.
2) The developing Division will furnish an individual who is sufficiently familiar with the project to answer questions raised by citizens.

3) The Division's presentation will include project description, alternatives, environmental and other effects of the project.

4) Provision will be made for submission of written statements and other exhibits in addition to oral statements at meetings or hearings.

5) The Division will explain its right of way acquisition process, relocation assistance program and relocation assistance payments at each public meeting and/or hearing where appropriate.

f) PUBLIC HEARING TRANSCRIPT

A court reporter will develop a verbatim transcript of the proceedings of each public hearing. The responsible individual within the Division will make arrangements for the court reporter. Copies and certification will be forwarded to the developing Division for appropriate action and transmittal to the Federal Highway Administration, should the project be federally funded, is eligible for federal funds or if the FHWA has agreed to be the lead federal agency. Copies of the transcript and appendices will be available for public inspection.

g) PUBLIC MEETING NOTES

The developing Division will be responsible for notes of the meeting. These notes are to include the approximate number of people attending, Division participants, meeting handouts/flyers, advertisement method(s), retain copies of all written comments received and, if applicable, retain a copy of the public hearing transcript.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-202
FIELD AND OFFICE REVIEWS FOR INITIAL ENGINEERING, PRELIMINARY ENGINEERING AND FINAL DESIGN
March 30, 2012

Attached is the West Virginia Department of Transportation, Division of Highways, procedures for *field* and *office* reviews during *initial engineering*, *preliminary engineering* and *final design*. These procedures shall be used on all applicable projects.

As a part of these procedures, in accordance with DD-200, approvals required at the end of certain phases are indicated. These approvals must be obtained before the project proceeds to the next stage of development.

Attachment

FIELD AND OFFICE REVIEWS FOR INITIAL ENGINEERING, PRELIMINARY ENGINEERING AND FINAL DESIGN

I. SCHEDULED REVIEWS

Projects developed by the West Virginia Department of Transportation (WVDOT), Division of Highways (DOH), shall generally consist of three phases of work. Each phase of work shall be accomplished utilizing a series of review submittals.

The following phases of development shall be utilized on all applicable projects:

PHASE I Initial Engineering

PHASE II Preliminary Engineering

This work generally includes environmental assessments, topographic surveys, geotechnical investigations, hydrologic analysis, hydraulic analysis, utility engineering, traffic studies, financial plans, revenue estimates, hazardous material assessments, general estimates of the types and quantities of materials. Other design activities are allowed for the purposes of defining project alternates or completing the NEPA alternatives analysis and review process as listed below under Preliminary Engineering.

PHASE III Final Design (According to 23 CFR 771.113)

Note: The designer is cautioned that no final design activities (regardless of funding source) shall proceed until one of the following three National Environmental Policy Act (NEPA) determinations have been completed:

a. The action has been classified a PCE (Programmatic Categorical Exclusion)

b. The action has been classified as a "Categorical Exclusion" (CE)

c. A "Finding of No Significant Impact" (FONSI) has been approved

d. A "Final Environmental Impact Statement" (FEIS) has been approved and available for the prescribed period of time and a "Record of Decision" (ROD) has been signed

Initial Engineering:

End Product: Corridor Study/Design Report –See DD-205, "Guidance for Preparation of Design Reports and Studies" for more information.

Scheduled Reviews:

1. Field Review

2. Office Review

Preliminary Engineering:

End Product: Preliminary contract documents, completion of scheduled preliminary reviews shown below, preparation of review notes, and action on all comments agreed upon during the review. Location and Design Approval shall be per DD-206, Guidance for Location and Design Approvals. *Line and grade* approval is to be obtained after *environmental clearance* is given.

Preliminary engineering will normally provide all the project information needed to satisfy environmental requirements; however, in certain cases more detailed design work may be needed to permit the full evaluation of environmental impacts and to permit the consideration of appropriate mitigation measures. This should not be construed as an authorization to proceed with final design activities for the entire project, but only for those aspects of the project necessary to consider specific environmental concerns. Written documentation should be prepared and retained in the project files to support any decision to proceed with final design activities needed to consider any specific environmental concerns. Such documentation should include identification of the specific environmental concern(s) and justification for those specific final design activities that need to be performed.

This documentation shall include a completed copy of the appropriate "Authorization for Detail Design Work Exceeding Preliminary Engineering", attached to this Design Directive. Supporting information, reports, comments, and other appropriate documentation may also be included in the project file.

Other design activities are allowed for the purposes of defining project alternates or completing the NEPA alternatives analysis and review process. These activities include but are not limited to complying with other related environmental laws and regulation, environmental justice analyses, supporting agency coordination public involvement and permit application, development of environmental mitigation plans, development of typical sections, grading plans, geometric alignment including any clearances necessary, noise wall justification, temporary structure requirements, staged bridge construction requirements, bridge type/size/location studies, structural design, retaining wall design, noise wall design, design exceptions, guardrail length and layout, existing property lines and deed research, soil boring, cross sections, ditch designs, intersection design, interchange design, pavement design, storm or sanitary sewer design, culvert design identification of removal items quantity estimates, pavement details and preliminary traffic control plans.

Scheduled Reviews:

1. Preliminary Field Review/Span Arrangement (generally submitted simultaneously)

2. Value Engineering Review (if required per DD-816) to be conducted according to the currently approved Value Engineering Program

3. Slope Review

Final Design:

End Product: Final Contract Documents. See DD-706, *Guidelines for Preparation of Plans, Specifications, and Estimates (PS&E)* for more detailed instructions on the make-up of the *final contract documents*.

Scheduled Reviews:

1. Final Field Review

2. Combined Type, Size, and Location Review

3. Final Office Review

4. Bridge Rating Submission

5. Final Detail Bridge Plan Review

Scheduled Submittals:

1. PS&E Submission

2. Tracing Submission

Note:

1. An office review may be scheduled to supplement or replace any of the scheduled field reviews.

2. Additional reviews may be required when all the necessary data was not available at the scheduled review or whenever problems arising from the review are considered of sufficient importance to warrant another review.

3. Minor projects may not require all scheduled reviews be held. All projects should have a minimum of one review.

II. SUBMITTAL DOCUMENTS FOR SCHEDULED REVIEWS

Certification checklists, of required submittal documents for each scheduled review, are included in this design directive. The designer shall submit a signed copy of the appropriate certification checklist with each scheduled review. The submittal will not be considered complete if the checklist is not included and initialed by an appropriate level of management. The absence of a completed certification checklist may be cause for rejection of the submittal. The checklist must be initialed on each line by an Office Manager or an appropriate management level representing the designer. The project manager shall not initial the checklist.

The certification checklist indicates the documents required to be submitted for each scheduled review. The required number of plans to be submitted for each scheduled review shall be per the "Plan Distribution Schedule" included in this design directive. The plans shall be submitted to the division responsible for project development.

Distribution of the plans shall be made by the division responsible for project development. The responsible division shall distribute the plans to the appropriate "resource agencies" per Appendix A of this DD.

The plans submitted in accordance with the Plan Distribution Schedule shall be bound separately and labeled on the outside per the schedule.

III. COMMENTS ON SCHEDULED REVIEW DOCUMENTS

A. Notes

1. Following any review, the responsible Division shall prepare notes in the following form:

   Date of Review:

   Project Number:

   Description of Project:

   Participants: West Virginia Department of Transportation, Division of Highways
   Federal Highway Administration
   Consultant
   Other

   Comments:

2. Distribution of the review notes will be made to the appropriate Divisions and agencies.

3. Federal Highway Administration concurrence in the notes will be obtained, where applicable.

B. Action on Comments

1. All comments mutually agreed upon during the review are to be complied with immediately.

2. The list of comments and action taken thereon shall be prepared in the following form:

   Project Number:

   (Field Review, Office Review, etc.)

   Consultant:

   Date:

(Numbering of comments shall correspond to numbering at the *scheduled review*, etc.)

1. Comment: Show garage left of Station 0+00.

1. Action: Garage has been shown on plans.

PLAN DISTRIBUTION SCHEDULE

The Plan Distribution Schedule has moved to WVDOH Publication Webpage at:

http://www.transportation.wv.gov/highways/engineering/Pages/DD-202ContactInformation.aspx

AUTHORIZATION
FOR
DETAIL DESIGN WORK
EXCEEDING
PRELIMINARY ENGINEERING
NON-EXEMPT AND CONCURRENCE PROJECTS

STATE PROJECT: ________________________ **DATE SUBMITTED:** _________________

FEDERAL PROJECT: _____________________ **PREPARED BY:** _____________________

PROJECT NAME: ________________________

ROUTE NUMBER: ________________________

COUNTY: ________________________________

PROJECT MANAGER: ____________________

ENVIRONMENTAL CONCERN:____

____

____

____

ASPECTS OF PROJECT AFFECTED: ____

____

____

____

JUSTIFICATION FOR FINAL DESIGN ACTIVITIES: ____________________________________

____

____

____

☐ **APPROVED** ☐ **NOT APPROVED**

____
Deputy State Highway Engineer for Development

__________________ **Date**

☐ **APPROVED** ☐ **NOT APPROVED**

____
FHWA

__________________ **Date** **6/16/06**

AUTHORIZATION
FOR
DETAIL DESIGN WORK
EXCEEDING
PRELIMINARY ENGINEERING
EXEMPT PROJECTS

STATE PROJECT: ________________________ **DATE SUBMITTED:** _________________

FEDERAL PROJECT: _____________________ **PREPARED BY:** _____________________

PROJECT NAME: ________________________

ROUTE NUMBER: ________________________

COUNTY: ________________________________

PROJECT MANAGER: ____________________

ENVIRONMENTAL CONCERN:____

____

____

____

ASPECTS OF PROJECT AFFECTED: ____

____

____

____

JUSTIFICATION FOR FINAL DESIGN ACTIVITIES: ___________________________________

____

____

____

☐ **APPROVED** ☐ **NOT APPROVED**

____
Deputy State Highway Engineer for Development

__________________ **Date**

6/16/06

WEST VIRGINIA DIVISION OF HIGHWAYS
DESIGN REPORT FIELD REVIEW SUBMISSION CERTIFICATION

State Project No. ______________________

Federal Project No. ______________________

Project Name ______________________

County ______________________

Consultant ______________________

Project Manager ______________________

Submission Date ______________________

General Plan Requirements

_________ Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown

Plan and Profile Sheets

_________ Alignment, Curve Data, and Superelevation Rate Shown for Mainline and all Sideroads
_________ Stationing Shown for Mainline and all Sideroads
_________ Prel. Grades and Vertical Curve Data, Including K-Value, Shown for Mainline and all Sideroads
_________ Proposed Construction Limits Shown
_________ Property Lines from Tax Maps Shown
_________ Disposition of all Crossroads, Railroads, and Streams or Rivers
_________ Channel Change Requirements Incorporating Natural Channel Design Features Shown
_________ Major Drainage Requirements, Shown (DD-706)
_________ Proposed and Existing R/W Limits Shown (DD-301)
_________ Existing & Private Major Utilities, Including Gas Fields, Sewer, and Water Facilities Shown

Typical Sections

_________ Mainline Typicals
_________ Sideroad Typicals

Cross Sections

_________ Mainline Sections at 500 foot Spacing and at Critical Locations
_________ Sideroad Sections at 500 foot Spacing and at Critical Locations
_________ Existing Topography, Including R/W, Streams, Roads, Utilities, etc., Shown

Miscellaneous Sheets

_________ Title Sheet with Proposed Sheet Index (DD-701)
_________ Mass Diagram
_________ Traffic Sketch Map (DD-802)
_________ Conceptual Maintenance of Traffic Scheme, Including Detours
_________ Ownership Index (May be submitted as a separate report on large projects involving a significant number of parcels)

Field Review Report

_________ Design Criteria Listing for Mainline and all Sideroads
_________ Listing of Proposed Design Exceptions
_________ Listing of Advantages and Disadvantages of Each Alignment Under Study
_________ Table of Physical Characteristics (curvature, grades, construction costs, right-of-way costs, displacements, length, etc.) of Each Alignment
_________ Access Point Analysis Including type, location, etc.
_________ Access Point Cost Analysis (DD-307)
_________ Geotechnical Overview

Miscellaneous Reports

_________ Major Drainage Calculations
_________ Total Project Construction Cost Estimate of Each Alignment Under Study
_________ Consultant's Quality Control Markups

Notes:
1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
DESIGN REPORT OFFICE REVIEW SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

General Plan Requirements

_________ Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown

Plan and Profile Sheets

_________ Alignment, Curve Data, and Superelevation Rate Shown for Mainline and all Sideroads
_________ Stationing Shown for Mainline and all Sideroads
_________ Prel. Grades and Vertical Curve Data, Including K-Value, Shown for Mainline and all Sideroads
_________ Proposed Construction Limits Shown
_________ Property Lines from Tax Maps Shown
_________ Disposition of all Crossroads, Railroads, and Streams or Rivers
_________ Channel Change Requirements Incorporating Natural Channel Design Features Shown
_________ Major Drainage Requirements, Shown (DD-706)
_________ Proposed and Existing R/W Limits Shown (DD-301)
_________ Existing & Private Major Utilities, Including Gas Fields, Sewer, and Water Facilities Shown

Typical Sections

_________ Mainline Typicals
_________ Sideroad Typicals

Cross Sections

_________ Mainline Sections at 500 foot Spacing and at Critical Locations
_________ Sideroad Sections at 500 foot Spacing and at Critical Locations
_________ Existing Topography, Including R/W, Streams, Roads, Utilities, etc., Shown

Miscellaneous Sheets

_________ Title Sheet with Proposed Sheet Index (DD-701)
_________ Mass Diagram
_________ Traffic Sketch Map (DD-802)
_________ Conceptual Maintenance of Traffic Scheme, Including Detours (If Required)
_________ Ownership Index (May be submitted as a separate report on large projects involving a significant number of parcels)

Office Review Report

_________ Design Criteria Listing for Mainline and all Sideroads
_________ Listing of Proposed Design Exceptions
_________ Listing of Advantages and Disadvantages of Each Alignment Under Study
_________ Table of Physical Characteristics (curvature, grades, construction costs, right-of-way costs, displacements, length, etc.) of Each Alignment
_________ Access Point Analysis Including type, location, etc.
_________ Access Point Cost Analysis (DD-307)
_________ Geotechnical Overview
_________ Listing of Design Report Field Review Comments and Action Taken on Each Comment

Miscellaneous Reports

_________ Major Drainage Calculations
_________ Total Project Construction Cost Estimate of Each Alignment Under Study
_________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
PRELIMINARY FIELD REVIEW SUBMISSION CERTIFICATION

State Project No. __________________________

Federal Project No. __________________________

Project Name __________________________

County __________________________

Consultant __________________________

Project Manager __________________________

Submission Date __________________________

General Plan Requirements

_________ Construction Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown

Field Review Preparation

_________ Mainline Centerline Flagged at Sufficient Intervals for Field Review
_________ RW-1 Plans or RW-1 & RW-2 Combined Plans Submitted (DD-301)
_________ Value Engineering Review Required (DD-816)

Plan and Profile Sheets

_________ Alignment, Curve Data, and Superelvation Shown for Mainline and all Sideroads
_________ Stationing Shown for Mainline and all Sideroads
_________ Prel. Grades and Vertical Curve Data, Including K-Value, Shown for Mainline and all Sideroads
_________ Proposed Construction Limits Shown
_________ Property Lines Shown
_________ Disposition of all Crossroads, Railroads, and Streams or Rivers
_________ Channel Change Requirements Incorporating Natural Channel Design Features Shown
_________ Major Drainage Requirements, Including Pipe Profiles, Shown (DD-706)
_________ Major Erosion and Sediment Control Features on Plans and Cross Sections
_________ Proposed and Existing R/W Limits Shown
_________ Existing Public & Private Utilities, Including Gas, Water, Septic, and Leach Fields for All Parcels, Shown (DD-303)

Typical Sections

_________ Mainline Typicals
_________ Sideroad Typicals
_________ Temporary Detour Typicals

Cross Sections

_________ Mainline Sections at 200 foot Spacing and at Critical Locations
_________ Sideroad Sections at 200 foot Spacing and at Critical Locations
_________ Earthwork Based on Assumed Slopes
_________ Existing Topography, Including R/W, Utilities, Bldg.'s, etc., Shown

Environmental Requirements

_________ Type of 404 Permit Documented (Individual or Nationwide)
_________ Certification of Familiarity with Environmental Documents
_________ List of Required Environmental Mitigations (DD-206)
_________ Listing and Explanation of Deviations to Design Report and Env. Documents
_________ Noise Mitigation or Noise Wall Justification

Miscellaneous Sheets

_________ Title Sheet with Proposed Sheet Index (DD-701)
_________ Mass Diagram
_________ Interchange Geometric Layout
_________ Traffic Sketch Map (DD-802)
_________ Conceptual Maintenance of Traffic Scheme, Including Detours (DD-681)
_________ Traffic Routing Contingency Plan for Bridge/Structure Projects
_________ Property Maps, Ownership and Utility Index from R/W-1 Plans (DD-301)

Boring Layout and Documents

_________ Boring Layout Shown on a Set of Topographic Plans
_________ Boring Bid Documents (Submitted after Preliminary Field Review) (DD-401)
_________ Boring Tabulation Showing all Pertinent Information (Submitted after Preliminary Field Review)

Preliminary Field Review Report

_________ Design Criteria Listing for Mainline and all Sideroads
_________ Access Point Cost Analysis (DD-307)
_________ Draft of required Design Exceptions

Miscellaneous Reports

_________ Major Drainage Calculations
_________ Geometric Calculations
_________ Total Project Construction Cost Estimate
_________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
SLOPE REVIEW SUBMISSION CERTIFICATION

State Project No. ______________________

Federal Project No. ______________________

Project Name ______________________

County ______________________

Consultant ______________________

Project Manager ______________________

Submission Date ______________________

General Plan Requirements

_________ Construction Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown

Plan and Profile Sheets

_________ Alignment, Curve Data, and Superelvation Shown for Mainline and all Sideroads
_________ Stationing Shown for Mainline and all Sideroads
_________ Prel. Grades and Vertical Curve Data, Including K-Value, Shown for Mainline and all Sideroads
_________ Proposed Construction Limits Shown
_________ Property Lines Shown
_________ Disposition of all Crossroads, Railroads, and Streams or Rivers
_________ Channel Change Requirements Incorporating Natural Channel Design Features Shown
_________ Major Drainage Requirements, Including Pipe Profiles, Shown (DD-706)
_________ Proposed and Existing R/W Limits Shown
_________ Existing Public & Private Utilities, Including Gas, Water, Septic, and Leach Fields for Residences, Shown (DD-303)
_________ Boring Layout Plotted on All Plan Sheets
_________ Borings Plotted on Profile Sheets
_________ Preliminary Layout of all Structures, Including Bridges, Culverts, and Walls

Typical Sections

_________ Mainline Typicals
_________ Sideroad Typicals
_________ Temporary Detour Typicals

Cross Sections

_________ Cross Sections with Recommended Cut Slopes, Fill Slopes and Associated Fill Benches, and Select Embankment Placement
_________ Earthwork Based on Assumed Slopes and Recommended Shrink and Swell Factors
_________ Borings Plotted on all Applicable Sections

Miscellaneous Sheets

_________ Title Sheet for Boring Logs Showing Geologic Symbols (DD-402)
_________ Mass Diagram

Geotechnical Report

_________ Discussion of Recommended Slopes
_________ Discussion of Recommended Culverts and Retaining Walls
_________ Discussion of Project Soils and Geologic Conditions, Including Subsurface Conditions (DD-402)
_________ Discussion and Justification for Recommended Shrink and Swell Factors (DD-406)
_________ Laboratory Testing & Soil/Rock Analysis
_________ Engineer's Written Field Boring Logs
_________ Total Project Construction Cost Estimate

Miscellaneous Report

_________ Consultant's Quality Control Markups

Notes:
1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL FIELD REVIEW SUBMISSION CERTIFICATION

State Project No. ______________________

Federal Project No. ______________________

Project Name ______________________

County ______________________

Consultant ______________________

Project Manager ______________________

Submission Date ______________________

General Plan Requirements

_______ Construction Project Numbers Shown
_______ Line Weights Legible
_______ Contours Screened and Legible
_______ Adequate Spot Elevations Shown
_______ All Phases of Work Included in a Bid Item

Plan and Profile Sheets

_______ Alignment, Curve Data, and Superelvation Shown for Mainline and all Sideroads
_______ Stationing Shown for Mainline and all Sideroads
_______ Grades and Vertical Curve Data, Including K-Value, Shown for Mainline and all Sideroads
_______ Construction Limits Shown
_______ Property Lines Shown
_______ Disposition of all Crossroads, Railroads, and Streams or Rivers
_______ Channel Change Requirements Incorporating Natural Channel Design Features Shown
_______ All Drainage Requirements Including Pipes, Pipe Profiles, Ditches, and Underdrains Shown (DD-706)
_______ Major Erosion and Sediment Control Features on Plans and Cross Sections
_______ Proposed and Existing R/W Limits Shown
_______ Utility Dispositions Shown (If Available)
_______ Existing Public & Private Utilities, Including Gas, Water, Septic, and Leach Fields for All Parcels, Shown (DD-303)
_______ Pavement/Surface Limits for All Roads
_______ Site Plans for All Structures

Typical Sections

_______ Mainline Typicals
_______ Sideroad Typicals
_______ Pavement Edge/Shoulder Details
_______ Pavement Design with Legend Including all Related Details
_______ Temporary Detour Typicals

Miscellaneous Sheets

_______ Title Sheet with Proposed Sheet Index (DD-701)
_______ Summary of Quantities Showing List of Items Separated by Categories with Alternates at the End of Each Category (BAMS Format) (DD-705)
_______ General Note Sheets (DD-704)
_______ Quantity Tables without Quantities except Earthwork (DD-705)
_______ Mass Diagram
_______ Reference Point Sheet
_______ Geometric Layout Sheet with Coordinates
_______ Benchmarks Shown on Ref. Pt. Sheet, Geometric Layout Sheet, or Profile Sheet
_______ Superelevation Shown for all Curves (DD-603)
_______ Interchange Geometrics Shown
_______ Intersection Layout Including Joint Layout
_______ Complete Maintenance of Traffic Scheme Including Sequence of Construction (DD-681)
_______ Traffic Routing Contingency Plan
_______ for Bridge/Structure Projects
_______ Prel. Pavement Marking Layout (DD-682)
_______ Preliminary Sign Layout (DD-683)
_______ Preliminary Signal Layout
_______ Preliminary Lighting Layout (DD-684)
_______ All Required Ret. Wall and Culvert Details Shown
_______ Any Required Special Detail Sheets
_______ Property Maps, Ownership and Utility Index from R/W-2 Plans (DD-301)
_______ Completed Set of Soil Plans and Profiles Including Title Sheet (DD-402)

Cross Sections

_______ Complete Set of Mainline Cross Sections Showing Templates, Earthwork, Borings, R/W Limits. Guardrail & Barriers
_______ Complete Set of Sideroad Cross Sections Showing Templates, Earthwork, Borings, R/W Limits. Guardrail & Barriers
_______ All Drainage Features Shown
_______ Quantity Tables Completed

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL FIELD REVIEW SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

Final Field Review Report

_________ Listing of Preliminary Field Review and Slope Review Comments and Action Taken on Each Comment
_________ Preliminary Calculations for Turning Lane Lengths and Tapers, Intersection Sight Distances, Interchange Ramp Lengths
_________ Completed Design Exception Reports
_________ Completed ADA Exception Reports
_________ Discussion of Construction Sequence Utilized in Plan Development
_________ Listing of Proposed Project Specific Special Provisions
_________ Discussion of Need for Incentive/Disincentive Contract Provisions (DD-708)

Miscellaneous Reports

_________ Complete Drainage Calculations
_________ Geometric Calculations
_________ Geotechnical Report (Draft)
_________ Total Project Construction Cost Estimate
_________ Consultant's Quality Control Markups

Environmental Requirements

_________ Type of 404 Permit Documented (Individual or Nationwide)
_________ List of Required Environmental Mitigations (DD-206)
_________ Certification and Listing of Adherence to Environmental Documents
_________ Listing and Explanation of Deviations to Design Report and Env. Documents
_________ Completed NPDES Registration Form

Value Engineering Report (If Applicable)

_________ Listing of Comments From Value Engineering Review (DD-816)
_________ Discussion of Actions Taken on Each Comment

Final Field Review Preparation

_________ RW-2 Plans Submitted (DD-301)

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL OFFICE REVIEW SUBMISSION CERTIFICATION

State Project No. ____________________ Consultant ____________________

Federal Project No. ____________________ Project Manager ____________________

Project Name ____________________ Submission Date ____________________

County ____________________

General Plan Requirements

_________ Construction Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown
_________ All Phases of Work Included in a Bid Item

Plan and Profile Sheets

_________ Alignment, Curve Data, and Superelvation Shown for Mainline and all Sideroads
_________ Stationing Shown for Mainline and all Sideroads
_________ Grades and Vertical Curve Data, Including K-Value, Shown for Mainline and all Sideroads
_________ Construction Limits Shown
_________ Property Lines Shown
_________ Disposition of all Crossroads, Railroads, and Streams or Rivers
_________ Channel Change Requirements Incorporating Natural Channel Design Features Shown
_________ All Drainage Requirements Including Pipes, Pipe Profiles, Ditches, and Underdrains Shown (DD-706)
_________ Major Erosion and Sediment Control Features on Plans and Cross Sections
_________ Drainage and Guardrail Limits/Data Noted on Plan and Profile Sheets
_________ Proposed and Existing RW Limits Shown
_________ Utility Dispositions Shown for all affected Utilities (If Available)
_________ Existing Public & Private Utilities, Including Gas, Water, Septic, and Leach Fields for Residences, Shown (DD-303)
_________ Pavement/Surface Limits for All Roads
_________ Site Plans for All Structures
_________ Curb Ramps and Other ADA Features

Typical Sections

_________ Mainline Typicals
_________ Sideroad Typicals
_________ Pavement Edge/Shoulder Details
_________ Pavement Design with Legend Including all Related Details
_________ Temporary Detour Typicals

Miscellaneous Sheets

_________ Title Sheet with Proposed Sheet Index (DD-701)
_________ Summary of Quantities Showing List of Items Separated by Categories with Alternates at the End of Each Category (BAMS Format) (DD-705)
_________ General Note Sheets (DD-704)
_________ Quantity Tables with all Quantities Completed (DD-705)
_________ Mass Diagram
_________ Reference Point Sheet
_________ Geometric Layout Sheet with Coordinates
_________ Benchmarks Shown on Ref. Pt. Sheet, Geometric Layout Sheet, or Profile Sheet
_________ Superelevation Tables and Diagrams Completed for all Curves (DD-603)
_________ Interchange Geometrics Shown
_________ Intersection Layout Including Joint Layout
_________ Complete Maintenance of Traffic Scheme Including Sequence of Construction (DD-681)
_________ Traffic Routing Contingency Plan
_________ for Bridge/Structure Projects
_________ Pavement Marking Layout (DD-682)
_________ Sign Layout (DD-683)
_________ Signal Layout
_________ Lighting Layout (DD-684)
_________ All Required Ret. Wall and Culvert Details Shown
_________ Any Required Special Detail Sheets Including ADA Features
_________ Property Maps, Ownership and Utility Index from Revised RW-3 Plans
_________ Completed Set of Soil Plans and Profiles Including Title Sheet (DD-402)

Cross Sections

_________ Complete Set of Mainline Cross Sections Showing Templates, Earthwork, Borings, RW Limits. Guardrail & Barriers
_________ Complete Set of Sideroad Cross Sections Showing Templates, Earthwork, Borings, RW Limits. Guardrail & Barriers
_________ All Drainage Features Shown
_________ Quantity Tables Completed

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL OFFICE REVIEW SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

Final Office Review Report

_________ Listing of Final Field Review Comments and Action Taken on Each Comment
_________ Final Calculations for Turning Lane Lengths and Tapers, Intersection Sight Distances, Interchange Ramp Lengths
_________ Approved Design Exception Reports
_________ Approved ADA Exception Reports
_________ Discussion of Construction Sequence Utilized in Plan Development
_________ Completed Copies of All Project Specific Special Provisions (Word Format) (DD-105, DD-820)
_________ Complete Incentive/Disincentive Provisions
_________ Letters Approving Proposed Relocations From Utility Companies

Environmental Requirements

_________ List of Required Environmental Mitigations (DD-206)
_________ Certification and Listing of Adherence to Environmental Documents
_________ Listing and Explanation of Deviations to Design Report and Env. Documents
_________ Copy of Transmittal Letter From DDT Submitting NPDES Registration to DEP
_________ Completed NPDES Registration Form with all Attachments sent to DEP

Miscellaneous Reports

_________ Complete Drainage Calculations
_________ Computations Including Horizontal/Vertical Geometry and Quantity Calculations
_________ Final Geotechnical Report (DD-402)
_________ Consultant's Quality Control Markups

Corps of Engineers Permit Requirements

_________ Plan View of all Project Areas Requiring a 404 Permit
_________ Profile View of all Project Areas Requiring a 404 Permit
_________ Cross Section View of all Project Areas Requiring a 404 Permit
_________ Quantity of Material to be Placed Below "Ordinary High Water" Shown on Appropriate Sheets
_________ Temporary Fills, Causeways, Bridges, Pipes, etc. Shown For Proposed Construction Scheme
_________ Copy of Section 106 "Historical Clearance Document" Included
_________ Copy of "Rare, Threatened, and Endangered Species Clearance Letter" Included
_________ Copy of Letter Submtting Plans to Resource Agencies for Review
_________ Copy of All Comments Received from Resource Agencies
_________ Copy of FEMA Clearance Letter (If Applicable)
_________ Two Copies of Completed 404 Permit Application Package Included

Supplemental Contract Information

_________ Estimated Contract Time Chart (DD-803)
_________ Total Project Construction Cost Estimate

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
SPAN ARRANGEMENT SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

Struc. No. or Wall Sta. ____________________

General Plan Requirements

_________ Construction Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown
_________ Bridge Number Shown on All Applicable Documents and Plan Sheets

Plan and Profile Sheets

_________ Plan and Profile Sheet for Each Span Arrangement Studied
_________ Proposed Grading for Each Alternative Shown
_________ Alignment and Curve Data Shown for Each Alternative
_________ Prel. Grades and Vertical Curve Data Shown for Each Alternative
_________ Stationing Shown for Each Alternative
_________ Boring Locations Shown for Each Span Arrangement
_________ Hydraulic Data Plotted on Profile
_________ Clearance Envelope for Any Railroads Highways, or Associated Structures
_________ Proposed and Existing R/W Limits Shown
_________ Traffic Data Shown on Plan Sheets
_________ Profile of All Crossroads or Intersecting Features Shown
_________ Existing Public & Private Utilities, Including Gas, Water, Septic, and Leach Fields for Residences, Shown (DD-303)
_________ Schematic Profile of Underpassing Railroad or Roadway

Typical Sections

_________ Roadway Typicals
_________ Bridge Typicals Shown, Including Staging Requirements
_________ Temporary Detour Typicals

Miscellaneous Sheets

_________ Conceptual Maintenance of Traffic Scheme
_________ Traffic Routing Contingency Plan for Bridge/Structure Projects
_________ Location and Elevation of Existing Structure Showing Clearances, Waterway Opening, and Appropriate Storm Frequency Elevations

Boring Layout and Documents

_________ Boring Layout
_________ Boring Bid Documents (Submitted after Span Arrangement Review) (DD-401)
_________ Boring Tabulation Showing all Pertinent Information (Submitted after Span Arrangement Review)

Span Arrangement Report

_________ Alignment, Grades, Typical Sections, and Superelevation of Bridge Matches Those used in the Prel. Field Review and are Documented in the Report
_________ Preliminary Hydraulic Study Submitted
_________ Freeboard Documented
_________ Navigational Clearance Requirements Documented
_________ Roadway or Railroad Clearance Requirements Documented (DD-303)
_________ Maintenance of Traffic Requirements Documented
_________ Constructablility and Staging Requirements Discussed and Accounted for in Proposed Layout
_________ Description of Proposed Superstructure Depth, Type, and Span Length for Each Alternate
_________ Listing of Proposed Computer Software
_________ Listing of Deck Drainage Requirements
_________ Listing of Joint and/or Bearing Requirements
_________ Listing of Environmental, Aesthetic, and Utility Requirements
_________ Description of Assumed Foundation Type
_________ Preliminary Total Structure Cost for Each Span Arrangement, Listed by Item and Separated by Super and Sub Structure
_________ Recommended Layouts for TS&L
_________ Copy of Minutes from Pre-Span Arr. Meeting
_________ Total Project Construction Cost Estimate
_________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
COMBINED TS&L SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

Struc. No. or Wall Sta. ____________________

General Plan Requirements

- ________ Construction Project Numbers Shown
- ________ Line Weights Legible
- ________ Contours Screened and Legible
- ________ Adequate Spot Elevations Shown
- ________ Bridge Number Shown on All Applicable Documents and Plan Sheets

Plan and Profile Sheets

- ________ Plan and Profile Sheet for Each Alternative Studied
- ________ Proposed Grading for Each Alternative Shown
- ________ Alignment and Curve Data Shown for Each Alternative
- ________ Grades and Vertical Curve Data Shown for Each Alternative
- ________ Stationing Shown for Each Alternative
- ________ Boring Locations Shown for Each Alternative
- ________ Hydraulic Data Plotted on Profile
- ________ Clearance Envelope for Any Railroads Highways, or Associated Structures
- ________ Proposed and Existing R/W Limits Shown
- ________ Existing Public & Private Utilities, Including Gas, Water, Septic, and Leach Fields for All Parcels, Shown (DD-303)
- ________ Schematic Profile of Underpassing Railroad or Roadway

Boring Layout and Documents

- ________ Completed Geotechnical Report
- ________ Bearing Capacities Documented
- ________ Foundation Depth Shown
- ________ Scour Depths Shown
- ________ External Stablility Calculations of MSE Walls Included

Typical Sections

- ________ Roadway Typicals
- ________ Bridge Typicals Shown, Including Staging Requirements
- ________ Temporary Detour Typicals (If Applicable)

Combined TS&L Report

- ________ Alignment, Grades, Typical Sections, and Superelevation of Bridge Matches those Currently Approved and are Documented in the Report
- ________ Final Hydraulic Study Submitted
- ________ Scour Analysis Including Completed DS-34
- ________ Freeboard Documented
- ________ Navigational Clearance Requirements Documented
- ________ Roadway or Railroad Clearance Requirements Documented (DD-303)
- ________ Maintenance of Traffic Requirements Documented
- ________ Constructablility and Staging Requirements Discussed and Accounted for in Proposed Layout
- ________ Conceptual Deck Drainage Design for Each Alternate
- ________ Conceptual Design of Joint and/or Bearing Requirements
- ________ Listing of Environmental, Aesthetic, and Utility Requirements
- ________ Lighting and Signing Requirements Documented
- ________ Inspection Access Requirements Documented
- ________ Description of Superstructure Types Considered
- ________ Description of Substructure and Foundation Types Considered
- ________ Detailed Discussion of the Advantages and Disadvantages of each Type and a Recommended Superstructure/ Substructure Combination
- ________ Total Structure Cost for each Appropriate Superstr./Substr. Combination Listed by Item and Separated between Superstructure and Substructure
- ________ Total Project Construction Cost Estimate
- ________ Listing of all Project Specific Special Provisions
- ________ Listing of Span Arr. Review Comments and Action Taken on Each Comment

WEST VIRGINIA DIVISION OF HIGHWAYS
COMBINED TS&L SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

Struc. No. or Wall Sta. ____________________

Miscellaneous Sheets

_________ Title Sheet with Proposed Sheet Index
_________ Conceptual Maintenance of Traffic Scheme
_________ Traffic Routing Contingency Plan for Bridge/Structure Projects
_________ Location and Elevation of Existing Structure Showing Clearances, Waterway Opening, and Appropriate Storm Frequency Elevations
_________ Proposed Framing Plan of All Alternates
_________ Outline Drawings of All Alternate Substructure Units Showing Major Dimensions
_________ Jacking Point Concepts Shown
_________ Proposed Architectural Treatments Shown
_________ Deck Drainage Requirements Shown
_________ Proposed Expansion Dams Shown
_________ Proposed Bridge Bearings Shown

Coast Guard Permit Requirements

_________ Coast Guard Sketches for Recommended Alternate Included
_________ List of Adjoining Property Owners
_________ Quantity of Material to be Removed and Replaced Below the 100 Year Flood Level. Separated by Excavation, Backfill, and Concrete for Each Substructure Unit

Corps of Engineers Permit Requirements

_________ Plan View of all Areas Requiring a 404 Permit
_________ Profile View of all Areas Requiring a 404 Permit
_________ Cross Section View of all Areas Requiring a 404 Permit
_________ Quantity of Material to be Placed Below "Ordinary High Water" Shown on Appropriate Sheets
_________ Temporary Fills, Causeways, Bridges, Pipes, etc. Shown For Proposed Construction Scheme
_________ Copy of Section 106 "Historical Clearance Document" Included
_________ Copy of "Rare, Threatened, and Endangered Species Clearance Letter" Included
_________ Copy of FEMA Clearance Letter (If Applicable)
_________ Completed 404 Permit - One Electronic Copy OR Two Paper Copies

Miscellaneous Report

_________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
BRIDGE RATING SUBMISSION CERTIFICATION

State Project No. ______________________

Federal Project No. ______________________

Project Name ______________________

County ______________________

Consultant ______________________

Project Manager ______________________

Submission Date ______________________

General Requirements - Rating by District Bridge Eng.

_________ Title Sheet with Proposed Sheet Index (DD-701)

_________ Complete Set of Superstructure Plans with All Dimensions, Thicknesses, and Material Specifications Shown

_________ Complete Set of Substructure Plans with All Dimensions, Thicknesses, and Material Specifications Shown

_________ Horizontal Roadway Alignment Including Curve Data Shown

_________ Vertical Roadway Grade Shown

_________ Bridge Layout Dimensions Shown

_________ Foundation Elev. And Low Bearing Elevation Shown

_________ Plan View of Deck Showing All Dimensions, Including Span Lengths Widths, Skew Angles, etc.

_________ Typical Sections Showing Deck Width, Overhang, Parapet Location, Deck Thickness, Overlay Thickness (If applicable), Reinforcing, and Reinforcing Clearances

_________ Complete Set of Bridge Superstructure Calculations

Miscellaneous Report

_________ Consultant's Quality Control Markups

General Requirements - Rating by Design Engineer

_________ Title Sheet with Proposed Sheet Index (DD-701)

_________ Complete Set of Superstructure Plans with All Dimensions, Thicknesses, and Material Specifications Shown

_________ Complete Set of Substructure Plans with All Dimensions, Thicknesses, and Material Specifications Shown

_________ Horizontal Roadway Alignment Including Curve Data Shown

_________ Vertical Roadway Grade Shown

_________ Bridge Layout Dimensions Shown

_________ Foundation Elev. And Low Bearing Elevation Shown

_________ Plan View of Deck Showing All Dimensions, Including Span Lengths Widths, Skew Angles, etc.

_________ Typical Sections Showing Deck Width, Overhang, Parapet Location, Deck Thickness, Overlay Thickness (If applicable), Reinforcing, and Reinforcing Clearances

_________ Complete Set of Bridge Rating Calculations with All Members Rated by "The Manual for Bridge Evaluation", Latest Edition, Published by AASHTO and the "LRFD Bridge Design Specifications" Latest Edition Published by AASHTO

_________ Completed WVDOH DS-25 "Bridge Safe Load Capacity-Analysis and Justification Report"

_________ Completed WVDOH DS-34 "Scour Evaluation Summary"

Notes:
1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL DETAIL BRIDGE PLAN SUBMISSION CERTIFICATION

State Project No. ____________________

Federal Project No. ____________________

Project Name ____________________

County ____________________

Consultant ____________________

Project Manager ____________________

Submission Date ____________________

Struc. No. or Wall Sta. ____________________

General Plan Requirements

_________ Construction Project Numbers Shown
_________ Line Weights Legible
_________ Contours Screened and Legible
_________ Adequate Spot Elevations Shown
_________ North Arrow Shown on all Layout Sheets
_________ Bridge Number Shown on All Applicable Documents and Plan Sheets
_________ AASHTO Material Designations Utilized
_________ Designer and Checker Have Initialed All Sheets
_________ Index to Bridge Sheets Included
_________ Index to Abbreviations Included

Notes and Quantity Sheets

_________ Governing Specification Note
_________ Design Criteria and Methodology Note Included
_________ Material Notes Including Concrete, Reinforcing Steel, Prestressing Strands, Structural Steel, Piling, Drilled Shafts, etc.
_________ Maintenance of Traffic
_________ Temporary Structure Requirements Shown
_________ Dismantling Structure Requirements Shown
_________ Erection Notes
_________ Charpy V-Notch Note Included
_________ Piling Notes Included
_________ Minimum Reinforcing Lap Note Included
_________ Minimum Reinforcing Cover Note Included
_________ Scour Protection Material Size Noted
_________ Lead Paint Notes if Paint Removal or Dismantling Structure Required
_________ Containment Criteria Shown for Cleaning & Painting
_________ Railroad Requirements Shown (DD-303)
_________ Miscellaneous Required Notes to Describe Nonstandard Items of Work
_________ Quantity Table Identifying Pay Items with Quantities, Units, and Totals Shown (TRNSPORT Format)
_________ Table for Lump Sum Items Showing Breakdown of Material Included
_________ All Work Included in an Appropriate Pay Item
_________ Quantities Split per Corporation Limits or Border State Agreements
_________ Columnar Breakdown of Quantities per Substructure Unit and Superstructure Included

Substructure Units

_________ Elevation, Plan, and Sections of Substructure Unit Shown
_________ North Arrow and Orientation Shown
_________ Workpoint and Centerline Bearing Shown
_________ Skew of Substructure Unit Shown
_________ Dimensions of All Components of Each Unit Shown
_________ Bridge Seat and Foundation Elevations Shown
_________ Anchor Bolt Layout Shown in Plan and Section
_________ Limits of Select Material for Backfilling Shown
_________ Limits of Structure Excavation and/or Wet Excavation Shown
_________ Paving Notch Shown as Appropriate
_________ Underdrains Shown
_________ Weep Holes for Abutments and Wingwalls
_________ Reinforcing Steel with Bar Marks Shown
_________ Existing and Finished Grade Shown on Each Substructure Unit
_________ Factored Unit Bearing/Side Resistance & Max Factored Substructure Axial Load
_________ Quantity Table for Substructure Unit Shown

Core Boring Stick Logs

_________ Boring Stick Logs Plotted with Legend and Showing Each Soil and Rock Layer Encountered Using DOH Standard Symbology
_________ Station and Offset for Each Boring Shown
_________ Elevation of Top of Boring Shown
_________ Including RQD, Per-Cent Recovery, HCSI
_________ Bottom of Foundation Plotted on Logs
_________ Pile Tip Elevations Shown On Logs
_________ Drilled Shaft Elevations Shown on Logs, Including Top of Competent Rock and Bottom of Shaft

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL DETAIL BRIDGE PLAN SUBMISSION CERTIFICATION

State Project No. ______________________

Federal Project No. ______________________

Project Name ______________________

County ______________________

Consultant ______________________

Project Manager ______________________

Submission Date ______________________

Struc. No. or Wall Sta. ______________________

Plan and Profile Sheets

_________ Horizontal Roadway Alignment Including Curve Data Shown
_________ Vertical Roadway Grade Shown
_________ Stationing Shown and Matching Roadway Plans
_________ Centerline Bearing Station Shown on All Substructure Units
_________ Bridge Length Shown (paving notch to paving notch)
_________ Skew Angles and Span Lengths Shown
_________ Bridge Layout Dimensions Shown
_________ Foundation Elev. And Low Bearing Elev. Shown
_________ Station and Elevation of All Berms Shown
_________ Limits/Thickness of Slope Protection Shown
_________ Stream Flow Direction Shown
_________ Low Water Surface Elevation Shown
_________ Hydraulic Data Plotted on Profile
_________ Scour Depths Shown for 100 Year Flood Level
_________ Clearance Envelope for Any Railroads Highways, or Associated Structures
_________ Schematic Profile of Underpassing Railroad or Roadway
_________ Bearing Type Shown (i.e. fixed,expansion, integral, semi-integral, etc.)

Deck Slab

_________ Plan View of Deck Showing All Dimensions, Including Span Lengths Widths, Skew Angles, etc.
_________ Typical Sections Showing Deck Width, Overhang, Parapet Location, Deck Thickness, Overlay Thickness (If applicable), Reinforcing, and Reinforcing Clearances
_________ Deck Pour Sequence Shown with Allowable Options Indicated
_________ Reinforcing Steel with Bar Marks Shown
_________ Deck Construction Joint Locations and Details Shown
_________ Drip Goove Detail Shown
_________ Haunch Detail Shown and Noted
_________ End Diaphragm Details for Semi-Integral Abutments Shown
_________ Deck Drain Locations Shown
_________ Sidewalk Details Shown (If applicable)
_________ Railing and/or Screening Attachment Location and Details Shown

Framing Plans and Details

_________ Plan View Showing Location of All Structural Framing
_________ Elevation of All Girders Showing Flange Sizes, Flange Transition Points, Splices Bearing Stiffeners, and Web Size
_________ Size, Location, Type, and Details of All Stiffeners Shown
_________ Detail and Location of All Bolted and Welded Splices Shown
_________ Number, Location, and Spacing of Shear Studs Shown
_________ Stiffener to Girder Welds Detailed
_________ Tension and Stress Reversal Areas Noted
_________ Prestressing Details and Notes Shown (If applicable)
_________ Post-Tensioning Details Shown (If applicable)
_________ Strand Debonding Areas Shown
_________ Camber Diagram Provided
_________ Dead Load Deflection Table Included
_________ Diaphragm/Cross-Frame Details Shown
_________ Bearing Details Shown
_________ Anchor Bolt Details Shown
_________ Expansion Dam Details Shown
_________ Inspection Access Details Shown
_________ Materials Utilized in Girder and Various Components Clearly Shown in Details
_________ Future Jacking Points Shown

Situation Plan

_________ Contours Showing Required Grading Shown
_________ Plan and Elevation View of New Bridge Shown
_________ Right-of-Way Limits Shown
_________ Utilities and Their Disposition Shown
_________ Hydraulic Data Shown
_________ Temporary Detour Shown (If applicable)
_________ Existing Bridge Shown
_________ Core Boring Locations Shown and Core Boring Table Provided
_________ Bridge Length and Span Lengths Shown
_________ Bottom of Pile Tips and Foundations Shown
_________ Fill Slopes Shown

WEST VIRGINIA DIVISION OF HIGHWAYS
FINAL DETAIL BRIDGE PLAN SUBMISSION CERTIFICATION

State Project No. ______________________________

Federal Project No. ______________________________

Project Name ______________________________

County ______________________________

Consultant ______________________________

Project Manager ______________________________

Submission Date ______________________________

Struc. No. or Wall Sta. ______________________________

Miscellaneous Sheets

__________ Foundation Layout Sheet with Workpoints and Adequate Dimensions for Overall Layout Included
__________ Table of Deck Elevations Showing Deflections for Construction Phases
__________ Reinforcing Bar Sheet Included
__________ Railing Details Shown
__________ Fencing or Screening Details Shown
__________ Deck Drainage Details Shown, Including Scuppers, Deck Inlets, Piping System, and Location and Details of Discharge Points
__________ Approach Slabs Competely Detailed with Quantity Table Showing Items Included in Approach Slab Pay Item
__________ Utility Accomodation Details Shown
__________ Lighting Details Shown
__________ Navigational Lighting Details Shown
__________ Architectural Treatment Details Shown
__________ Parapet Transition Details Shown
__________ Drilled Shaft Details Shown
__________ Existing Bridge Plans Included (If Required by the Project Manager)

Supplemental Contract Information

__________ Listing of Comb. TS&L Review Comments and Action Taken on Each Comment
__________ Completed Project Specific Special Provisions (Word Format)
__________ Estimated Contract Time Chart (DD-803)
__________ Total Project Construction Cost Estimate
__________ Shop Drawing and Construction Services Proposal Submitted to Consultant Services (If applicable)

Miscellaneous Report

__________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager
2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
PS&E SUBMISSION CERTIFICATION
(To Be Submitted With Half-Size PS&E Plans)

State Project No. ______________________________ Consultant ______________________________

Federal Project No. ______________________________ Project Manager ______________________________

Project Name ______________________________ Submission Date ______________________________

County ______________________________

General Requirements

__________ Title Sheet (Full-Size Mylar) Signed and Sealed by the Responsible Professional Engineer Registered in the State of West Virginia (DD-701)
__________ Title Sheet (Half-Size Plan) Signed and Sealed by the Responsible Professional Engineer Registered in the State of West Virginia (DD-701)
__________ Proposed and Existing Right-of Way Limits Shown on the Construction Plans Match Those Limits Shown on the Latest RW-3 Plans
__________ Listing of Final Office Review Comments and Final Detail Bridge Plan Comments and Action Taken on Each Comment
__________ Copy of Consultant's Quality Control Markups
__________ Approved Design Exception Reports
__________ Approved ADA Exceptions Reports
__________ Final Completed Project Specific Special Provisions (Word Format)
__________ Final Completed Estimated Contract Time Chart (DD-803)
__________ Final Total Project Construction Cost Estimate
__________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager

2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

WEST VIRGINIA DIVISION OF HIGHWAYS
TRACING SUBMISSION CERTIFICATION
(To Be Submitted Following Award of Project or as Directed by Project Manager)

State Project No. ______________________________ Consultant ______________________________

Federal Project No. ______________________________ Project Manager ______________________________

Project Name ______________________________ Submission Date ______________________________

County ______________________________

General Requirements

__________ Complete Set of Contract Plans in dgn and pdf formats with all Appropriate Revisions
Revisions Shown and Noted. Dgn files drawn to DOH CADD Standards

__________ Final Completed Geometric, Drainage, and Quantity Calculatioins

__________ Final Completed Bridge and Structure Computations

__________ Survey and Project Control Data Including Aerial Photography Control

__________ Consultant's Quality Control Markups

Notes: 1- All Lines to be initialed by Office Manager or responsible management level above the Project Manager

2- Use "NA" for any item not applicable to the project. Do not leave any items blank.

APPENDIX A

RESOURCE AGENCY ADDRESS LISTING

Resource Agency Address Listing has moved to WVDOH Publication Webpage at:

http://www.transportation.wv.gov/highways/engineering/Pages/DD-202ContactInformation.aspx

APPENDIX B

SAMPLE LETTERS

30 MARCH, 2005

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division of Highways
1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • 304/558-3505

Joe Manchin III
Governor

March 30, 2005

Mr. Michael Cummings, Jr.
US Army Corps of Engineers
Pittsburgh District
Williams S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222-4186

Dear Mr. Cummings:

State Project S326-27-1.31 00
Federal Project BR-0027(027)E
Graysville Bridge
Preliminary Field Review
Marshall County

A Preliminary Field Review has been scheduled for April 15, 2005, on the subject project. The review will begin at 10:30 a.m. with the participants meeting at the project site.

Enclosed is one set of plans for your review and comments in relation to the permitting process.

If you can not attend the review, please forward any comments that you may have to Ms. JoAnn Ford, Project Manager, at (304)558-2885, or by fax at (304)558-0605, or e-mail jford@dot.state.wv.us, prior to the review.

Very truly yours,

John G Morrison
Consultant Review Section
Engineering Division

JGM:ss

Enclosure

cc: TOH Bridge, Inc.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • 304/558-3505

Joe Manchin III
Governor

March 30, 2005

Ms. Jessica Martinsen
Environmental Protection Agency
Region III
3ES30
1650 Arch Street
Philadelphia Pennsylvania

Dear Ms. Martinsen:

State Project S326-27-1.31 00
Federal Project BR-0027(027)E
Graysville Bridge
Preliminary Field Review
Marshall County

A Preliminary Field Review has been scheduled for April 15, 2005, on the subject project. The review will begin at 10:30 a.m. with the participants meeting at the project site.

Enclosed is one set of plans for your review and comments in relation to environmental issues.

If you can not attend the review, please forward any comments that you may have to Ms. JoAnn Ford, Project Manager, at (304)558-2885, or by fax at (304)558-0605, or e-mail jford@dot.state.wv.us, prior to the review.

Very truly yours,

John G Morrison
Consultant Review Section
Engineering Division

JGM:ss

cc: Mr. David Rider

Enclosure

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • 304/558-3505

Joe Manchin III
Governor

March 30, 2005

Mr. Tom Chapman
US Fish and Wildlife Services
694 Beverly Pike
Post Office Box 1278
Elkins, West Virginia 26241

Dear Mr. Chapman:

State Project S326-27-1.31 00
Federal Project BR-0027(027)E
Graysville Bridge
Preliminary Field Review
Marshall County

A Preliminary Field Revie w has been scheduled for April 15, 2005, on the subject project. The review will begin at 10:30 a.m. with the participants meeting at the project site.

Enclosed is one set of plans for your review and comments in relation to fish and wildlife effects.

If you can not attend the review, please forward any comments that you may have to Ms. JoAnn Ford, Project Manager, at (304)558-2885, or by fax at (304)558-0605, or e-mail jford@dot.state.wv.us, prior to the review.

Very truly yours,

John G Morrison
Consultant Review Section
Engineering Division

JGM:ss

Enclosure

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • 304/558-3505

Joe Manchin III
Governor

March 30, 2005

Mr. Kerry Bledsoe
West Virginia Department of Natural Resources
1110 Railroad Street
Farmington, West Virginia 26571

Dear Mr. Bledsoe:

State Project S326-27-1.31 00
Federal Project BR-0027(027)E
Graysville Bridge
Preliminary Field Review
Marshall County

A Preliminary Field Review has been scheduled for April 15, 2005, on the subject project. The review will begin at 10:30 a.m. with the participants meeting at the project site.

Enclosed is one set of plans for your review and comments in relation to significant fish, wildlife and recreational resources effects.

If you can not attend the review, please forward any comments that you may have to Ms. JoAnn Ford, Project Manager, at (304)558-2885, or by fax at (304)558-0605, or e-mail jford@dot.state.wv.us, prior to the review.

Very truly yours,

John G Morrison
Consultant Review Section
Engineering Division

JGM:ss

Enclosure

cc: Mr. Frank Jezioro, Director
Mr. Curtis Taylor, Chief
Mr. Roger Anderson

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • 304/558-3505

Joe Manchin III
Governor

March 30, 2005

Mr. Frank Jernejcic
Fisheries Management
1110 Railroad Street
Farmington, West Virginia 26571

Dear Mr. Jernejcic:

State Project S326-27-1.31 00
Federal Project BR-0027(027)E
Graysville Bridge
Preliminary Field Review
Marshall County

A Preliminary Field Review has been scheduled for April 15, 2005, on the subject project. The review will begin at 10:30 a.m. with the participants meeting at the project site.

Enclosed is one set of plans for your review and comments in relation to fish and wildlife and recreational resources effects.

If you can not attend the review, please forward any comments that you may have to Ms. JoAnn Ford, Project Manager, at (304)558-2885, or by fax at (304)558-0605, or e-mail jford@dot.state.wv.us, prior to the review.

Very truly yours,

John G Morrison
Consultant Review Section
Engineering Division

JGM:ss

Enclosure

cc: Mr. Frank Jezioro, Director
Mr. Curtis Taylor, Chief
Mr. Roger Anderson

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division of Highways
1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • 304/558-3505

Joe Manchin III
Governor

March 30, 2005

Mr. Andy Weaks
West Virginia Department of Environmental Protection
2031 Pleasant Valley Road
Suite 1
Fairmont, West Virginia 26554

Dear Mr. Weaks:

State Project S326-27-1.31 00
Federal Project BR-0027(027)E
Graysville Bridge
Preliminary Field Review
Marshall County

A Preliminary Field Review has been scheduled for April 15, 2005, on the subject project. The review will begin at 10:30 a.m. with the participants meeting at the project site.

Enclosed is one set of plans for your review and comments in relation to significant water quality effects.

If you can not attend the review, please forward any comments that you may have to Ms. JoAnn Ford, Project Manager, at (304)558-2885, or by fax at (304)558-0605, or e-mail jford@dot.state.wv.us, prior to the review.

Very truly yours,

John G Morrison
Consultant Review Section
Engineering Division

JGM:ss

Enclosure

cc: Ms. Lisa McClung, Director
Mr. Larry Betonte, Assistant Chief

APPENDIX C

REGIONAL MAPS

Regional Maps has moved to WVDOH Publication Webpage at:

http://www.transportation.wv.gov/highways/engineering/Pages/DD-202ContactInformation.aspx

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-203
(FORMERLY DESIGN DIRECTIVE 205)
NATURAL RESOURCES CONSERVATION SERVICE COORDINATION
July 1, 2006

Attached is a map dated January 1996 as supplied by the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture which shows the status of their ongoing watershed projects in West Virginia.

Also attached is a progress report dated July 1, 1990 dealing with the same matter.

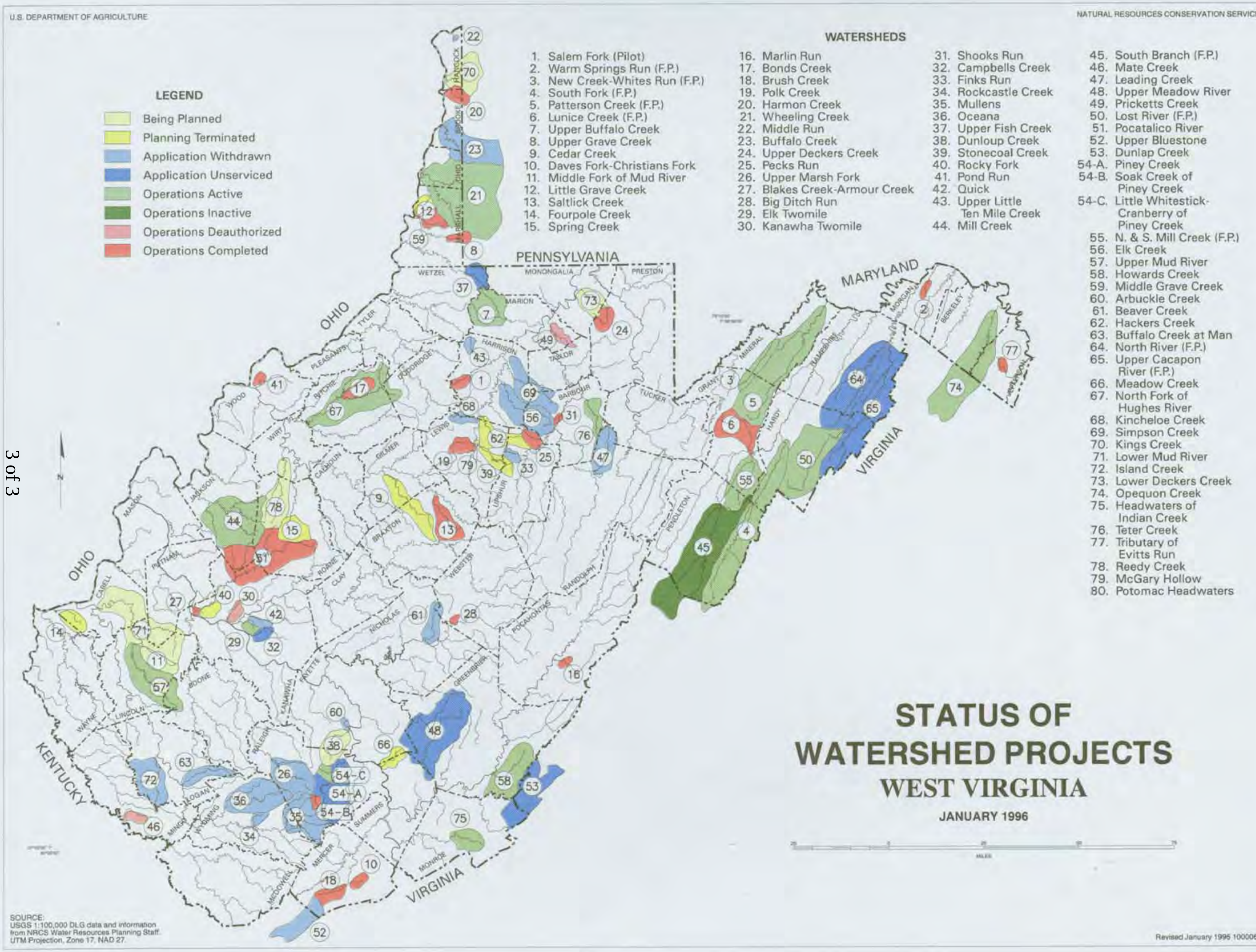
Whenever proposed design is undertaken in these areas, coordination with the NRCS should be accomplished.

Attachment

TABLE 1 - WATERSHED DAMS IN APPROVED PROJECTS
Water Resources Progress Report
July 1, 1990

MAP NO.	PROJECT	COMPLETED	UNDER CONSTRUCTION	REMAINING TO BE BUILT	TOTAL
1	Salem Fork (Pilot)	7	0	0	7
2	Warm Springs Run	8	0	0	8
3	New Creek-Whites Run	9	0	3	12
4	South Fork	23	0	1	24
5	Patterson Creek	30	1	3	34
6	Lunice Creek	3	0	2	5
7	Upper Buffalo Creek	6	0	6	12
8	Upper Grave Creek	7	0	0	7
10	Daves Fork-Christians Fork	3	0	0	3
13	Saltlick Creek	5	0	0	5
16	Marlin Run	1	0	0	1
17	Bond's Creek	1	0	0	1
18	Brush Creek	10	0	0	10
19	Polk Creek	8	0	0	8
20	Harmon Creek	6	0	0	6
21	Wheeling Creek	4	0	1	5
24	Upper Deckers Creek	7	0	0	7
27	Blakes Creek-Armour Creek	1	0	0	1
28	Big Ditch Run	1	0	0	1
29	Elk Twomile Creek	2	0	4	6
41	Pond Run	1	0	0	1
44	Mill Creek	4	1	2	7
45	South Branch	0	0	5	5
50	Lost River	0	0	5	5
51	Pocatalico River	2	0	0	2
55	North & South Mill Creek	3	0	3	6
57	Upper Mud River	0	1	0	1
58	Howard Creek	0	0	1	1
TOTAL		**152**	3	36	191[1]/
% of Total		80	1	19	100

[1]/ Thirteen dams in the Harmon Creek, Wheeling Creek, and South Branch Watersheds are located in adjoining states and are not included in this figure.


U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
LEGEND
Being Planned
Planning Terminated
Application Withdrawn
Application Unserviced
Operations Active
Operations Inactive
Operations Deauthorized
Operations Completed
WATERSHEDS
1. Salem Fork (Pilot)
2. Warm Springs Run (F.P.)
3. New Creek-Whites Run (F.P.)
4. South Fork (F.P.)
5. Patterson Creek (F.P.)
6. Lunice Creek (F.P.)
7. Upper Buffalo Creek
8. Upper Grave Creek
9. Cedar Creek
10. Daves Fork-Christians Fork
11. Middle Fork of Mud River
12. Little Grave Creek
13. Saltlick Creek
14. Fourpole Creek
15. Spring Creek
16. Marlin Run
17. Bonds Creek
18. Brush Creek
19. Polk Creek
20. Harmon Creek
21. Wheeling Creek
22. Middle Run
23. Buffalo Creek
24. Upper Deckers Creek
25. Pecks Run
26. Upper Marsh Fork
27. Blakes Creek-Armour Creek
28. Big Ditch Run
29. Elk Twomile
30. Kanawha Twomile
31. Shooks Run
32. Campbells Creek
33. Finks Run
34. Rockcastle Creek
35. Mullens
36. Oceana
37. Upper Fish Creek
38. Dunloup Creek
39. Stonecoal Creek
40. Rocky Fork
41. Pond Run
42. Quick
43. Upper Little Ten Mile Creek
44. Mill Creek
45. South Branch (F.P.)
46. Mate Creek
47. Leading Creek
48. Upper Meadow River
49. Pricketts Creek
50. Lost River (F.P.)
51. Pocatalico River
52. Upper Bluestone
53. Dunlap Creek
54-A. Piney Creek
54-B. Soak Creek of Piney Creek
54-C. Little Whitestick-Cranberry of Piney Creek
55. N. & S. Mill Creek (F.P.)
56. Elk Creek
57. Upper Mud River
58. Howards Creek
59. Middle Grave Creek
60. Arbuckle Creek
61. Beaver Creek
62. Hackers Creek
63. Buffalo Creek at Man
64. North River (F.P.)
65. Upper Cacapon River (F.P.)
66. Meadow Creek
67. North Fork of Hughes River
68. Kincheloe Creek
69. Simpson Creek
70. Kings Creek
71. Lower Mud River
72. Island Creek
73. Lower Deckers Creek
74. Opequon Creek
75. Headwaters of Indian Creek
76. Teter Creek
77. Tributary of Evitts Run
78. Reedy Creek
79. McGary Hollow
80. Potomac Headwaters
PENNSYLVANIA
MARYLAND
VIRGINIA
OHIO
KENTUCKY
STATUS OF
WATERSHED PROJECTS
WEST VIRGINIA
JANUARY 1996
SOURCE:
USGS 1:100,000 DLG data and information from NRCS Water Resources Planning Staff.
UTM Projection, Zone 17, NAD 27.
Revised January 1996 1000069

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-204
GUIDANCE FOR USE OF CPM SCHEDULES
FOR PROJECTS UNDER DESIGN
May 1, 2014

This Design Directive will give guidance and instruction, along with sample CPM schedule templates, on how to prepare and submit CPM schedules for projects under design. These CPM schedules will be used by all designers, whether they are Division of Highways designers or Consultant designers employed by the Division. The guidelines for Division-designed projects are different than those for Consultant-designed projects, and both procedures will be described herein.

Attachment

10. General

10.1 Introduction: CPM (Critical Path Method) schedules are to be submitted by the Designer for each project, including Design Study projects. The CPM outlines all the project milestones and the submission at these project milestones required during development of projects, and therefore is utilized by the Division to establish completion dates for all projects. In turn, the completion date for design of projects is established by the CPM, and is utilized for scheduling a project for advertisement for bids. There are other factors that are considered after a project's design is complete, such as the availability of funding, necessity of construction completion of the project because of construction phasing, interim completion dates, etc. that are factored in to determine a project's advertisement date.

The three approved CPM charts are included at the end of this Design Directive. There is a CPM for Design Reports, one for the "Typical Process" of project design, and one for the "Alternate Process" of project design. See Design Directive 301, Right of Way Plans, Sections 10.3.3.1 and 10.3.3.2 for explanations of these two "Processes".

A Bar Chart can be substituted for the CPM schedule on projects where CPM's are not appropriate. A Bar Chart is considered appropriate for projects such as traffic studies, bridge deck replacements, architectural design projects (such as rest area buildings, buildings for the Division itself), publications writing and/or revisions when performed by a consultant, etc.

The Programming Division will keep the original CPM schedule. When updates are required they are to be resubmitted to the Programming Division with the revision date(s) noted on the Cover Sheet.

20. Preparation of the CPM Schedule for Division of Highways-designed Projects

20.1.1 Cover Sheet: All items listed on the Cover Sheet for each CPM for each project are to be completed, except for the signature block for the Engineering Division at the bottom. Again, the three approved CPM charts are included at the end of this Design Directive.

20.1.2 CPM Schedule: The CPM schedule is to be completed after the completion of all surveys and mapping. All times shown on the CPM schedules will be in working days, not calendar days. For certain projects, if the surveying/mapping is part of the Scope of Work, then the CPM will be completed starting with the Notice to Proceed, with the working time to complete the required surveys/mapping indicated on the CPM.

The boxes shown with various labels, such as "Notice To Proceed", "Mapping Complete", "Prelim FR Plans Complete", etc., indicate a project milestone. The small strip at the top of these boxes will be filled in with the date that the project milestone is expected to be completed. The lines between these boxes represent an activity, such as preparation or review of preliminary, final field (if required), final office, slope, span arrangement, etc. plans. Core boring contract

administration, if required, is also included. A circle above an activity indicates the time the activity is expected to take to complete. This will be filled in by the Division's Designer. A box above an activity represents the time the Designer expects the review of the submission to take. For projects involving the Federal Highway Administration, their review time must be added to the Division's review time. Again, it is stressed that these times are in working days only. The black ovals represent "dummy nodes", indicating project milestones which are submissions to be made concurrently.

After the working days are filled in all required fields by the Designer, the Designer then computes the actual dates, and then places them in the small strip at the top of the project milestone boxes. The CPM schedule is then approved by the Designer, and given to the Programming Division.

If a project is not going to meet the original CPM schedule or approved changes thereto, the Project Manager should discuss this with the responsible person from the Programming Division and justify the reasons for the delay. Any changes approved are to be indicated on a revised CPM schedule, and the Programming Division will request a PS&E schedule change from Management.

30. Preparation of the CPM Schedule for Consultant-designed Projects

30.1.1 General: As indicated in the Scope of Work notes for Consultant-designed projects, each project will have a CPM submitted to the Division's Project Manager. The first submission of the CPM by the Consultant will show the Consultant's working days only, and reflect the project duration specified in the Scope of Work meeting.

30.1.2 Cover Sheet: All items listed on the Cover Sheet for each CPM are to be completed, except for the signature block for the Engineering Division at the bottom. Again, the three approved CPM charts are included at the end of this Design Directive.

30.1.3 CPM Schedule: The CPM schedule is to be completed after Notice to Proceed has been given. All times shown on the CPM schedules will be in working days, not calendar days.

The boxes shown with various labels, such as "Notice To Proceed", "Mapping Complete", "Prelim FR Plans Complete", etc., indicate a project milestone, or a submission to the Division's Project Manager. The small strip at the top of these boxes will be filled in with the date that the project milestone is expected to be completed. The lines between these boxes represent an activity, such as preparation and review of preliminary, final field (if required), final office, slope, span arrangement, etc. plans. Core boring contract administration, if required, is also included. A circle above an activity indicates the time the activity is expected to take to complete. The Consultant is responsible for placing his/her working days in the circle above an activity. The Division's Project Manager for roadway and structures are responsible for placing his/her working days in the boxes above an activity. This will also include the Federal Highway Administration's review times. Again, it is stressed that these times are in working days only. The black ovals represent "dummy nodes", indicating project milestones with which there are submissions to be made concurrently.

After the working days are filled in for all required fields by the Consultant and the Division's Project Manager, the Project Manager then computes the actual dates, and then places them in the small strip at the top of the project milestone boxes. The CPM schedule is then approved by the responsible Project Manager and given to the Programming Division.

Consultants are required to submit three copies of an updated CPM schedule at each of his/her monthly Progress Meetings for each individual project. Activities and project milestones completed should be entered with the date accomplished followed by an "A" for Actual. Project milestone dates that are not accomplished as shown on the CPM are to be noted with justification given for missing the date. The completed work should be marked in color to indicate the latest point of progress.

If a project is not going to meet the original CPM schedule or approved changes thereto, the Project Manager should discuss this with the Consultant, other reviewers, and the responsible person from the Programming Division and justify the reasons for the delay. Any changes approved are to be indicated on a revised CPM schedule, and the Programming Division will request a PS&E schedule change from Management.

CPM NETWORK

DESIGN REPORT

PROJECT NAME ____

STATE PROJECT NUMBER ______________________________

FEDERAL PROJECT NUMBER ___________________________

PROJECT TERMINI ______________________________________

PROJECT LENGTH (MILES) ______________________________

COUNTY ____

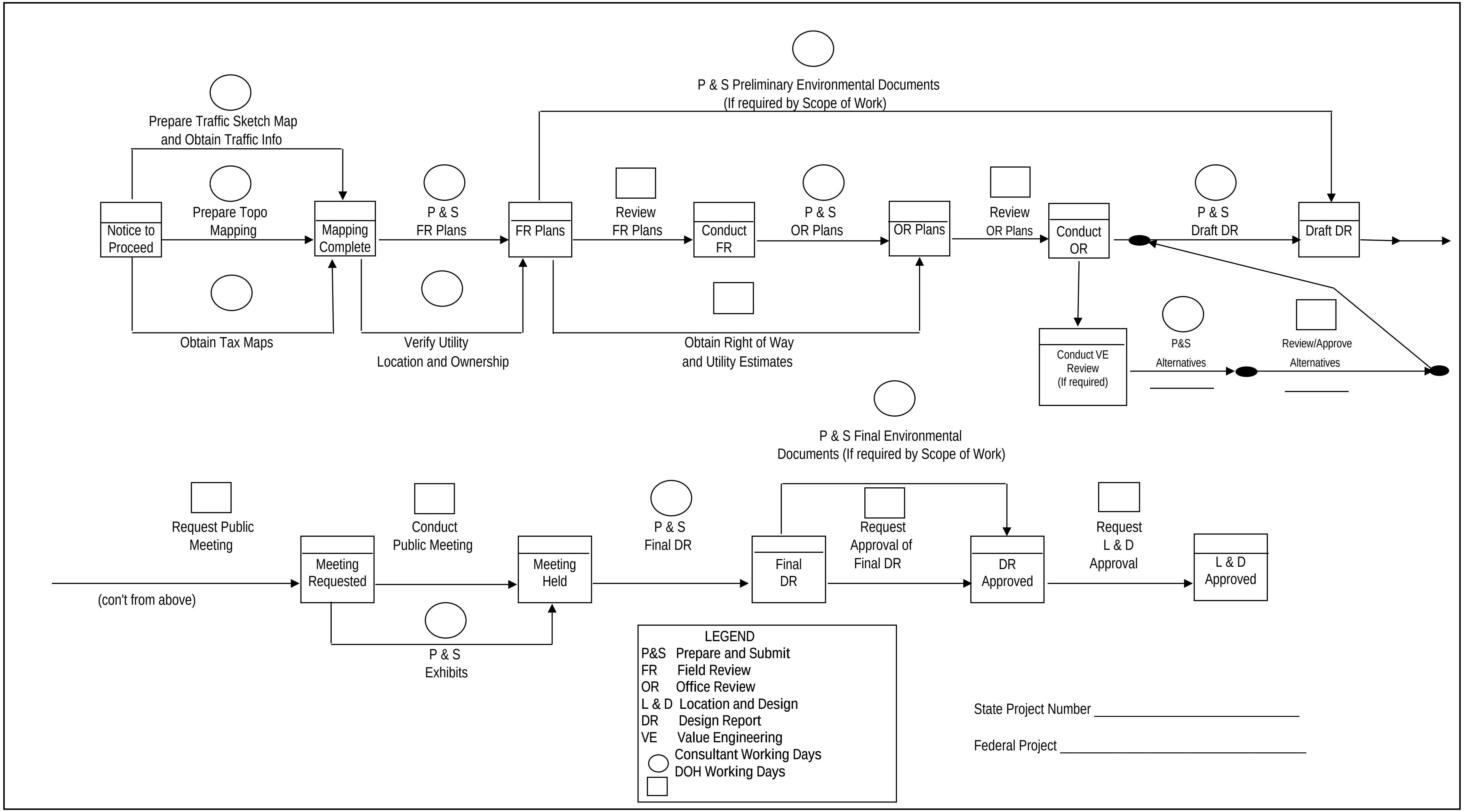
CONSULTANT ____

ENGINEERING DIVISION

APPROVAL BY: ____

APPROVAL DATE: ______________________________________

Form Rev. 8/04


P & S Preliminary Environmental Documents
(If required by Scope of Work)
Prepare Traffic Sketch Map
and Obtain Traffic Info
Notice to Proceed
Prepare Topo Mapping
Mapping Complete
P & S FR Plans
FR Plans
Review FR Plans
Conduct FR
P & S OR Plans
OR Plans
Review OR Plans
Conduct OR
P & S Draft DR
Draft DR
Obtain Tax Maps
Verify Utility
Location and Ownership
Obtain Right of Way
and Utility Estimates
Conduct VE Review (If required)
P&S Alternatives
Review/Approve Alternatives
P & S Final Environmental
Documents (If required by Scope of Work)
Request Public Meeting
(con't from above)
Meeting Requested
Conduct Public Meeting
Meeting Held
P & S Exhibits
P & S Final DR
Final DR
Request Approval of Final DR
DR Approved
Request L & D Approval
L & D Approved
LEGEND
P&S Prepare and Submit
FR Field Review
OR Office Review
L & D Location and Design
DR Design Report
VE Value Engineering
Consultant Working Days
DOH Working Days
State Project Number ______________________
Federal Project __________________________

Form Rev. 8/04

CPM NETWORK

ROADWAY AND/OR BRIDGE DESIGN

"TYPICAL PROCESS"

(TWO FIELD REVIEWS)

PROJECT NAME ____

STATE PROJECT NUMBER _______________________________

FEDERAL PROJECT NUMBERS E _____________________

R _____________________

C _____________________

PROJECT TERMINI _____________________________________

PROJECT LENGTH (MILES) ______________________________

COUNTY ____

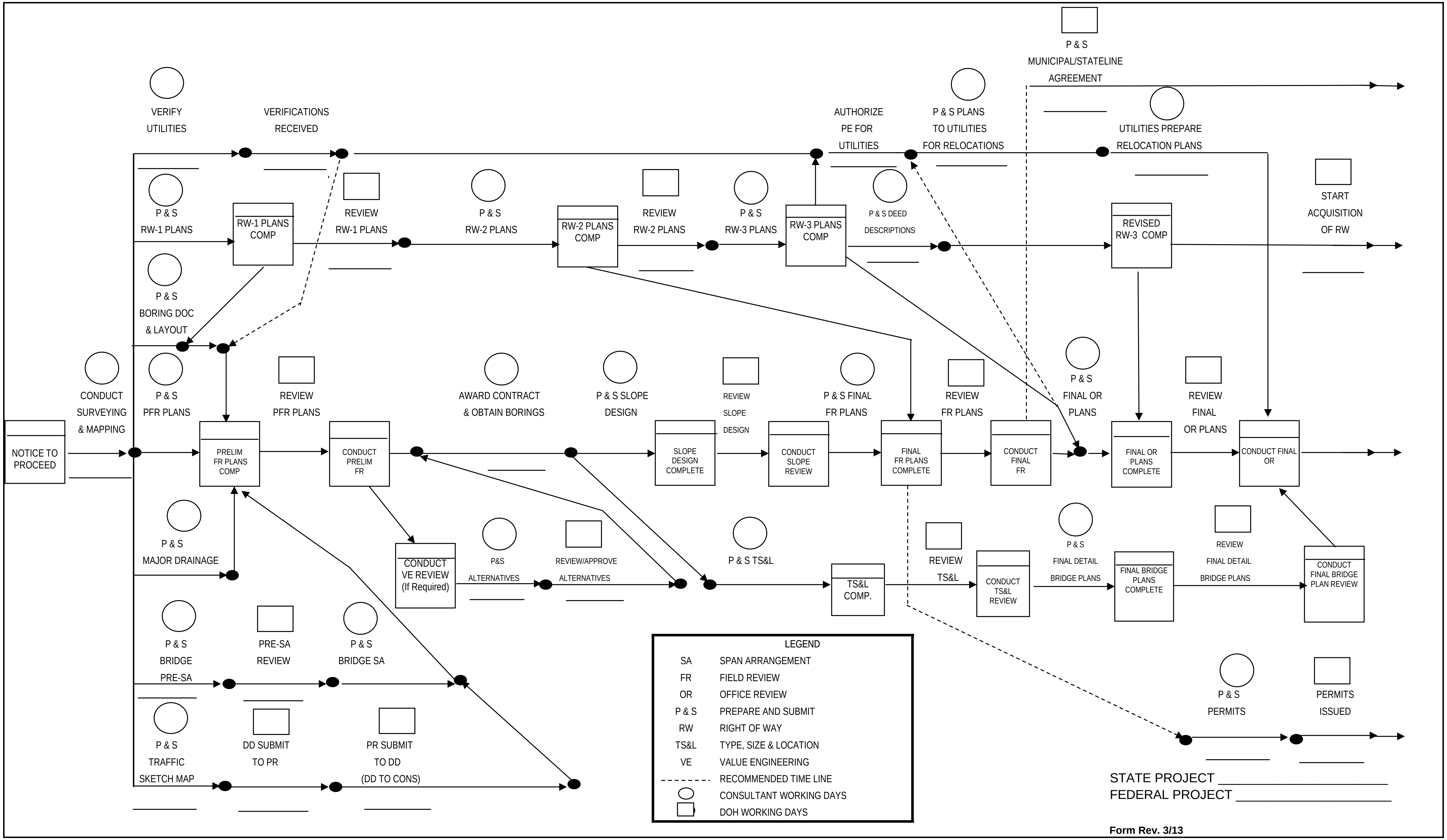
CONSULTANT ____

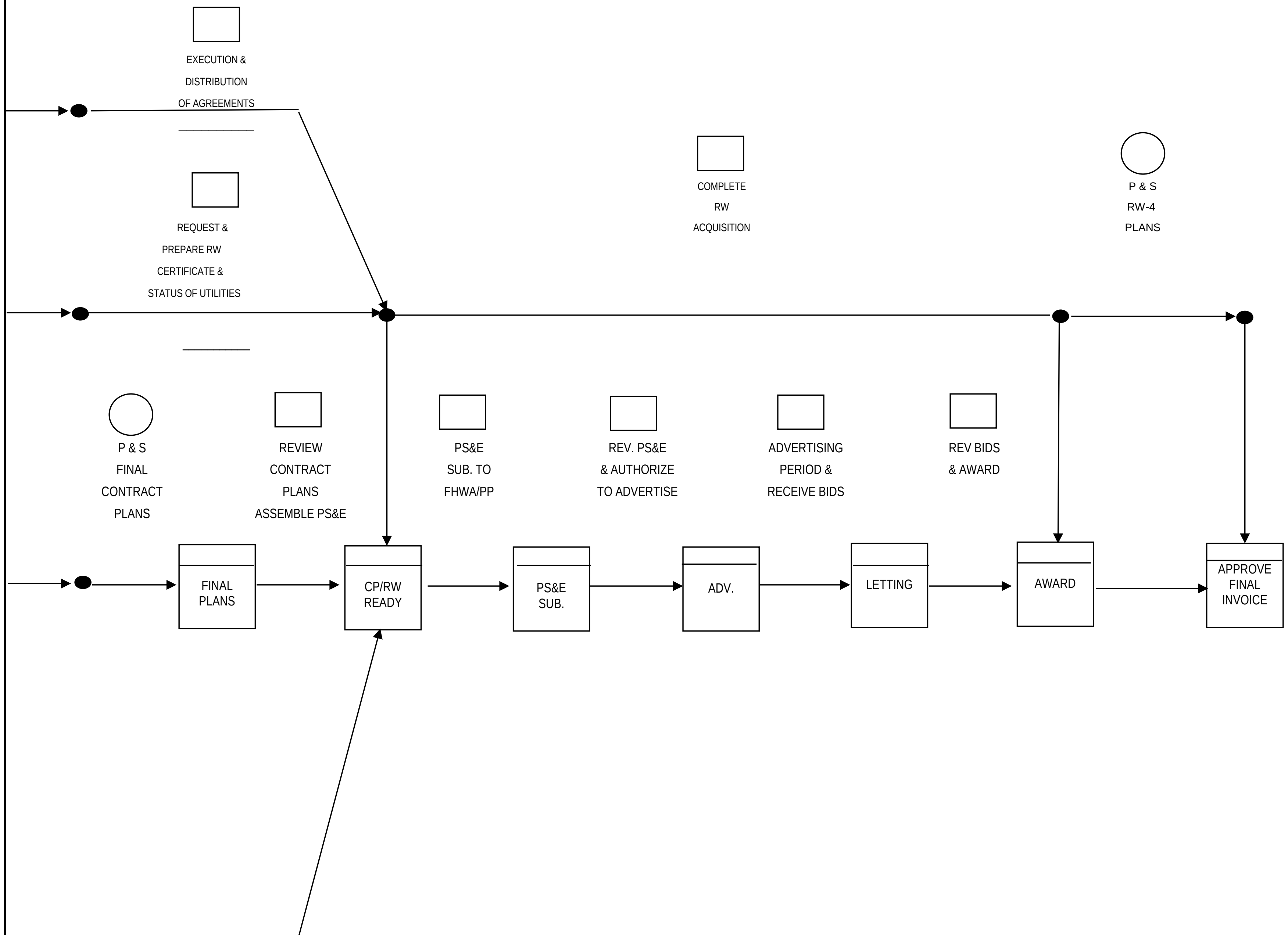
ENGINEERING DIVISION

APPROVAL BY: ____

APPROVAL DATE: ______________________________________

Form Rev. 3/13


NOTICE TO PROCEED
CONDUCT SURVEYING & MAPPING
VERIFY UTILITIES
VERIFICATIONS RECEIVED
AUTHORIZE PE FOR UTILITIES
P & S PLANS TO UTILITIES FOR RELOCATIONS
P & S MUNICIPAL/STATELINE AGREEMENT
UTILITIES PREPARE RELOCATION PLANS
P & S RW-1 PLANS
RW-1 PLANS COMP
REVIEW RW-1 PLANS
P & S RW-2 PLANS
RW-2 PLANS COMP
REVIEW RW-2 PLANS
P & S RW-3 PLANS
RW-3 PLANS COMP
P & S DEED DESCRIPTIONS
REVISED RW-3 COMP
START ACQUISITION OF RW
P & S BORING DOC & LAYOUT
P & S PFR PLANS
PRELIM FR PLANS COMP
REVIEW PFR PLANS
CONDUCT PRELIM FR
AWARD CONTRACT & OBTAIN BORINGS
P & S SLOPE DESIGN
SLOPE DESIGN COMPLETE
REVIEW SLOPE DESIGN
CONDUCT SLOPE REVIEW
P & S FINAL FR PLANS
FINAL FR PLANS COMPLETE
REVIEW FR PLANS
CONDUCT FINAL FR
P & S FINAL OR PLANS
FINAL OR PLANS COMPLETE
REVIEW FINAL OR PLANS
CONDUCT FINAL OR
P & S MAJOR DRAINAGE
CONDUCT VE REVIEW (If Required)
P&S ALTERNATIVES
REVIEW/APPROVE ALTERNATIVES
P & S TS&L
TS&L COMP.
REVIEW TS&L
CONDUCT TS&L REVIEW
P & S FINAL DETAIL BRIDGE PLANS
FINAL BRIDGE PLANS COMPLETE
REVIEW FINAL DETAIL BRIDGE PLANS
CONDUCT FINAL BRIDGE PLAN REVIEW
P & S BRIDGE PRE-SA
PRE-SA REVIEW
P & S BRIDGE SA
P & S TRAFFIC SKETCH MAP
DD SUBMIT TO PR
PR SUBMIT TO DD (DD TO CONS)
P & S PERMITS
PERMITS ISSUED
LEGEND
SA SPAN ARRANGEMENT
FR FIELD REVIEW
OR OFFICE REVIEW
P & S PREPARE AND SUBMIT
RW RIGHT OF WAY
TS&L TYPE, SIZE & LOCATION
VE VALUE ENGINEERING
RECOMMENDED TIME LINE
CONSULTANT WORKING DAYS
DOH WORKING DAYS
STATE PROJECT ____________________
FEDERAL PROJECT ____________________
Form Rev. 3/13



STATE PROJECT ____________________________
FEDERAL PROJECT _________________________

Form Rev. 3/13

CPM NETWORK

ROADWAY AND/OR BRIDGE DESIGN

"ALTERNATE PROCESS"

(ONE FIELD REVIEW AND
FIVE OR LESS RW PARCELS)

PROJECT NAME ____

STATE PROJECT NUMBER _______________________________

FEDERAL PROJECT NUMBERS E _____________________

R _____________________

C _____________________

PROJECT TERMINI _____________________________________

PROJECT LENGTH (MILES) ______________________________

COUNTY ____

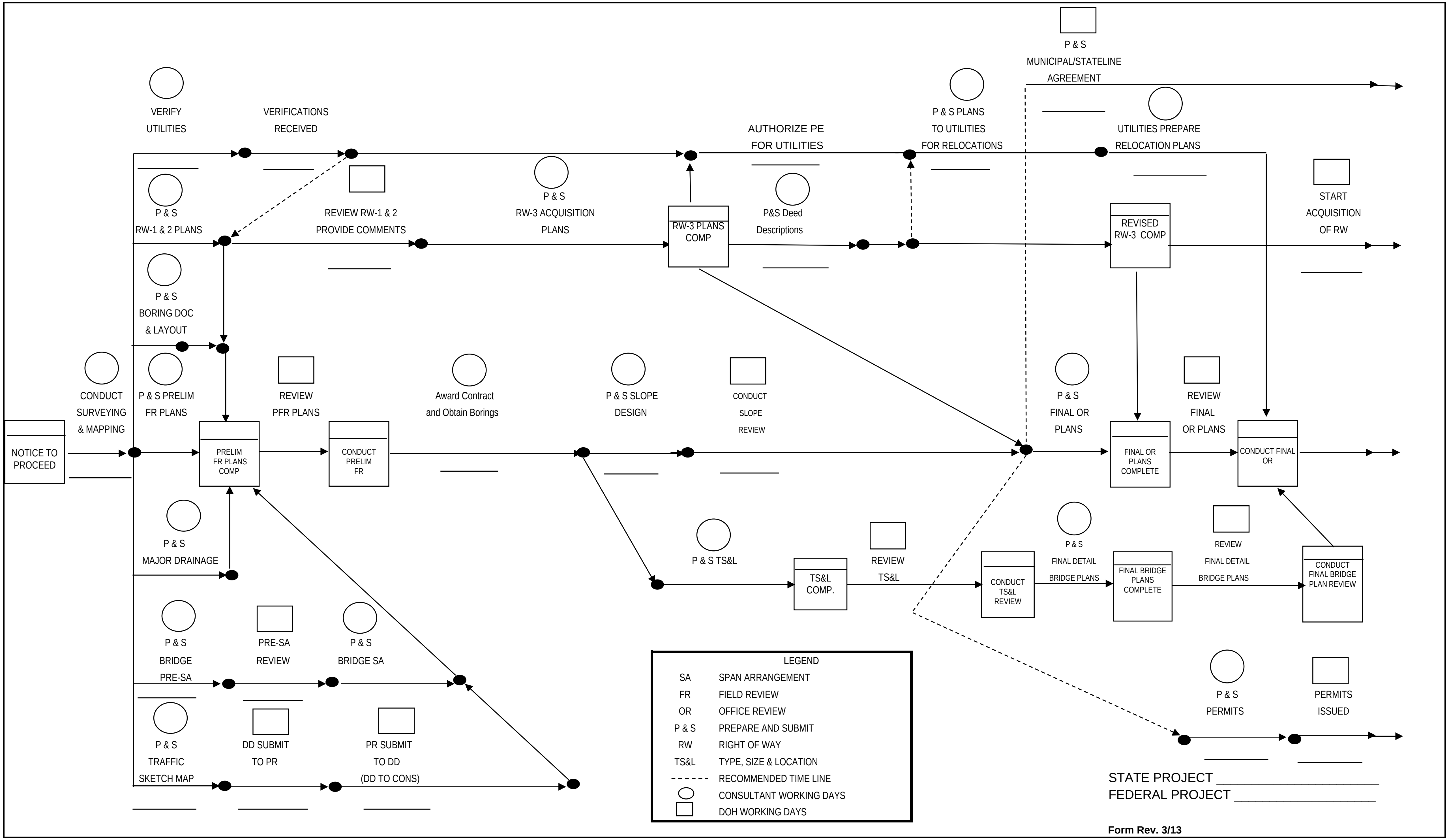
CONSULTANT ____

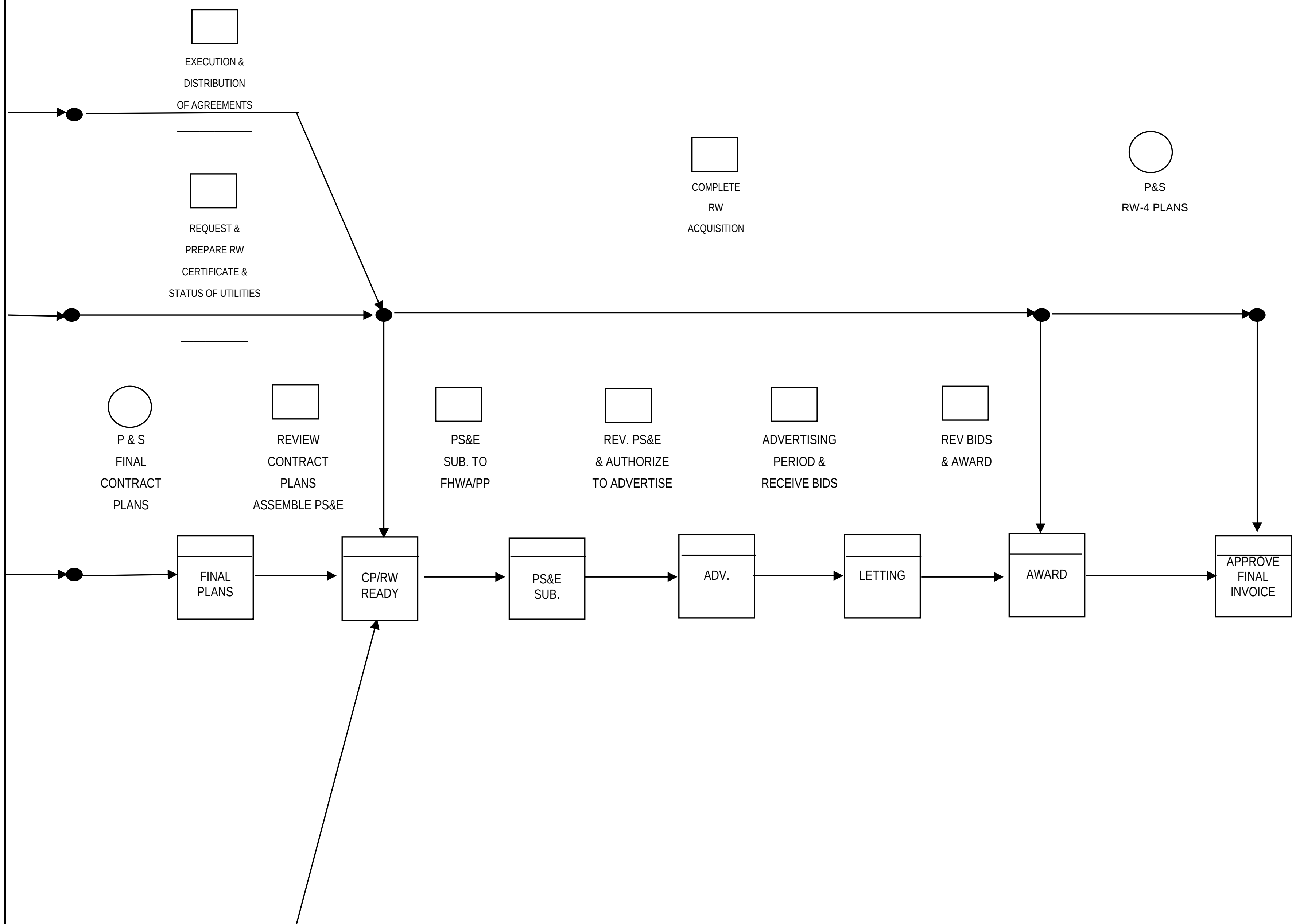
ENGINEERING DIVISION

APPROVAL BY: ____

APPROVAL DATE: ______________________________________

Form Rev. 3/13


NOTICE TO PROCEED
CONDUCT SURVEYING & MAPPING
VERIFY UTILITIES
VERIFICATIONS RECEIVED
P & S RW-1 & 2 PLANS
REVIEW RW-1 & 2 PROVIDE COMMENTS
P & S RW-3 ACQUISITION PLANS
RW-3 PLANS COMP
AUTHORIZE PE FOR UTILITIES
P&S Deed Descriptions
P & S PLANS TO UTILITIES FOR RELOCATIONS
P & S MUNICIPAL/STATELINE AGREEMENT
UTILITIES PREPARE RELOCATION PLANS
REVISED RW-3 COMP
START ACQUISITION OF RW
P & S BORING DOC & LAYOUT
P & S PRELIM FR PLANS
PRELIM FR PLANS COMP
REVIEW PFR PLANS
CONDUCT PRELIM FR
Award Contract and Obtain Borings
P & S SLOPE DESIGN
CONDUCT SLOPE REVIEW
P & S FINAL OR PLANS
FINAL OR PLANS COMPLETE
REVIEW FINAL OR PLANS
CONDUCT FINAL OR
P & S MAJOR DRAINAGE
P & S TS&L
TS&L COMP.
REVIEW TS&L
CONDUCT TS&L REVIEW
P & S FINAL DETAIL BRIDGE PLANS
FINAL BRIDGE PLANS COMPLETE
REVIEW FINAL DETAIL BRIDGE PLANS
CONDUCT FINAL BRIDGE PLAN REVIEW
P & S BRIDGE PRE-SA
PRE-SA REVIEW
P & S BRIDGE SA
P & S TRAFFIC SKETCH MAP
DD SUBMIT TO PR
PR SUBMIT TO DD (DD TO CONS)
P & S PERMITS
PERMITS ISSUED
LEGEND
SA SPAN ARRANGEMENT
FR FIELD REVIEW
OR OFFICE REVIEW
P & S PREPARE AND SUBMIT
RW RIGHT OF WAY
TS&L TYPE, SIZE & LOCATION
RECOMMENDED TIME LINE
CONSULTANT WORKING DAYS
DOH WORKING DAYS
STATE PROJECT ____________________
FEDERAL PROJECT __________________
Form Rev. 3/13



STATE PROJECT ____________________________
FEDERAL PROJECT _________________________

Form Rev. 3/13

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-205
GUIDANCE FOR PREPARATION OF DESIGN REPORTS AND STUDIES
March 30, 2012

This Design Directive will give guidance and instruction on how to prepare, distribute for comments, and begin the final approval process of Design Reports and Studies. This Design Directive will provide uniformity for development of these reports/studies throughout the Division of Highways, to include the various Districts within the Division.

Attachments

10. General Purpose of Design Reports and Studies

Design Reports and Studies (hereinafter referred to as “Study”, or “Studies”) are engineering studies of several proposed alignments for a highway project. These Studies are produced for projects such as small bridge replacements, roadway realignments, intersection improvements, turning lane additions, new roadway alignments, etc. By nature, these Studies are considered Initial Engineering by Design Directive (DD) 200, “Project Development Process”. The completion of the Study with an approved alternative alignment is considered the end of Initial Engineering by that particular DD. If a choice of alignments is given, the report will recommend one alignment as the “Preferred Alternate”, otherwise the alignment shown in the Study will be considered the “Preferred Alternate”. For most projects, the “Location & Design (L & D) Approval” will be requested at this time. On some projects, additional environmental work may be required, and Location and Design Approval may be requested during the Preliminary Engineering phase (see DD– 206, “Guidance for Location and Design Approvals” for more information concerning this approval process). This Design Directive will cover only the preparation, distribution, receipt of comments, and selection of the Preferred Alignment in the Design Study itself.

These Design Reports and Studies should be prepared in enough detail to adequately hold the Scope of Work meeting for each project. The Study should contain a minimum of items that are unknown at the time of scoping. It is anticipated that these Studies will be handed over to the Division’s Designer or a Consultant Designer (overseen by a Roadway and a Bridge Project Manager (if required) assigned by the Division) for completion of design.

20. Preparation of Design Studies

20.1 General: DD - 201, “Public Involvement Process” should be reviewed to determine if any of the stipulations contained therein apply to each and every Design Study project. Any public involvement must take place before L & D Approval is requested. Public involvement must be noted in the L & D Approval request.

20.2 Existing information: All existing facilities, such as roadways, streams, culverts, storm sewers, bridges, homes/businesses (to include any sewerage facilities required by that facility, such as septic systems, “shotgun sewers”, etc.), railroads, utilities (public and private), etc. are to be field investigated and placed on the Study base mapping. The Division’s and courthouse tax map/assessor’s records are to be researched for any existing roadway, structure, right-of-way plans, property lines/owners, and known environmental information (which can be obtained from the Environmental Services Section of the Engineering Division) which may contain preliminary information vital to the Study (and can further be used when the project is scoped and assigned to a Designer). See DD – 301, “Right of Way Plans” for more information on the required existing information to be shown on the plan sheet for each alignment. A centerline with stationing is to be provided for all existing roadways, with horizontal curve data to include at minimum the existing radii and superelevation, vertical curve data to include at minimum K-values and lengths, sight distances, etc. Bearings may be obtained from any existing mapping held by the Division, or can be taken from a compass reading. Sight distance for existing intersections/driveways should be determined and placed on the plan sheets also. Existing rights-of-way are to be placed on the plan sheets for each alternative alignment.

20.3 **Mapping:** As a minimum, statewide base mapping in 1” = 400’ scale, with 10’ contour intervals, is available from the Planning and Research Division. There are other sources of mapping available within the Division. The Administrative Section of the Engineering Division maintains records of all aerial photography that has been flown and is in the Division’s possession, as well as any mapping that has been produced from said photography. In the absence of any mapping the Division may possess, blow-ups of USGS 7 ½ minute topographic sheets may be used, although this is not recommended. Any mapping provided by the Division is to be field-checked by the preparer of the Study for accuracy and then updated, with any and all updates to be made to the base mapping by the Designer. If no existing mapping is available, then conventional surveys or aerial photography and subsequent field-edited mapping may be utilized.

20.4 **Scale/Paper Size:** The reports/studies should be produced at a 1” = 100’ scale, or a larger scale for smaller studies, such as a bridge replacement with very little roadway work. The scale should be chosen with the type and size of the Study, and the desired paper size in mind. If the scale needs to be made larger to show any necessary details, then match marks are to be utilized wherever necessary, based on the existing roadway’s centerline. Paper sized 11”x17” folded to 8 ½”x 11” can be used if the preparer of the Study determines that a larger scale on one sheet will contain all of the information required.

20.5 **Design Criteria:** All design criteria to be used, according to the projected traffic volumes and existing or proposed roadway classification, are to be given, preferably in table format. The roadway classification and projected traffic volumes can be obtained from the Planning and Research Division. The latest approved issues of the AASHTO Green Book, Very Low-Volume Local Roads Guide, Design Directives, Drainage Manual, and the Roadside Design Guide are to be used to determine all necessary criteria. If any design criteria cannot be met, design exceptions are to be indicated, and enough preliminary information given so that the designer can complete the design exception report(s) required during future design stages as described in the latest edition of DD – 605, “Design Exception Policy”.

20.6 Content: Reference is hereby made to the Design Report Submission Checklists contained in DD – 202, "Field and Office Reviews for Initial Engineering, Preliminary Engineering and Final Design" for the information required in the Study. Depending on the type, size, and complexity of the Study, not all information required by the checklists will be necessary. Any other information that may be known about the Study area, such as visible high water marks, other information gleaned from field surveys and observations, discussions with the residents in the Study area, and at any required public meetings such as location of septic systems, wells, etc. should be included also. The checklists are required to be submitted with each Study submission. The Project Numbers will be shown on each and every Study.

20.6.1 Existing facilities: All existing facilities as described in Section 20.2 above are to be contained on each alternative's plan sheet. It is very important that all existing information be indicated on the Study plans and narratives, as estimates for possible home/business relocations and right-of-way purchases, will be made by the Right-Of-Way Division for the Study. Utilities should be located in the field by notifying Miss Utility of West Virginia before the field visit is made, so as much accurate utility information is shown in the Study as possible. It is to be noted that not all utilities subscribe to Miss Utility, so it is vital that other utilities in the area be investigated for their presence. A list of the affected utilities in the project area is to be included in the narrative (See Section 20.6.6 hereinafter in this Design Directive). The capital cost of all required utility relocations will be made by the Utilities Unit of the Technical Section, Engineering Division. All existing features described here and above in Section 20.1 are to be shown as described by the Division's CADD Standards, available on the WVDOT website.

20.6.2 Proposed roadway facilities: A plan sheet and a profile sheet are to be prepared for each alternative alignment. A centerline is to be shown with stationing, radius and proposed superelevation for each required horizontal curve. Grades and vertical curves with preliminary K-values are to be shown for each proposed alternative's profile. This information is to be given for the mainline and all side roads.

Proposed detour roads required, such as an upstream and a downstream detour for a small bridge replaced on its existing alignment, are to be shown, along with the design speed.

The proposed construction limits should be shown, as well as property line information, obtained from the assessor's tax maps. Existing rights-of-way information and proposed right-of-way limits are to be shown. No stations or offsets are required. The cost of the necessary rights-of-way for each alternative alignment will be obtained from the Right-Of-Way Division.

All work in streams and wetlands in the project area must be indicated. Channel changes are to be shown, as the permits required are more complex and will require more time and design effort to obtain. Natural stream design methods and principles are to be used as necessary when designing any channel change on any US Army Corps of Engineers' jurisdictional stream; however this is only to be indicated in the report, and no design effort put forth. Streams which will require a culvert crossing of the roadway(s) are to be shown also, with preliminary sizes given. Preliminary drainage calculations required to size these culverts are to be included with the Study.

A sheet showing all roadway(s) typical section(s) is to be included, with widths obtained from utilizing the roadway classification and traffic volumes, the AASHTO Green Book, the AASHTO Low-Volume Local Roads Guide, and the Division's Design Directives. The Study should reference all AASHTO publications and Design Directives that were used to develop the Study. This will include a typical section for all required side roads, not including driveways. Also, the typical section for any proposed temporary detour roads and bridges is to be included.

All proposed roadway information is to be shown as described by the Division's CADD Standards, available on the West Virginia Division of Transportation's website.

20.6.3 Proposed structures: The intent of this Design Directive in relation to structures is to develop a "Pre-Span Arrangement" report for each structure to be included in the Study. See the Division's "Bridge Design Manual", 2003 (revised March 1, 2004 including 2006 Interim and Errata) for more information on this matter. Not all of the requirements for a Span Arrangement submission are required; the necessary information will be indicated in this Section of this Design Directive.

The Bridge Designer's tasks for a Design Study are to provide the necessary bridge information, capital cost estimates, and sketches for the Study to be developed. The Bridge Designer must look at the existing conditions for the project site, such as roadway geometry (both horizontal and vertical), utilities, right-of-way, existing and adjacent structures, etc. Also, historical data such as the latest Bridge Inspection Report, existing bridge plans, etc., hydraulic opening, and the proposed roadway alignments should be reviewed to assist in the development of the Study. The Bridge Inspection Files are available from the Maintenance Division, Bridge Evaluation Section. The Bridge Designer will develop plans and profile sheets for each structure, and give a capital cost estimate (to include any required Temporary Bridges). The bridge drawings are to be simple line drawings with minimal details, such as stationing, grades, horizontal and vertical curve data. The capital cost estimate is to be based on historical data for similar structures based on a cost per square foot of deck area (including parapets and sidewalks). This cost can be obtained from discussions with any of the Bridge Engineers employed by the Division, or from the Designer's own engineering judgment.

The Bridge Designer is to meet with the Division's assigned Bridge Project Manager to discuss the feasible structural systems and span arrangements that will be included in the Study. The purpose of the meeting will be to eliminate or add additional alternates for further consideration on the Study. The Division's Bridge Project Manager will make the final decision on which alternates are to be carried through and studied in the Span Arrangement.

At this meeting the following information is to be available for use by the Bridge Designers and the Division's Bridge Project Manager: preliminary horizontal and vertical alignments and geometry, site plan for each structure alternate with both plan and profile sheets for each alternate, discussions on why structure options were chosen or rejected, superstructure types being considered, and a capital cost estimate for each alternative. No girder analysis is required in the Study.

As a matter of course, there will always be "No-Build" alternate given in the Study. At times, the preparer of the Study will be asked to include an alternate that is rehabilitation of the existing structure. In this case, unit costs can to be obtained from the yearly Unit Bid Price Report, which is available on the Division's website, from discussions with any of the Bridge Engineers employed by the Division, or from the preparer's own engineering judgment.

All proposed structure information is to be shown according to the Division's CADD Standards, available on the WVDOT website.

20.6.4 **Hydraulics:** Hydraulics of any stream impacted by the proposed Study are a very important factor to consider when deciding on a new location for any structure, whether it is a bridge, large culvert, such as a box culvert or very large diameter pipe, or a channel change.

Enough preliminary hydraulic observations and computations are to be made to, at minimum, to determine the low chord elevation of any proposed structure, and the Q_{100} backwater elevation of the existing structure. Field surveys may be required to determine the stream channel bottom's topography and Manning's "n" values. Also, Flood Insurance Rate Maps should be consulted to see what Flood Zone the Study area is in. The regulatory Base Flood Elevation (BFE) should be shown on the plan and profile for each alternate, and the source cited in the Study. Many published Flood Insurance Studies and maps are available from the Technical Section of the Engineering Division. Further, the US Army Corps of Engineers and/or the local Flood Plain Coordinator should be contacted to determine if a detailed hydraulic study has already been performed in the area. Both tailwater and backwater effects are to be considered, as well as preliminary scour depths for piers in the stream channel. A zero backwater increase is to be striven for. If this cannot be achieved, then easements will have to be acquired to cover the proposed backwater increase possibly involving the purchase of homes/businesses, and at minimum a Conditional Letter of Map Revision will have to be filed with the Federal Emergency Management Authority during final design activities.

The hydraulic aspects of altered streams, whether the work is as simple as locating piers in the stream, floodway or flood fringe, placing embankment in these areas, or a complete channel change become paramount when the new facility will result in water surface elevations very close to any published flood elevation. If there are no published flood elevations in the Study area, then a preliminary HEC-RAS analysis on all affected streams is to be performed and submitted as part of the Study.

20.6.5 Environmental overview: A preliminary environmental overview is required. This work will require a representative from the Environmental Services Section of the Engineering Division to examine the project site in enough detail to establish any environmental constraints which would affect the location of alternative alignments in the report, and be of sufficient detail to show in the Study as known constraints to the design. It is preferred that the environmental process be completed for a typical small bridge replacement study. But, studies over larger streams and rivers may require extensive agency coordination and environmental approval, especially federally endangered mussel species are encountered with the preliminary surveys. However, there should be enough surface observations and literature investigations performed to be reasonably sure that there are no major environmental constraints associated with the project.

Wetland involvement, cultural resource considerations for any structure (to include existing railroad facilities and roadway bridges), permit requirements, known endangered species, known hazardous waste/storage tank sites, etc. should be identified so there are no hidden items that come up when the project enters the Preliminary Engineering phase.

It is desired that the environmental process be completed for projects which fall under the Programmatic Categorical Exclusion process to have this document completed and approved at the time the L & D request is made.

20.6.6 **Narrative requirements:** The narrative to accompany each report shall describe the existing facilities, to include traffic data for the present day as well as vehicles per day projected 20 years from the anticipated opening year of the facility to traffic, deficiencies in the existing horizontal/vertical alignments, sight distance obstructions, condition of the existing facilities (to include all roadways, shoulders, drainage facilities, and other structures, such as bridges), etc. The history of the section of roadway in question, such as construction year, any major reconstructions or rehabilitations performed, is to be described. Some of this information can be obtained from the Straight-Line Diagrams and Roadway Inventory Logs maintained by the Planning and Research Division. These diagrams should be obtained and made a part of the project file in any case.

A conceptual Maintenance of Traffic scheme is to be described. At minimum, cases from the latest adopted issue of the Manual on Uniform Traffic Control Devices shall be cited. More complex Maintenance of Traffic schemes may require a more detailed plan. It is not the intent of this Design Directive to show detailed schemes in plan view, rather to describe in words a phasing of construction for the project, and therefore a required Maintenance of Traffic scheme. The length in miles of any detour assuming the facility will be closed is to be indicated. The proposed detour route must be examined for adequate roadway/shoulder widths for the character and amount of traffic which will be utilizing it, as well as the structural capacity/ratings/postings of all bridges along the route.

The proposed work for each alignment is to be described, listing the physical characteristics of each alignment (curvature, grades, length). Capital costs, such as construction costs, right-of-way costs to include home/business relocation costs and utility relocation costs, temporary roadway/bridge are to be indicated for each alignment. Also, each alignment's advantages and disadvantages shall be described. Bridge renovation costs are required if the existing bridge is potentially eligible for inclusion on the National Register of Historic Places.

The preliminary structure information, with the exception of the plan and profile sheets, described in Section 20.6.3 above is to be included as part of the narrative. The Sufficiency Rating for all existing structures is to be shown.

All utilities affected by the project are to be shown on the plan sheets and listed as a part of this narrative.

All accesses to be affected by each alternative are to be identified and taken into account in the capital cost estimates. If a property is to be landlocked, it shall be indicated as such on the plan sheet for that alternative.

A geotechnical overview shall be presented. This will consist of any known data from Natural Resource Conservation Service mapping, knowledge of the geology of the area (possibly from an adjacent project or one in the vicinity), on-hand literature searches such as bridge inspection reports or original bridge plans, etc.

The environmental overview described in Section 20.6.4 shall be made a part of the narrative.

A table listing all capital costs associated with that particular alternative, such as temporary roadway/structure costs, permanent roadway/structure costs, right-of-way costs, utility relocation costs, structure rehabilitation costs (if required), etc., is to be included with each alternative.

At the end of the report narrative, a Summary Table is to be given, with information for each alternative shown, including engineering costs, construction costs, detour length, and advantages/disadvantages of each alternative alignment, advantages/disadvantages of each structure arrangement, etc. From this information, a Preferred Alternate is then chosen, and indicated. This will be the alignment that L & D Approval is requested on. When there is disagreement among the involved parties the Division's Project Manager or Designer will build a consensus among the parties to choose the Preferred Alternate, provided there are major anticipated environmental constraints.

The typical sections sheet(s) will follow the narrative section of the Study, followed by plan and profile sheets showing the existing situation, followed by plan and profile sheets for each and every alternative alignment. At the very end of the Study, photographs of the existing site showing the project area, including the bridge/roadway to be improved or replaced, nearby homes/businesses that may be impacted, streams impacted. Finally, a copy of all pertinent information from the most current Bridge Inspection File, the approved Programmatic Categorical Exclusion or the completed Environmental Services Section approval form (See DD – 206 for this form), the completed Design Study checklists, etc. shall be included at the end of the Study.

30. Distribution of Design Studies for Comments

Distribution of preliminary report: Reference is hereby made to DD – 202, "Field and Office Reviews for Initial Engineering, Preliminary Engineering and Final Design". The Study should be distributed to all entities shown under the Design Report Field Review column.

After each entity's receipt of the Study, at least 2 weeks should be allotted for review and comment. The transmittal memo is to state the date that comments are due. If no comments have been received by the due date in the transmittal memo, it will be assumed that the entity has no comments and the process will continue. It is highly recommended that each entity receiving a Study review and comment at each submission. For example, comments which would apply to the Field Review should be made at that submission, and not at the Office Review.

Distribution of final report: Reference is hereby made to the Distribution List given in DD – 202, "Field and Office Reviews for Initial Engineering, Preliminary Engineering and Final Design". The study should be distributed again to all entities indicated in the Design Report Office Review column. At this time, a request should be made to the Utilities Unit of the Engineering Division, Technical Section for preliminary utility relocation cost estimates, and to the Right-of-Way Division with a request for preliminary estimates of the cost of property acquisitions.

Again, it is recommended that at least 2 weeks be given for review, as described above in Section 30.1. The Office Review portion of the study is the last review before a request for L & D Approval is made.

30.3 Documentation of comments: All comments received are to be fully documented and made a part of the project file, as stipulated in DD-202.

40. Location and Design (L & D) Request and Approval: Once a "Preferred Alternate" is chosen from the Study, an L & D approval request is made to gain the State Highway Engineer's approval. This process is described in DD – 206, "Guidance for Location and Design Approvals" and shall be followed for all Design Reports for approval of the Preferred Alternate. Again, when there is disagreement among the involved parties the Division's Project Manager or Designer will build a consensus among the parties to choose the Preferred Alternate. For most projects, the "Location & Design (L & D) Approval" will be requested at the end of the Initial Engineering Phase. On some projects, additional environmental work may be required, and Location and Design Approval may be requested during the Preliminary Engineering phase.

50. **Scope of Work notes:** The Scope of Work notes will be developed by the preparer of the Study based on the approved Preferred Alternate from the Study. These notes should be adequate for a complete description of all design work to be performed to make a complete set of Contract Plans. See DD-706 for more information concerning what constitutes a complete set of Contract Plans.

60. **Preliminary Engineering estimate:** The Preliminary Engineering Estimate will also be developed by the preparer of the Study. This Estimate is the estimate of man-hours of time expected to be required to develop the complete set of Contract Plans for the Preferred Alignment, which will be advertised for bids. See DD-706 for more information concerning what constitutes a complete set of Contract Plans.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-206
GUIDANCE FOR LOCATION AND DESIGN APPROVALS
June 18, 2014

This Design Directive will give guidance and instruction on how to obtain Location and Design (L & D) Approval for Design Reports and Studies produced by the Planning Division; the Engineering Division: In-House Design, Initial Engineering, and Consultant Review Sections; and all of the Districts within the Division of Highways.

Use of this Design Directive will provide a means to standardize the process required to gain these L & D Approvals throughout all development units of the Division of Highways.

Attachments

10. General

Design Reports and Studies (hereinafter referred to as “Study”, or “Studies”) are engineering studies of several proposed alignments for a highway project. These Studies are produced for projects such as bridge replacements, roadway realignments, intersection improvements, turning lane additions, new roadway alignments, etc. By nature, these Studies are considered Initial Engineering by Design Directive (DD) 200, “Project Development Process”. The completion of the Study with an approved alternative alignment is considered the end of Initial Engineering by that particular DD. If a choice of alignments is given, the report will recommend one alignment as the “Preferred Alternate”, otherwise the alignment shown in the Study will be considered the “Preferred Alternate”.

However, in those cases where there is no prudent, feasible or practicable alternative that would avoid adverse impacts to, the taking of, or the constructive use of: US Government property; those environmental resources covered by process requirements of certain federal laws (Section 404 of the Clean Water Act, Section 4(f) of the Transportation Act, Section 6(f) of the Land and Water Conservation Act, Section 106 of the National Historic Preservation Act, Endangered Species Act); or individual US Army corps of Engineers’ Section 404 permit thresholds; a number of comparative alternatives may need to be carried further into the Project Development Process, or refined at a later date, to document that there is no prudent, feasible, or practicable alternative to the impacts. Projects such as these may require a more rigorous initial engineering analysis or some revisiting of the Study in later stages of the process in order to comply with the unique process requirements of the federal regulations mentioned above.

For most projects, “Location & Design (L & D) Approval” will be requested when the Design Report is completed. Projects that require additional environmental work may request L & D Approval during the Preliminary Engineering phase. This Design Directive will cover only the approval process for L & D requests for any study. Refer to DD-205, “Guidance for Preparation of Design Reports and Studies” for more information concerning the preparation of the Studies themselves.

20. Process of Approval of Location and Design (L & D) Requests

20.1 Environmental Requirements

A preliminary environmental overview is required. This work will require a representative from the Environmental Section of the Engineering Division to examine the project site in enough detail to establish any environmental constraints which would affect the location of alternative alignments in the report, and be of sufficient detail to show in the Study as known constraints to the design. The environmental process does not have to be completed fully. However, there should be enough surface observation and literature investigations performed to determine that there are no major environmental constraints associated with the project, such as wetland involvement, cultural resources considerations (to include existing railroad and roadway facilities and bridges), permit requirements, utility relocations, known endangered species, known hazardous waste/storage tank sites, etc. so there are no major constraints that come up when the project enters the Preliminary Engineering phase that would require the project to go through the process of developing and approving a Design Study again, thus delaying the project or requiring a change in the preferred alignment.

It is desired that the environmental process be completed for projects which fall under the Categorical Exclusion process to have this document completed and approved at the time the L & D Approval request is made.

A form has been developed that is attached to and made a part of this Design Directive for completion by the responsible Environmental Project Managers assigned to the project by the Environmental Section of the Engineering Division, indicating that the environmental constraints for each project have been evaluated.

20.2 Selection of the Preferred Alignment

Once the draft Study has been completed and sent through the required distribution and comment periods as described in DD-202, “Field and Office Reviews for Initial Engineering, Preliminary Engineering and Final Design”, an alignment is then selected from the alternates given in the report. See DD–205, “Guidance for Preparation of Design Reports and Studies” for information on how to complete a Design Study. The decision on the Preferred Alternate is usually made by the Division using the information provided in the final approved Study. It should be noted that DD–201, “Public Involvement Process” should be reviewed to determine if any of the stipulations contained therein apply to each and every Study. Any public involvement must take place before L & D Approval is requested. When there is disagreement among the involved parties the Project Manager or Designer will build a consensus among the parties to choose the Preferred Alternate.

20.3 Preparation of the L & D Approval Request

After all required reviews described in DD-202, to which reference is hereby made, are completed, a Preferred Alternate is then chosen. The Preferred Alternate is the end result of the Study process. This is the alignment for the L & D Approval request to be made on.

The request will be made in memo form (see attached sample memo, which is for example only, and is to be modified as needed for each individual Study) from the Director of the Engineering Division for Central Office Studies, and from the District Engineer for District-produced Studies, to the State Highway Engineer – Development outlining the choice of the Preferred Alternate. This memo should describe the justification for the choice, discussing estimated capital costs, environmental affects, utility relocations, major hydraulic requirements and residential/commercial effects, permit requirements, etc. Also, the attached Environmental Requirements approval form, completed for each alternate required to be carried forward, or the completed and approved Categorical Exclusion is to be included, as well as a copy of the approved Design Study itself showing the Preferred Alternate.

If the package is NOT approved, then the Study will have to be reinvestigated and the process repeated. Again, it is not necessary to have full environmental clearance to make an L & D request on most projects, but enough environmental work should be performed to assure that there are no major issues or circumstances as described in 20.1 above concerning federal regulatory agencies or major constraints that may be uncovered during Preliminary and Final Design that may delay the project or require a change in the Preferred Alternate. However, it is desirable that the environmental process be complete for projects which fall under the Categorical Exclusion process, having the environmental document completed and approved at the time the L & D Approval request.

The approved memo shall go into the Project Manager's on-hand files (as well as the Structure Manager's on-hand files, if required), a copy placed in Engineering Division's master files, copies sent to all parties involved in the review and selection of the Preferred Alternate, and a copy sent to the Programming Division.

30. Sample L & D Approval Request Memorandum – to be modified as required for each individual Study

M E M O R A N D U M

TO: HD

FROM: DDR (*Project Manager*) **OR** DDI *(Designer)* **OR** *(District xx - Designer)* **through** *the Director of the Engineering Division (for Central Office projects)* **OR** *the District Engineer (for District projects)*

SUBJECT: State Project xxxxxxxxx
Federal Project xxxxxxxxx
(Project Name)
(County)

Enclosed is the design report for the subject project, a summary of the recent public meeting on this project (if applicable), comment sheets from local public officials (if applicable), the completed Environmental Requirements Checklists, and a copy of the Study showing all xxx alternates for this project, with Construction Cost Estimates, a Scope of Work narrative, and Preliminary Engineering Estimates.

In compliance with Section 23, Code of Federal Register (CFR), Part 771, Environmental Impact and Related Procedures, the Division is considering (or "has considered" if the Environmental Document is completed and approved) the social, economic and environmental effects of this project and has determined that the preferred alternative is not likely to result in adverse impacts to environmental resources.

From an engineering and financial point of view, we recommend that Alternative xx be approved for the subject project; however, there has been strong support from local citizens for Alternate xx. Alternate xx is an acceptable alternate technically, but it will cost $xxxxxxx more than Alternate xx. We request approval on the Preferred Alternate to advance to plan development.

Enclosure

GLB:ss

Approved: __________________ Disapproved: ___________________________
Date: ________________ (Reason for Disapproval)

cc: DDR(*(Roadway Project Manager, Structure Project Manager (if necessary)*), DDE *(Environmental Project Manager)*, DD(MF), *(Also copy to all parties who reviewed and commented)*, D-*xx (and any other District people who reviewed and commented)*, CP

Environmental Requirements Checklist

(Note: Complete this form for each alternative required to be carried forward)

Project Name: ____

Project Numbers: ____

Environmental and Cultural/Natural Resources Reviewers:

Archaeology: ____

Historic Resources: ____

Streams/Wetlands: ____

Endangered Species: ____

Alternative # and description _____________________________________

____

	No Effect	No Adverse Effect	Adverse Effect
Archaeology:	☐	☐	☐

If adverse effects describe: ____

____

	No Effect	No Adverse Effect	Adverse Effect
Historic resources:	☐	☐	☐

If adverse effects describe: ____

____

	No Effect	No Adverse Effect	Adverse Effect
Streams/Wetlands:	☐	☐	☐

If adverse effects describe: ____

____

	No Effect	No Adverse Effect	Adverse Effect
Endangered Species:	☐	☐	☐

If adverse effects describe: ____

____

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-207
WEST VIRGINIA DIVISION OF HIGHWAYS "CONTEXT SENSITIVE SOLUTIONS" POLICY
October 26, 2012

This Design Directive will give guidance and instruction on the West Virginia Division of Highway's Context Sensitive Solutions Design Policy, and its implementation within the various design units within the Division, to include the Central Office and all Districts.

Attachments

10. General

In 1997, the Federal Highway Administration (FHWA) published *Flexibility in Highway Design* to encourage creative thinking when designing and constructing transportation projects. This guidance grew out of the design related provisions of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the National Highway System Designation Act of 1995.

Section 109 of Title 23, United States Code, provides that a design for new construction, reconstruction, resurfacing, restoration, or rehabilitation of any highway on the National Highway System (other than a highway designated as an Interstate Highway) may take into account [in addition to safety, durability, and economy of maintenance] the following:

A. The constructed and natural environment of the area;

B. The environmental, scenic, aesthetic, historic, community, and preservation impacts of the activity; and

C. Access for other modes of transportation.

The Forward of the latest adopted edition of the AASHTO publication *A Policy on Geometric Design of Highways and Streets* states "The intent of this policy is to provide guidance to the designer by referencing a recommended range of values for critical dimensions. Sufficient flexibility is permitted to encourage independent designs tailored to particular situations".

To this end, Context Sensitive Solutions (CSS) is the vehicle that will allow designers to blend the design of transportation facilities into the ideas presented in 10.A., B., and C. above.

20. Context Sensitive Solutions

""Context Sensitive Solutions" (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits in its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist. CSS principles include the employment of early, continuous and meaningful involvement of the public and all stakeholders throughout the project development process." – quoted from the "What is CSS" page of the Context Sensitive Solutions main page of the Federal Highway Administration's web site.

"Stakeholders" may be defined as residents, businesses, governmental agencies, local politicians, other agencies or groups, etc., adjacent to or otherwise affected by a proposed project. Governmental agencies, such as cities, counties, the Division of Highways itself, the Army Corps of Engineers, the US Environmental Protection Agency, etc. become stakeholders when a proposed project falls within its jurisdiction. Other agencies or groups may be defined as local Chambers of Commerce, development or community groups, schools, construction experts, etc. It is imperative that all stakeholders in a proposed project be identified and involved in the project from its conception to completion of construction.

30. Context Sensitive Solutions Policy and Implementation

This document will provide general information and guidance regarding the implementation of an integrated CSS approach at the project level within the Division of Highways of the West Virginia Department of Transportation. The CSS policy described herein is to be the reference for designers, unit leaders, project managers and other Division employees who may be involved in projects where the CSS approach is applied. It is also to be provided to consultants at the time of the Scope of Work meeting on those projects where the CSS approach is integrated.

The following 5 criteria will be achieved so that the West Virginia Division of Highways (WVDOH) will be considered as having achieved CSS at a project level:

A. There is a written CSS commitment and/or policy. This Design Directive will serve as the policy.

B. Technical staff will be trained in the CSS approach, both in the field and central offices, and across disciplines (i.e., planning, environmental, design, right-of-way, construction, and maintenance). A substantial portion of the staff will be trained in CSS for project development, to include Central Office and District staff, and consultants.

C. At a minimum, all new projects will be developed in accordance with CSS concepts, consistent with scope, size, and type of project. The level of effort for small-scope projects, such as pavement overlay or rehabilitation projects, or a small bridge rehabilitation or replacement in the same location projects, may not need to be as intense as for a roadway realignment or widening, or a roadway on new alignment project. This determination will be made by the project manager at the inception of the project, or as the situation warrants during the development of the project.

D. There will be early, continuing, and interactive public involvement throughout the project development process. The WVDOH Public Involvement Process (DD-201) dated November 14, 2011, provides for communication and public interaction throughout the process. The current Public Involvement Process is to be utilized for all WVDOH projects.

E. Interdisciplinary teams will be involved in the process from the beginning until the end. WVDOH Policies provide opportunities for multi-discipline team input from conception to construction of transportation projects.

Some examples of where the interdisciplinary team approach is used are as follows:

1. NEPA Process;

2. Value Engineering Process (See Design Directive 816 for more information concerning Value Engineering);

3. Design Reviews (See Design Directive 202 for more information concerning Design Reviews);

4. Partnering (Construction); and

5. FHWA Detailed Design, Active Construction, Detailed Physical Maintenance Reviews

The following *Characteristics of Process to Yield Excellence* were developed during the 1998 Thinking Beyond the Pavement National Workshop. Section 109(c)(2) United States Code, Title 23 was amended in SAFETEA-LU Section 6008 to adopt the *Characteristics of Process to Yield Excellence*. Those involved in project development are encouraged to apply these CSS principles when planning, designing, and constructing projects in West Virginia.

A. Communication with all stakeholders is open, honest, early, and continuous.

B. A multidisciplinary team is established early, with disciplines based on the needs of the specific project, and with inclusion of the public.

C. A full range of stakeholders is involved with transportation officials in the scoping phase. The purposes of the project are clearly defined, and consensus on the scope is forged before proceeding.

D. The highway development process is tailored to meet the circumstances. This process should examine multiple alternatives that will result in a consensus of approach methods.

E. A commitment to the process from top Division of Highways officials and local leaders is secured.

F. The public involvement process, which includes informal meetings, is tailored to the project.

G. The landscape, the community, and valued resources are understood before engineering design is started.

H. A full range of tools for communication about project alternatives is used (e.g., visual aids, renderings, etc.).

Those involved in project development are also encouraged to consider the following approaches for Context Sensitive Solutions.

A. Start early: Consider community and customer values and needs from the project selection process through design, construction, and maintenance. This would also include getting local governments and citizens involved from the start.

B. Involve local governments and citizens: Remember to include all affected parties and those with partnership interest.

C. Balance wants, needs, money and the law: Availability of transportation funds is a major factor and should be considered with the competing needs of safety and mobility.

D. Practice thinking "outside the box": Encourage creative thinking during the project development process.

E. Listen and keep an open mind: Be willing to listen to our customers and incorporate their ideas into the project. This will help achieve buy-in.

F. Support teamwork and communication: Work together to add value to the communities through which our projects travel.

40. References

Federal Highway Administrator January 24, 2002 Memorandum on CSS
http://www.fhwa.dot.gov/csd/012402

FHWA: October 29, 2002 Memorandum on CSS
http://www.fhwa.dot.gov/csd/102902

FHWA: *Flexibility in Highway Design*
http://www.fhwa.dot.gov/environment/flex/index

FHWA: *Community Impact Assessment*
http://www.ciatrans.net/ciahomes

AASHTO: *A Policy on Geometric Design of Highways and Streets*

Transportation Research Board *NCHRP Report 480: A Guide to Best Practices for Achieving Context Sensitive Solutions*
http://gulliver.trb.org/publications/nchrp/nchrp_rpt_480a

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-250
(FORMERLY DESIGN DIRECTIVE 203)
DUST PALLIATIVE
July 1, 2006

Item 637001-001, "Water for Dust Palliative," shall be included as a proposal item for all projects in which the total excavation is 10,000 Cubic Yards or greater.

When the total excavation is less than 10,000 Cubic Yards Item 637001-001, "Water for Dust Palliative," shall be included as a proposal item when the dust may become a nuisance. Such as when working in urban areas or when working in close proximity to occupied structures or when installing utilities or drainage inside the roadway where traffic is to be maintained on an unpaved surface during construction.

The proposal quantity will be the greater of the following:

a) 2 gallons of water per cubic yard of excavation or embankment, whichever is greater.

b) ¾ gal per Square yard of unpaved roadway area per day that traffic is to be maintained through the work area for projects that the ADT exceeds 2500 ADT and ½ gal per Square yard of unpaved roadway area per day that traffic is to be maintained through the work area for all other projects.

The proposal quantity will be in thousand gallons (MG).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-251
(FORMERLY DESIGN DIRECTIVE 204)
TEMPORARY EROSION CONTROL
July 1, 2006

Temporary erosion control measures and NPDES permitting measures shall be incorporated into contract plans on all projects per the attached guidelines for “Temporary Erosion Control.”

Attachment

TEMPORARY EROSION CONTROL GUIDELINES

GENERAL REQUIREMENTS:

The designer shall prepare, or include provisions in the contract plans for the contractor to prepare, erosion and sediment control plans in accordance with "Best Management Practices" and the West Virginia Department of Transportation, Division of Highways “Erosion and Sediment Control Manual” (ES&C Manual) latest edition.

COORDINATION OF PLANS:

The DOH has agreed to maintain close coordination with DEP during the design and construction stages of highway development. This will be accomplished by informing DEP of all future projects in writing as outlined in DD-202 and will conduct periodic reviews during plan development and during construction. As shown in Appendix A of DD-202 all coordination letters shall contain the following statements:

- Letters to the DEP:
  “This submission is for your review and comments in relation to significant water quality effects.”

- Letters to the DNR:
  “This submission is for your review and comments in relation to fish and wildlife and recreational resources effects.”

PLAN REQUIREMENTS:

The method of calculating the quantities for pay items is outlined in Section 30 of the ES&C Manual and is intended to be used as a guide. Conditions on individual projects may indicate the need for adjustment of these methods.

NPDES PERMIT REQUIREMENTS:

The General “National Pollutant Discharge Elimination System” (NPDES) Permit requires registration of most construction projects. The registration process and appropriate forms are contained in the E&SC Manual. An approved NPDES registration or a memorandum stating that NPDES registration is not required shall be included in all PS&E submissions. Completed example forms are attached to this DD for your information.

On state funded resurfacing projects the following note shall be added to the plans:

> “If the contractor chooses to waste the millings and the waste area is between 1 acre and 3 acres, the contractor is responsible for obtaining the NPDES Notice of Intent Registration through the DEP which includes a $300.00 registration fee prior to beginning construction. The contractor shall provide the West Virginia Division of Highways a copy of the DEP’s acceptance and confirmation of the registration, prior to the start of construction. The DEP will require additional fees based on the length of time required for construction and is outlined in the general NPDES permit.”

DEP

WEST VIRGINIA

Department of Environmental Protection
Division of Water Resources

NOTICE OF INTENT (NOI)
CONSTRUCTION STORM WATER WV/NPDES GENERAL PERMIT

GENERAL PERMIT REGISTRATION NO. WVG____________(office use only)

1. Project name and Number **Suddy Bridge, S336-17-7.88**

2. Applicant's name: **Gregory L. Bailey, P.E.**
Address: **West Virginia Department of Transportation**
Division of Highways
Building 5, Room A-317
1900 Kanawha Boulevard, East
Charleston, WV 25305-0430 **Telephone (304) 558-2830**

3. Operator or contractor: **Will notify when contract is awarded**

4. Acres disturbed **0.4 acres + waste/borrow sites** *(Must be" less than 3 acres" to use NOI Form)*

5. Latitude **38°36'30"** Longitude **79°31'33"**

6. Nearest Town **Cherry Grove** County **Boone** **Pendleton** Route **CR 17**

7. Receiving Stream*(s) **Dry Run**
(If the receiving stream tier is 2.5 or 3.0, the NOI Form cannot be used)
Basin **NFSB of Potomac**
Municipal System Operator (if applicable) **none**

8. Statement of Right-to-Enter *(Label as "Attachment 8" if applicable)* **All rights-of-way are acquired.**

9. Brief Description of Project *(Use additional pages if necessary and label as "Attachment 9")*
Replace Bridge on existing Line and Grade, Construct Bypass Upstream. Structure Excavation= 206 cy
Borrow= 400 CY Waste= 400 cy

10. Proposed Construction Schedule **August 2003 - June 2004**

11. Certification of compliance with local and state laws (ex. subdivision, FEMA, and storm water management).
Label as "Attachment 11" **All applicable laws will be complied with.**

12. Topographic map with site located. *(Label as "Attachment 12")* **Snowy Mountain**

13. Groundwater Protection Plan *(Do Not Attach. Maintain on site)*

14. Storm Water Pollution Prevention Plan – *Check one to be used*
- [✓] DWR Generic SWPPP
- [✓] Developing other SWPPP
- [ ] If other, name source/preparer for the plan **WVDOH Erosion & Sediment Manual**

BY COMPLETING AND SUBMITTING THIS APPLICATION, I HAVE REVIEWED AND UNDERSTAND AND AGREE TO THE TERMS AND CONDITIONS OF THE GENERAL PERMIT ISSUED ON NOVEMBER 5, 2002. I UNDERSTAND THAT PROVISIONS OF THE PERMIT ARE ENFORCEABLE BY LAW. VIOLATION OF ANY TERM AND CONDITION OF THE GENERAL PERMIT AND/OR OTHER APPLICABLE LAW OR REGULATIONS CAN LEAD TO ENFORCEMENT ACTION.
I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED ON THIS FORM AND THAT IT IS, TO THE BEST OF MY KNOWLEDGE, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT.

APPLICANT SIGNATURE ________________________________ DATE ____________________

Gregory L. Bailey, P.E.
Director, Engineering Division

Pursuant to an Emergency Rule filed by DEP and approved by the Secretary of State effective October 11, 2002, the application fee for construction projects disturbing between 1 to less than 3 acres in size is $300.00. The Emergency Rule will be in effect pending action by the Legislature on a proposed rule amendment that would establish that fee in the legislative rules of the Department of Environmental Protection, Title 47, Series 26, Water Pollution Control permit fee schedule You may obtain a copy of the referenced rules from the Secretary of State's Office, State Capitol Building, Charleston, WV 25305.

Your check or money order for the application fee must be made payable to the West Virginia Department of Environmental Protection.

ALL SPILLS OR ACCIDENTAL DISCHARGES ARE REQUIRED TO BE REPORTED IMMEDIATELY TO THE EMERGENCY RESPONSE SPILL ALERT SYSTEM TOLL FREE TELEPHONE NUMBER 1-800-642-3074. CALLS FROM OUT OF STATE SHOULD BE MADE TO 304-348-8899.

GENERAL PERMIT REGISTRATION
GENERAL PERMIT REGISTRATION
NO. WVG____________

WEST VIRGINIA
Department of Environmental Protection
Division Of Water Resources

SITE REGISTRATION APPLICATION FORM
CONSTRUCTION STORM WATER WV/NPDES GENERAL PERMIT
(THREE ACRES OR GREATER)

1. PROJECT: NAME: *Coalfields Expressway, Slab Fork Rd. - Surveyor Creek Rd.*
   STATE NUMBER: *X341-121-5.60 , 03*
   FEDERAL NUMBER: *Boone* *NCPD-0121(003)C*
   COUNTY: *Pendleton*

2. APPLICANT'S NAME: *Mr. Gregory L. Bailey, P.E.*
   Director – Engineering Division

   ADDRESS: *West Virginia Division of Highways*
   Building 5, Room A-317
   1900 Kanawha Boulevard, East
   Charleston, West Virginia 25305-0430

   TELEPHONE: *(304) 558-2830*

   EMPLOYER IDENTIFICATION NUMBER (EIN): *556000813001*

3. OPERATOR OR CONTRACTOR: *Will notify after award of contract.*

4. PREPARER'S NAME: *J.W. Cantley, JR. P.E.*

   ADDRESS: *L.A. Gates Company*
   2302 South Fayette Street
   Beckley, WV 25801

   TELEPHONE: *(304) 256-1641*

5. ACRES DISTURBED: *71* RAINFALL ZONE: *1*
   APPLICATION FEE: *$1400*

6. LATITUDE: *37°42'20"* LONGITUDE: *81°18'25"*

7. NEAREST TOWN: *Cherry Grove*
   COUNTY: *Pendleton* *Boone*
   COUNTY ROUTE: *CR 17*

8. RECEIVING STREAM(S): *Dry Run*
   BASIN: *NFSB of Potomac*
   MUNICIPAL SYSTEM OPERATOR: *none*

9. STATEMENT OF RIGHT-TO-ENTER (*if necessary*): ***All rights-of-way are acquired.***

10. BRIEF DESCRIPTION OF PROJECT (ATTACH SOILS REPORT): ***See Project Plans & Proposal available @ WVDOH Field Office.***

11. PROPOSED CONSTRUCTION SCHEDULE: ***August 2003 - June 2004***

12. CERTIFICATION OF COMPLIANCE WITH LOCAL AND STATE LAWS (EX. SUBDIVISION, FEMA, AND STORM WATER MANAGEMENT) PLEASE ATTACH ***All applicable laws will be complied with.***

13. TOPOGRAPHIC MAP WITH SITE LOCATED (ATTACH COPY): ***Snowy Mountain***

14. DETAILED SITE MAP OF TEMPORARY SEDIMENT CONTROLS (ATTACH): ***Will be performed by the Contractor awarded the project. Approved Contractor's Erosion Control Plan will be available @ WVDOH Field Office.***

15. NARRATIVE DESCRIPTION OF SEDIMENT AND EROSION CONTROL AND SEQUENCE OF EVENTS (SEE INSTRUCTIONS) USE ADDITIONAL PAGES IF NECESSARY: ***As per Contractor's Erosion Control Plan, Project Plans, & WVDOH Erosion and Sediment Control Manual – all available @ WVDOH Field Office.***

16. SITE MAP OF THE FINAL CONDITIONS SHOWING THE STORM WATER MANAGEMENT FACILITIES (ATTACH): ***As per Project Plans available @ WVDOH Field Office.***

17. INCREASE IN IMPERVIOUS AREA: FROM TO SQ FT
    NEW IMPERVIOUS AREA AS A PERCENTAGE OF PROJECT AREA:
    PRE AND POST DEVELOPMENT PEAK DISCHARGES FOR 1 YR/24 HOUR STORM:

    See attached sheet labeled "Attachment 17"

18. NARRATIVE DESCRIPTION OF THE FINAL STORM WATER MANAGEMENT AND POLLUTION PREVENTION (ATTACH ADDITIONAL PAGES IF NECESSARY): ***As per Project Plans available @ WVDOH Field Office.***

19. GROUNDWATER PROTECTION PLAN (EITHER KEEP ON SITE OR SUBMIT WITH SWPPP FOR REVIEW) SEE INSTRUCTIONS: ***To be completed by the Contractor & available @ WVDOH Field Office.***

BY COMPLETING AND SUBMITTING THIS APPLICATION, I HAVE REVIEWED AND UNDERSTAND AND AGREE TO THE TERMS AND CONDITIONS OF THE GENERAL PERMIT ISSUED ON NOVEMBER 5, 2002. I UNDERSTAND THAT PROVISIONS OF THE PERMIT ARE ENFORCEABLE BY LAW. VIOLATION OF ANY TERM AND CONDITION OF THE GENERAL PERMIT AND/OR OTHER APPLICABLE LAW OR REGULATION CAN LEAD TO ENFORCEMENT ACTION.

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED ON THIS FORM AND ALL ATTACHMENTS AND THAT, BASED ON MY INQUIRING OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT.

OFFICIAL SIGNATURE: ______________________________ DATE ____________

PRINT NAME: *Gregory L. Bailey, P.E.*
Director, Engineering Division

PRIOR TO FILING THIS APPLICATION, YOU MAY WISH TO OBTAIN A COPY OF THE LEGISLATIVE RULES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION, TITLE 47, SERIES 26, WATER POLLUTION CONTROL PERMIT FEE SCHEDULE IN ORDER TO DETERMINE THE APPROPRIATE PERMIT APPLICATION FEE REQUIRED TO ACCOMPANY YOUR SUBMISSION OF THIS APPLICATION. YOU CAN OBTAIN A COPY OF THE REGULATION FROM THE SECRETARY OF STATE'S OFFICE, STATE CAPITOL BUILDING, CHARLESTON, WV 25305. HOWEVER, YOU MAY WISH TO USE THE TABLE FOUND IN ITEM V. OF THE ATTACHED INSTRUCTIONS.

YOUR CHECK OR MONEY ORDER FOR THE APPROPRIATE APPLICATION FEE MUST BE MADE PAYABLE TO THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION.

ALL SPILLS OR ACCIDENTAL DISCHARGES ARE REQUIRED TO BE REPORTED IMMEDIATELY TO THE EMERGENCY RESPONSE SPILL ALERT SYSTEM TOLL FREE TELEPHONE NUMBER 1-800-642-3074. CALLS FROM OUT OF STATE SHOULD BE MADE TO 304-348-8899.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-252
(FORMERLY DESIGN DIRECTIVE 206)
ENVIRONMENTAL MITIGATION ITEMS
July 1, 2006

All preparers of environmental documents shall prepare a listing of mitigation items to be incorporated into the project plans. Examples include:

1. A note will be added to the project general notes if the contractor's work hours are to be limited.

2. Locations on the project where no construction activity is to occur shall be so noted on the plans.

3. Weirs, boulders, or other items as required for certain channel changes will be shown on the plans with bid items.

The Environmental Mitigation Items listing will be submitted to the Director of the Engineering Division with the environmental document.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-253
NOISE ANALYSIS AND ABATEMENT GUIDELINES
August 19, 2011

Attached is the West Virginia Department of Transportation, Division of Highways, Noise Analysis and Abatement Guidelines. It shall be used on all applicable projects.

Attachment

WEST VIRGINIA DEPARTMENT OF HIGHWAYS

HIGHWAY TRAFFIC NOISE POLICY

EFFECTIVE JULY 13, 2011

I. PURPOSE

The purpose of this document is to provide policies and procedures for the consideration of highway traffic noise and highway traffic noise abatement in the planning, design and construction of highways.

II. INTRODUCTION

The West Virginia Division of Highways (WVDOH) recognizes the adverse effects that highway traffic noise may have on the citizens of West Virginia and will do what is practical to lessen these effects. Noise considerations are a part of the planning, design and construction of highways. During the planning phase, alternate alignments are considered to minimize noise impacts; during design, site specific measures may be proposed to lessen noise impacts; and during construction WVDOH is committed to minimizing disruption from construction noise. After all of the above efforts, some locations may still experience noise impact.

Federal requirements for handling noise impacts and abatement are contained in revised title 23 Code of Federal Regulations Part 772 (23 CFR 772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise". WVDOH considers the policies and procedures that follow to be consistent with both 23 CFR 772 and the Highway Traffic Noise Analysis and Abatement Guidance issued July 13, 2010, and revised January 2011 by the Federal Highway Administration (FHWA), Office of Natural Environment. Revised 23 CFR 772 and the guidance are effective July 13, 2011.

Three project types are specified in 23 CFR 772: Type I projects, Type II projects and Type III projects. The three types of projects are defined in 23 CFR 772 as follows:

Type I Project.

(1) The construction of a highway on new location; or,

(2) The physical alteration of an existing highway where there is either:

(i) Substantial Horizontal Alteration. A project that haves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,

(ii) Substantial Vertical Alteration. A project that removes shielding therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway noise source and the receptor; or,

(3) The addition of a through-traffic lane(s). This includes the addition of a through-

traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
(4) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,
(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
(6) Restriping existing pavement for purpose of adding a through-traffic lane or an auxiliary lane; or,
(7) The addition of a new or substantial alteration of a weigh station, rest stop, or ride-share lot or toll plaza.
(8) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project.

Type II Project. A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e). The WVDOT does not develop or implement Type II projects.

Type III Project. A federal or Federal –aid highway project that does not meet the classifications of a Type I or a Type II project. Type III projects do not require a noise analysis.

A Highway Traffic Noise Impact Study must be conducted for all Type I projects.

In 23 CFR 772, the FHWA offers several examples of possible abatement measures which may be considered if noise impact is expected to occur. These include traffic management measures; alteration of horizontal and vertical alignments; acquisition of property rights for construction of noise barriers; construction of noise barriers; acquisition of property or interest therein to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise; (Noise Abatement Criteria) and noise insulation of noise sensitive receptors listed in Activity Category D of Table 1 of 23 CFR 772. See table 1 attached. States are required to consider noise barriers for all Type I projects with impacts by 23 CFR 772; however, the other measures listed are to be considered when applicable and are eligible for federal participation. Noise Abatement Criteria defines noise impacts for different land use.

WVDOH endeavors to integrate noise considerations into the selection of alternates and into the horizontal and vertical design of highways. Both vertical and horizontal alignments may be altered to minimize noise impacts where practical. WVDOH believes that this is one of the most cost-effective means of reducing the overall noise impacts of a project.

The insulation and/or air conditioning of buildings to meet interior noise standards will only be considered for noise sensitive receptors listed in Activity Category D of Table 1 of 23 CFR 772. The insulation and/or air conditioning of other buildings is not provided for in 23 CFR 772.

The option presently given the most frequent consideration by WVDOH and FHWA for abating noise impacts is the construction of noise barriers on highway rights-of-way in the area between the shoulder and the right-of-way limits. According to 23 CFR 772.13(h), the FHWA will not approve project plans and specifications unless feasible and reasonable noise abatement measures are incorporated into plans and specifications to reduce the noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted. The WVDOH considers the detailed policies and procedures contained in SECTION VI of this document to be consistent with FHWA guidance and with 23 CFR 772.

While recognizing that proper planning, design and construction of highways can help reduce the impact of highway traffic noise; WVDOH feels that much of the burden for reducing highway traffic noise impact should involve control of vehicular noise at the source and proper land use planning and development to minimize noise sensitive development near highways. Since WVDOH does not have any authority over vehicular noise or land use planning and development, WVDOH can only encourage local, state and Federal agencies having authority over vehicular noise, land use planning and development to help reduce highway noise impact.

III. DEFINITIONS

(From 23 CFR 772)

Benefited Receptor. The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dBA.

Common Noise Environment. A group of receptors within the same Activity Category in Table 1 to Part 772,Noice Abatement Criteria, that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections, cross-roads.

Date of Public Knowledge. The date of approval of Categorical Exclusion (CE), the finding of No Significant Impact (FONSI), or the Record of Decision (ROD), as defined in 23 CFR 771.

Design Year. The future year used to estimate the probable traffic volume for which a highway is designed.

Existing Noise Levels. The worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

Feasibility. The combination of acoustical and engineering factors considered in evaluation of a noise abatement measure.

Impacted Receptor. The recipient that has a traffic noise impact.

L10. The sound level that is exceed 10 percent of the time(the 90^{th} percentile) of the period under consideration, with L10(h) being the hourly value of L10.

Leq. The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

Multifamily Dwelling. A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefited receptors.

Noise Barrier. A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level, including stand alone noise walls, noise berms (earth and other material), and combination berm/wall systems.

Noise Reduction Design Goal. The optimum dBA noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The noise reduction goal shall reduce the noise level for 10 percent or more of the benefited receptors but not more than 10 dBA.

Permitted. A definite commitment to develop land with an approved specific design of land use activities as evidenced by issuance of a building permit.

Property Owner. An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

Reasonableness. The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

Receptor. A discrete or representative location of a noise sensitive area(s), for any of the land uses listed in Table 1.

Residence. A dwelling unit. Either a single family residence or each dwelling unit in a multifamily dwelling.

Statement of Likelihood. A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

Substantial Construction. The granting of a building permit, prior to right-of-way acquisition or construction approval for the highway.

Substantial noise increase. One of two types of highway traffic noise impacts. For a type I project, an increase in noise levels of 15 dBA in the design year over the existing noise level.

Traffic Noise Impacts. Design year build condition noise levers that approach or exceed the NAC listed in Table 1 to Part 772, Noise Abatement criteria, for the future build condition; or design year build condition that create a substantial increase over existing noise levels.

IV. HIGHWAY TRAFFIC NOISE IMPACT STUDY

The WVDOH will conduct a Highway Traffic Noise Impact Study for each alternative of Type I projects under detailed study. This study will be re-evaluated and updated during each subsequent phase of project development. The study will include the following:

1. **Identification of existing and planned noise sensitive land uses.** An inventory will be made of all existing activities, developed lands, and undeveloped lands for which development is planned, designed and programmed, which may be affected by noise from the proposed highway. Proposed development will be considered planned, designed and programmed on the date of issuance of building permits. All noise sensitive receptors listed in Activity Categories A, B, C, D, and E of Table 1 of 23 CFR 772 will be included in the inventory. Land uses in Activity Category F of Table 1 of 23 CFR 772 may be included in the inventory if it will contribute to the completeness of the study; however, land uses in Category F are not required to be included in the inventory. Since West Virginia is a rural state with an average of less than 50 noise sensitive receptors along a typical 10 mile long project, the inventory will normally list each, house, place of worship, school, apartment building, or other noise sensitive receptor. However, several mobile homes in a trailer park or other closely spaced noise sensitive receptors having the same noise environment may be grouped.

2. **Determination of existing noise levels**. The determination of existing noise levels at the existing and planned noise sensitive receptors will be made by measuring and/or predicting Leq noise levels for the traffic characteristics which yield the worst hourly traffic noise impact on a regular basis at each noise sensitive receptor. The noise level should normally be determined at the closest point of the noise sensitive receptor to the proposed highway; however, if there is no noise sensitive activity at this location the noise level should be determined at the nearest noise sensitive activity to the highway. Normally at least one measurement will be made during peak hours for every 20 noise sensitive receptors identified. Each house, place of worship, school, apartment building, etc. will normally be considered to be a separate noise sensitive receptor; however; several mobile homes in a trailer park or other closely spaced noise sensitive receptors having the same noise environment may be grouped. Each noise measurement will be made for a period of at least fifteen minutes with an ANSI Type I or Type II integrating sound level meter or analyzer. Predictions will be made using a prediction model approved by the FHWA. The model is validated if measured existing highway traffic noise levels during peak traffic hours and predicted highway traffic noise levels for the existing condition are within +/-3 dBA. If the model is not validated, noise measurements should be repeated while taking traffic counts. The traffic counts should then be used to model existing conditions to validate the model. Noise measurements shall conform to the procedures outlined in Measurement of Highway Related Noise FHWA-80-96-046.

3. **Prediction of design year noise levels**. The Leq noise levels will be predicted at

existing and planned noise sensitive receptors for each alternative under detailed consideration including the no build alternative. The predictions will be made using a prediction method approved by the FHWA. The predictions will be made for the traffic characteristics which yield the worst hourly traffic noise impact on a regular basis. Average pavement type will be used in predicting noise levels unless a different pavement type is approved by the FHWA. Noise contour lines may be used for project alternative screening or for land use planning, but shall not be used for determination of highway traffic noise impacts.

4. **Determination of traffic noise impacts**. Primary consideration will be given to exterior areas where frequent human use occurs. Exterior traffic noise impact will be determined at each existing and planned noise sensitive receptor by comparing the predicted design year noise level with the Noise Abatement Criteria (NAC) of 23 CFR 772 and with the existing noise level. If the predicted design year noise level approaches (comes within 1 dBA) or exceeds the NAC noise impact will occur. Noise impact will also occur if the predicted design year noise level substantially exceeds the existing noise level (15 dBA or greater).

5. **Determination of interior noise impacts**. An indoor analysis shall only be done after exhausting all outdoor analysis options. In situations where no exterior activities will be affected by traffic noise, the interior noise levels shall be used to determine noise impact for noise sensitive receptors in Activity Category D of Table 1 of 23 CFR 772.

6. **Examination and evaluation of alternative noise abatement measures for reducing or eliminating noise impacts**. Noise abatement measures such as traffic management measures, changes in horizontal and vertical alignments, acquisition of property for buffer zones, insulation and/or air conditioning of buildings to meet interior noise standards for sensitive receptors listed in Activity Category D of Table 1 of 23 CFR 772, and construction of noise barriers will be considered. The feasibility and reasonableness of noise barriers is covered in detail in Section VI.

7. **Preparation of noise study report.** A detailed noise study report will be prepared if noise impact is expected to occur at any location along the route of the proposed project. If noise impact is not expected to occur in the vicinity of the proposed project, a detailed noise study report or a short summary type noise study report will be prepared. TNM files and other support files should be submitted on electronic media. The following will normally be included in a detailed noise study report:

- INTRODUCTION
- SUMMARY OF RESULTS
- FUNDAMENTALS OF SOUND AND NOISE
- NOISE IMPACT CRITERIA
- NOISE LEVEL MEASUREMENTS
- NOISE LEVEL ESTIMATES

- TRAFFIC
- EXISTING NOISE ENVIRONMENT
- DESIGN YEAR NO-BUILD NOISE ENVIRONMENT
- DESIGN YEAR BUILD ALTERNATIVE NOISE ENVIRONMENT
- TRAFFIC NOISE ABATEMENT
- CONSTRUCTION NOISE ABATEMENT
- FHWA POLICY REGARDING LAND USE DEVELOPMENT AND FUTURE NOISE ABATEMENT
- TABLE NO. 1 EXTERIOR NOISE LEVELS
- TABLE NO. 2 TRAFFIC DATA AND Leq CONTOURS
- MAP PROPOSED PROJECT

V. COORDINATION WITH LOCAL OFFICIALS

The lack of consideration of highway traffic noise in land use planning and development at the local level has added to the highway traffic noise problem. Many developments now experiencing high noise levels were constructed adjacent to major highways long after these highways were proposed and constructed. This lack of concern for predictable high noise levels by local planning and zoning agencies and by developers has affected citizens and resulted in many noise complaints. Since WVDOH does not have any authority over land use planning and development, WVDOH can only encourage local officials and developers to consider highway traffic noise in the planning, zoning and development of property near existing and proposed highways. WVDOH will send a letter to local officials at least ever two years encouraging them to consider highway traffic noise in land use planning and development. The letter will also encourage local officials to visit the FHWA Highway Traffic Noise website (www.fhwa.dot.gov/environment/noise/) to learn more about Noise Compatible Planning.

In order to help local officials and developers consider highway traffic noise in the vicinity of proposed Type I projects, WVDOH will include a copy of the noise study report in the Categorical Exclusion (CE), Environmental Assessment (EA), Finding of No Significant Impact (FONSI) or Environmental Impact Statement (EIS) for the proposed project. The noise study report will contain the distances to the 66 dBA and the 71 dBA contours along each segment of the proposed project. The noise study report will also encourage local officials and developers to visit the FHWA Highway Traffic Noise website (www.fhwa.dot.gov/environment/noise/) to learn more about Noise Compatible Planning.

VI. FEASIBILITY AND REASONABLENESS OF NOISE BARRIERS
FOR TYPE I HIGHWAY CONSTRUCTION PROJECTS

FEASIBILITY

Feasibility deals with engineering considerations -that is, can a substantial noise reduction be achieved given the conditions of a specific location. Is the ability to achieve noise reduction limited by: (1) topography; (2) animal migratory paths; (3) cultural resources such as historic places; (4) access requirements for driveways, ramps, etc.; (5) maintenance issues and utility encumberments; (6) the presence of local cross streets; or (7) other noise sources in the area, such as aircraft, trains, or industry? All these considerations affect the ability of noise barriers to achieve an actual noise reduction.

It is state policy that construction of a noise barrier is **NOT FEASIBLE** if a noise reduction of at least 5 dBA cannot be achieved for an impacted receptor.

REASONABLENESS

Reasonableness is a more subjective criterion than feasibility. It implies that common sense and good judgment have been applied in arriving at a decision. Reasonableness should be based on a number of factors, with regard for all of the individual, specific circumstances of a particular project.

It is state policy that the final determination of reasonableness will be made only after a careful and thorough consideration of a wide range of criteria. However, noise barriers will definitely not be built if a majority of benefited receptors do not want them. During the environmental phase (NEPA) of a project it will be assumed that the benefited receptors will want a noise barrier. During the design phase of the project after the exact location and design of the project have been determined a public meeting will be held to provide detailed information on the design of the project and possible noise barriers. After the public meeting a survey will be conducted of the benefited receptors to determine if they want a noise barrier.

23 CFR 772.13(d)(2)(iv) requires that reasonableness factors 1, 2, and 3 listed below must collectively be achieved in order for a noise abatement measure to be deemed reasonable. Failure to achieve any of the three required reasonableness factors will result in the noise abatement measures being deemed not reasonable. In addition to the required reasonableness factors optional reasonableness factors 4 through 8 listed below may be considered. However, no single optional reasonableness factor can be used to determine reasonableness.

1. The construction of a noise barrier is not reasonable unless a majority of residents and property owners of the benefited receptors (receptors that receive a noise reduction of 5 dBA or more from the noise barrier) want a noise barrier even if all other criteria indicate that a noise barrier is reasonable. During the environmental

phase (NEPA process) of a project it will be assumed that the benefited receptors want a noise barrier. During the design phase of the project a public meeting will be held for residents and owners of benefited receptors. Local officials will also be invited and encouraged to attend this public meeting. After the public meeting a survey will be conducted to determine if the residents and owners of the benefited receptors want a noise barrier. Local officials will be encouraged to consider highway traffic noise in the land use planning process.

2. The construction of a noise barrier is not reasonable if the cost is more than $30,000 per benefited receptor. The barrier cost will include the cost of construction (material and labor), the cost of additional right-of-way, the additional cost of relocating utilities and any other costs associated with the barrier. The estimated cost of construction (material and labor) will be $25 per square foot. The allowable cost per benefited receptor and the cost for construction shall be re-analyzed every 5 years. All receptors with noise reductions of 5 dBA or more will be counted. Each house or apartment unit will be counted as one receptor. Every 100 linear feet of frontage will be counted as one receptor when considering parks, active sports areas, campgrounds, cemeteries, and other similar outdoor noise sensitive land uses. For non-residential uses such as schools, places of worship, community centers and auditoriums the following equation will be used to determine the equivalent number of receptors:

   Equivalent No. of Receptors = (no. of occupants/3) X (usage) usage = (no. of hours used per day/ 24) X (no. of days used per year /365)

3. Each barrier must reduce the noise level by at least 7 dBA at ten percent or more of the benefited receptors pursuant to 772 .13(d) (2) (iii).

4. The construction of a noise barrier is not reasonable if the impacted receptors were not constructed or the building permits were not issued before the date of public knowledge of the project. The date of public knowledge is the date the public is officially notified of the adoption of the location of a proposed highway project. This date is considered to be the date of approval of CEs, FONSIs, or RODs when considering highway traffic noise and highway traffic noise abatement.

5. The date of development of impacted receptors should be an important part of the determination of reasonableness. More consideration will be given to impacted receptors that predated initial highway construction.

6. More consideration will be given to impacted receptors with larger increases over existing noise levels. If the future build noise levels are at least 5 dBA greater than the existing noise levels more consideration will be given.

7. More consideration will be given to areas where larger changes in traffic noise levels are expected to occur if the project is constructed than if it is not. If the future build noise levels are at least 3 dBA greater than the future no-build noise levels additional consideration will be given.

8. More consideration will be given to benefited receptors with future build noise levels at or above the 23 CFR 772 Noise Abatement Criteria.

VII. STATEMENT OF LIKELIHOOD

A statement of the likelihood of noise abatement measures shall be included in the CE, EA FONSI or the EIS for the proposed project. 23 CFR 772.13(g)(3) says, "The environmental document shall identify locations where noise impacts are predicted to occur, where noise abatement is feasible and reasonable, and locations with impacts that have no feasible or reasonable noise abatement alternative. For environmental clearance, this analysis shall be completed to the extent that design information on the alternative(s) under study in the environmental document is available at the time the environmental clearance document is completed. A statement of likelihood shall be included in the environmental document since feasibility and reasonableness determinations may change due to changes in project design after approval of the environmental document. The statement of likelihood shall also indicate that final recommendations on the construction of an abatement measure(s) is determined during the completion of the project's final design and the public involvement process."

VIII. INVENTORY OF CONSTRUCTED NOISE BARRIERS

The WVDOH shall maintain an inventory of all constructed noise abatement measures. The inventory shall include the following parameters: type of abatement; cost (overall cost, unit cost per/sq. ft.); average height; length; area; location; year of construction; average insertion loss/noise reduction as reported by the model in the noise analysis; NAC category(s) protected; material(s) used; features (absorptive, reflective, surface texture); foundation (ground mounted, on structure); project type(Type I, .Type II, and optional project types such as State funded, county funded, tollway/turnpike funded other, unknown).

5/24/11

NOISE BARRIER EVALUATION FORM

Proposed Project:
Location:

FEASIBILITY

Can a 5 dBA noise reduction be achieved at any impacted receptors?

If yes complete the reasonableness section.
If no, a noise barrier should not be constructed. No additional analysis is required.

REASONABLENESS

	Not Reasonable	Marginally Reasonable	Fully Reasonable	Highly Reasonable
REQUIRED FACTORS: *				
1. % of benefited receptors wanting barrier	<50%	50-60%	61-75%	>75%
2. cost/receptor	>$30K	$26K-$30K	$20K-$25K	<$20K
3. % of benefited receptors with 7 dBA noise reduction	<10%	10%-20%	21%-40%	>40%
OPTIONAL FACTORS: **				
4. % developed before public knowledge of proposed project	<20%	20%-30%	31%-40%	>40%
5. % developed before highway constructed	<20%	20%-30%	31%-40%	>40%
6. Build level ___ dBA Greater than existing	<3dBA	3-4	5-10	>10
7. Build level ___ dBA Greater than no-build	<2dBA	2	3-5	>5
8. Build level above Noise abatement criteria	not applicable	not applicable	0-3 dBA above	> 3 dBA above

9. ADDITIONAL CONSIDERATIONS: ______________________________

DECISION AND REASONS: ______________________________

* 23 CFR 772.13(d)(2)(iv) requires that reasonableness factors 1-3 must each be achieved for a noise abatement measure to be considered reasonable.

** 23 CFR 772.13(d)(2)(iv) allows consideration of these optional abatement factors, which cannot singly eliminate an abatement measure that meets the requirements of 1-3 above.

U.S. Department
of Transportation

Federal Highway
Administration

West Virginia Division

Geary Plaza, Suite 200
700 Washington Street, East
Charleston, West Virginia 25301
Phone (304) 347-5928
Fax (304) 347-5103

June 8, 2011

IN REPLY REFER TO:
WVDOH Noise Policy

Gregory L. Bailey, P.E.
Director – Engineering Division
West Virginia Division of Highways
Charleston, West Virginia 25305

Dear Mr. Bailey:

In response to your May 26, 2011 letter and in accordance with 23 CFR 772 Procedures for Abatement of Highway Traffic Noise and Construction Noise the Federal Highway Administration (FHWA) approves and accepts the West Virginia Division of Highways Noise Policy. Should you have any questions regarding the enclosed information, please contact me at (304) 347-5271 or via e-mail at Jason.Workman@dot.gov.

Sincerely yours,

Jason E. Workman
Environmental Protection Specialist

http://www.fhwa.dot.gov/wvdiv/wv.htm

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-270
MUSSEL SURVEYS AND RELOCATIONS

June 21, 2011

Attached is the West Virginia Department of Transportation, Division of Highways policy on mussel surveys and relocations.

This directive contains guidance on when a mussel survey is required, how it is to be performed and the necessary contract requirements.

Attachment

MUSSEL SURVEYS AND RELOCATIONS

10 – GENERAL:

When a project is near a stream or may affect a stream a mussel survey and/or special project restrictions may be required. The three distinct mussel stream types are the following:

a) Federally listed streams (United States Fish and Wildlife (FWS) listed)
b) State listed stream (West Virginia Division of Natural Resources (DNR) listed)
c) All other streams
   1. Any stream with a watershed greater than 10 square miles or
   2. Any stream that flows into a listed stream or
   3. Any project in which the DNR requests a survey.
   4. Streams that have been determined by the DNR to not contain mussels do not need to be surveyed. A listing of these streams can be obtained from the DNR.

Each of these stream types require a different standard of care and has different project requirements. Generally mussel surveys can only be conducted between April 15 and September 15 and the water temperature must be above 60 degrees Fahrenheit. These surveys must be performed in accordance with the approved permit from the appropriate agency and the current guidance from the DNR and/or FWS. Streams in which the DNR has indicated that no live native mussels exist do not need to be surveyed. If surveys need to be conducted outside of the above mentioned time or temperature guide lines then special approval and survey procedures must be given by the DNR and/or FWS prior to performing any work.

The person in “responsible charge” is the person that is in possession of the permit, plans, required protocol, identification skills, proper training and in charge of completing the mussel survey in a safe and efficient manner. Simply being in possession of a “collection permit” or having the most tenure does not qualify a person to be the person in “responsible charge.” The Natural Resource unit leader of the Environmental Section of the Engineering Division shall identify the person in “responsible charge” prior to the personnel leaving the office to conduct the survey.

The safety to the personnel performing the work is paramount. If in the opinion of the person in “responsible charge” of the work determines it is unsafe to perform the survey, they shall contact the DNR and/or FWS for their concurrence. The person in “responsible charge” shall provide to the DNR and/or FWS the project constraints, the reasons why the situation is unsafe and why the situation will not improve with probably future stream conditions. If the agencies involved are in concurrence that the situation is unsafe then no survey shall be required. If the agencies disagree that it is unsafe to perform the survey then the survey may need to be contracted to a consultant that has more training to perform the work.

20 – PERSONNEL QUALIFICATIONS

All mussel stream surveys must be performed by qualified personnel and must be trained in all aspects of surveying techniques, identification and relocation of mussels. The person in “responsible charge” of performing the survey must be in possession of all the proper permits and in possession of all necessary plans prior to beginning the survey and must be in control of all aspects of the work as the survey is being performed. The person in “responsible charge” shall have the right to end the work or stop any individual from continuing any activity if in their opinion it risks the safety of anyone. If any individual on the survey team has the opinion that their health and/or safety is at risk while performing the work they can elect not to continue until the issue of concern has been addressed. However the individual must inform the person in “responsible charge” of the issue of concern.

A scientific collection permit must be obtained from DNR prior to performing any in stream survey work. Coordination with the DNR and FWS may be required on Federally listed streams prior to DNR issuing the permit. Some projects may require each phase of work to be permitted separately so that the impact on the mussel population is known prior to proceeding to the next phase of work.

30 – PLAN SUBMISSIONS

30.1- Design Location Studies: If the project is on a Federally listed stream or a State listed stream the designer must submit the design location alternatives to the Environmental Section prior to selecting the preferred alternate. A Phase 1 & 2 Mussel Survey will be performed to assure that a significant mussel population is not affected. If a significant mussel population is found the designer shall coordinate with the Environmental Section to minimize and mitigate the effects of the project. Any project located on a Federally listed stream requires coordination with the FWS and may take several years before relocations can begin. Final design plans will be required prior to approval for relocation by the FWS can be obtained.

30.2 – Construction Plan Development: All projects that are near a stream or may affect a stream shall be submitted to the Environmental Section when all the temporary and permanent impacts are known, along with a copy of the permit package. Impacts include but are not limited to the following:

a) Any work below ordinary high water;
b) Bridge painting or repair projects that are over any Federally listed stream; and
c) Any ground disturbing project including paving that is within 200 feet of a Federally listed stream.

40 – MUSSEL SURVEY PHASES:

For Federal and State listed stream the Phase 1 and Phase 2 surveys are required in the early stages of the project to ensure that a significant mussel population or an endangered species is not being affected by the project. If it is determined that a significant population or endangered species exist, then the designers will be informed of the situation and further coordination may be required with the DNR and/or FWS. The Phase 3 survey should be performed in the same year as the construction is scheduled to begin.

For projects that are on any other stream the Phase 1 and 3 are required and should be performed in the same year as the construction is scheduled to begin.

40.1 – Habitat Survey (Phase 1): This survey is only to assess whether or not habitat exists at the site to support mussel population. The time of year and water temperature guidelines do not apply to this type of survey.

40.2 – Absence, Presence and Density Survey (Phase 2): This survey is performed only if the Phase 1 survey is positive.

40.3 – Relocation Survey (Phase 3): This survey is performed only if the Phase 2 survey is positive and is the most intensive survey performed.

50 – MUSSEL SURVEY TYPE AND TECHNIQUE REQUIREMENTS:

50.1 Habitat Survey (Phase 1): This survey requires approximately a one hour site investigation of the stream bed and characteristics to determine is habitat exist at the site to support mussel population.

50.2 – Absence, Presence and Density Survey (Phase 2): This survey requires approximately 1 person hour per 1,000 square feet of suitable habitat to be surveyed. This survey will be performed in accordance with the approved permit and the current guidance from the DNR.

50.3 – Relocation Survey (Phase 3):

50.3.1 – Mussel Collection: This process requires a minimum of 1 person hour per 1,000 square feet of streambed to be collected. During the survey type all native mussels shall be collected and documented for relocation to a relocation area. If the stream is wider than 20 feet the stream shall be divided into smaller manageable areas to search. This will ensure that the entire streambed is searched. Relocation of the collected mussels should begin when 50 or fewer mussels have been collected. The collected mussels shall be kept in the water as much as practical and should be in a bag that allows for water to freely flow through it. When it is evident that relocations will occur, the relocation site must be identified for use. The person in "responsible charge" must determine the manner of transportation of mussels to the relocation area and obtain the proper equipment to transport and ensure that the damage to the mussels is minimized.

The person in "responsible charge" needs to consider all of the following to ensure the relocations occur in a timely and safe manner:

a) Number of mussels to be relocated;
b) Time required for transportation to the relocation area;
c) Type of transportation required to relocate mussels (i.e. walking or moving by vehicle);

d) Equipment required for safely and efficiently transporting the mussels to the relocation area;
e) Weather Conditions;
f) Fatigue of the staff;
g) Site conditions (Terrain, Obstacles in stream, Access to work site, etc);
h) Time of Day;
i) Number of staff performing work; and
j) Any other issue that may affect the safety of staff or the mussels.

There are two distinct types of survey techniques. The first is a thorough search of the area with streambed disturbance in the form of sweeping the substrate by hand to remove silt and fine sediments to expose smaller and mostly buried mussels. If mussels are to be relocated then a minimum of two passes must be performed over the direct impact area. This type is the most commonly used and requires the least amount of work. This survey technique is used when all of the following are true:

a) A density of 5 or less mussels per 100 square feet of suitable habitat area with 2 species present;
b) A density of 10 or less mussels per 100 square feet of suitable habitat with 1 species present;
c) 3 or more different species are found or if any State Rare mussel species is found;
d) If the person in "responsible charge" believes that a more extensive survey is warranted due to their experience they may perform the Second Survey Technique.

When any of the preceding are false the Second Survey Technique must be used. The Second technique requires the following:

a) Dividing the survey area into small delineated areas;
b) Searching each small area thoroughly with streambed disturbance in the form of sweeping the substrate with hands to remove silt and fine sediments;
c) Raking the area thoroughly in the areas where mussels were previously found in an attempt to expose any buried mussels and searching each small area thoroughly again;
d) After the entire area has been searched using this method, it shall be searched again until the rate of recovery for the entire search area produces less than 10% of the mussels collected on the pervious pass and does not include a State Rare species to a maximum effort of less than 1 mussel per person hour in the last 2 hours of searching the entire survey area; and
e) After the above process is complete the areas of direct impact (from piers and/or causeways) shall be delineated and searched again using the above procedure.

50.3.2 – Mussel Documentation: The following information must be collected during Phase 2 & 3 surveys:

a) DNR form completed;
b) Mussel Identifications;
c) Mussels sorted according to species;
d) Mussels counted; and
e) Mussels photographed.
   1) Generally no more than 15 mussels appear in each photograph
   2) Generally no more than 2 species per photograph

50.3.3 – Mussel Relocations: A suitable relocation area is to be located prior to collecting any mussels for relocations. The relocation site should have all the following characteristics:

a) Should be upstream if possible; if the upstream locations is not practical then a downstream site can be utilized;
b) The site must have suitable habitat;
c) The site must have a stable streambed; and
d) The site should contain existing live mussels.

60 – MUSSEL SURVEY REPORTS:

Reports will be submitted to the DNR if mussels were found in a Phase 2 or Phase 3 survey or if the DNR specifically requested the survey. Reports for a Phase 1 survey will be required only for Federally listed streams. The DNR has three data sheets and the current forms must be included in all reports. The DNR data sheets are: Site Record, Current Stream and Weather Conditions and Mussel Survey Data Sheet.

All reports will contain:

- DNR data sheets;
- Photographs of mussels found, if any, and titled with species;
- Location Maps;
- Sketch of Survey and Relocation areas; and
- Project Description

If a Phase 3 survey is required then a more detailed report containing:

- DNR data sheet;
- Photographs of mussels found, if any, titled with species;
- Location Maps;
- Detailed Maps of Survey area, Mussel Bed and Relocation site;
- Detailed Project background and description; and
- Table of species found and individual numbers for each species.

No official reports will be submitted for surveys with negative results unless the DNR specifically requested the survey. However the Division will submit to the DNR annually, point data in ArcGIS format for all surveys and their respective results.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-271
ENVIRONMENTAL PROJECT CLEARANCE SUBMISSIONS
November 18, 2011

Attached is the West Virginia Department of Transportation, Division of Highways policy on environmental project clearance.

This directive contains guidance on what information needs to be submitted to the environmental section in order to begin the environmental clearance process.

Attachment

ENVIRONMENTAL PROJECT SUBMISSIONS

10 – GENERAL:

All highway projects require environmental clearance. The amount of information and effort required to clear a project is dependent on what work is being proposed and what resource(s) that may be impacted by the work.

Highway projects can be categorized in three general categories:

a) Routine maintenance (ditching, culvert replacements and extensions, slide repair, resurfacing, ect) (these projects generally require no new right-of-way)
b) Small projects (small bridge replacements and rehabilitations, intersection improvements, roadway widening projects, ect)
c) Large projects (bridge projects that require a US coast Guard permit, large bridge projects, 4-Lane highway projects, ect)

Routine maintenance projects generally require the least amount of time to clear the environmental process. These projects require sending the project information and scope of work to the District Environmental Coordinator (DEC). Generally the DEC can clear these projects relatively quickly. If the Environmental Coordinator determines that the project cannot be cleared at their level then the project will be forwarded to the Environmental Section of the Engineering Division (ESED) for clearance. This type of project normally requires a “Categorical Exclusion” (CE) or “Programmatic Categorical Exclusion” (PCE) depending on the scope of the project.

Small projects generally require several months to clear the environmental process. At a minimum this process requires coordination with the resource agencies and field work in order to clear environmental process. Very few of these types of projects require public involvement. Public involvement is generally required if the project adversely effects a historic resource and/or is in a populated area and it adds several additional months to the process. These types of projects must be sent to the ESED for clearance. This type of project normally requires a “Categorical Exclusion” (CE) or “Programmatic Categorical Exclusion” (PCE) depending on the scope of the project.

Large projects generally require the largest effort to clear the environmental process. This process generally requires public involvement, coordination with the resource agencies, and field work in order to clear environmental process. This type of project normally requires an “Environmental Assessment” (EA) or “Environmental Impact Statement” (EIS) depending on the resource(s) being affected by the project. These projects must be sent to the Environmental Section of the Engineering Division for clearance.

20 – ENVIRONMENTAL PROCESS

On routine and small projects the individual proposing the work will submit all of the project information to the DEC. The DEC will use the environmental Geographic Information System (GIS) tool and fill out the "Level 2 Checklist" to determine if it qualifies to be cleared at their level or it needs to be sent to the ESED for clearance. If a project can be cleared by the DEC they shall inform the individual that submitted the project and provide them with the proper clearance document. If a project cannot be cleared the DEC it will be sent to the ESED for clearance.

On Large projects and projects that cannot be cleared by the DEC they shall be submitted to the ESED for clearance. When the project has been cleared by the ESED they shall inform the individual that submitted the project and provide them with the proper clearance document.

30 – PROJECT SUBMISSIONS

30.1- Submissions to the District Environmental Coordinator: The individual proposing the work will submit the following project information to the DEC:

- Level 1 Checklist;
- Description of work;
- Plans (if available);
- Typical Sheet for type of project;
- Photographs of the structure and surrounding area including pictures of the stream substrate; and
- Any other information that helps explain the project purpose.

30.2 – Submissions to the Environmental Section of the Engineering Division: These project submissions shall include the following:

- All information required in section 30.1; and
- Level 2 Checklist and GIS screening tool information.

These checklists can be found in Appendix A. The ESED will use the information provided on the Checklists to clear the projects. If a project is submitted without the checklists or the checklists are incomplete the project will be returned to the individual that submitted the project.

WVDOH MAINTENANCE AND CONSTRUCTION ACTIVITIES CHECKLIST AND PROJECT INFORMATION SUBMITTAL FORM
Level 1 to be completed by Project Originator

District ______ County _______________ Route ___________ Milepost ______

Stream _________________ Latitude ________________ Longitude ________________ (D.Dº WGS 84)

Type of work is: ☐ bank stabilization ☐ culvert replacement or extension ☐ structure replacement or repair
☐ rock gutter associated with ditch cross-pipe ☐ roadway Improvement or widening
☐ other describe: ____

Project Description: ____

____

____

Total linear feet of stream impact expected? ___________ Stream Width: ________ Drainage Area: _________

		Yes	No	N/A
1.	Are you planning to change the type or size of structure at this site?	☐	☐	☐
2.	Does this project involve multiple bank stabilizations on the same stream?	☐	☐	
3.	Do you expect to need temporary fill (i.e. cofferdams, detours, etc.)?	☐	☐	
4.	Do you expect to use a detour?	☐	☐	

If using a detour ☐ the detour is upstream ☐ the detour is downstream
☐ the road is closed and existing roads are used as detour. (check one)

		Yes	No	N/A
5.	Will you be working in or adjacent to a state or national park or forest?	☐	☐	
6.	Will a waste or borrow site be needed?	☐	☐	
7.	Will there be in stream work April to June or September to February?	☐	☐	
8.	Will you be working in or near a marked “No Mowing or Spray” area?	☐	☐	
9.	Does there appear to be a potential wetland on or adjacent to the site?	☐	☐	
10.	Do you anticipate the removal of any trees to complete this project?	☐	☐	

If “yes”	Diameter at chest height	Quantity	Type “Species”
	____________	_______	______________
	____________	_______	______________
	____________	_______	______________

		Yes	No	N/A
11.	Will additional right of way or easements be required?	☐	☐	

If “yes” Describe any previous ground disturbance like (grading, fill, parking lots and photograph areas)

____

____

		Yes	No	N/A
12.	Will in stream work be required beyond 50 feet of the structure?	☐	☐	☐
13.	Will this project require fill to be placed within the 100 year floodplain?	☐	☐	
14.	Is the structure older than 40 years?	☐	☐	☐

If “yes” or unknown include photographs and complete the following:
Date of Construction ______________ Builder ______________
Bridge Plate Text ____
Alterations ____
Other Notes ____

15. Is there any standing structures (houses, barns, sheds, walls, etc.) that can be

seen from the project site? ☐ ☐

If "yes" include photographs of each structure and complete the following for each structure: Date of Construction if known _________
Property use _____________ Material used ____________________
Alterations _______________________ Other Notes _______________

16. Is the structure a concrete arch, metal truss, stone structure or have stone abutments? ☐ ☐ ☐

17. Is the project within a town or populated area? ☐ ☐ ☐

For culvert replacements/extensions, bank stabilizations, and outfalls complete the necessary typical drawing. For minor structure repairs provide plan and profile views showing the proposed repair work and any cofferdams needed to complete the repair work. Include the length of impact, acres of impact, and cubic yards of fill for material placed below OHW on the plan view.

For all projects include the following items:

- A) Plans and profiles including all temporary work (detours, causeways, staging areas, etc.)
- B) Project location map
- C) Photographs of the following:
  - a. General area views from project
  - b. Upstream, downstream and stream bottom
  - c. Bridge or structure (various views)
  - d. Bridge plates
  - e. Structures in vicinity
  - f. Old bridge or structure plans (if available)

Attach the drawing(s) along with a location map and pictures to this checklist and submit the information to the District Environmental Coordinator. Retain a copy of this information for your file. ***Work cannot begin until the appropriate authorization has been obtained.*** Upon completion of the work, submit post-construction pictures to the District Environmental Coordinator.

Comments (attach additional sheet if necessay): ____

____

Contact: ______________________________ Date: _______________

WVDOH MAINTENANCE ACTIVITIES CHECKLIST
Level 2 to be completed by Environmental Coordinator or Assistant Environmental Coordinator

<u>Use the Environmentally Sensitive GIS Layers to Answer Question 1 – 7a</u>

	Yes	No	N/A
1. Located within Zone 1, 8, 10, 12, 13, 14 or 18 GIS layers?	☐	☐	
2. Located within Zone 2 AND requires tree removal (>5” DBH) from 4/1 to 11/15?	☐	☐	
3. Located within Zone 3 AND requires tree removal (> ½ acre) from 4/1 to 11/15?	☐	☐	
4. Located within Zone 4 AND requires tree removal (>5” DBH) any time of year?	☐	☐	
5. Located within Zone 5 AND requires additional right of way or easements?	☐	☐	
6. Located within Zone 6 or 7 AND requires additional right of way or disturbance of previously undisturbed ROW?	☐	☐	
7. Located within Zone 9 AND requires work below OHW?	☐	☐	
8. Located within Zone 11 AND requires work below OHW of the stream itself?	☐	☐	
9. Located within Zone 11 but requires work on a tributary or on a road that drains into the stream?	☐	☐	
10. Located within Zone 15 AND requires work below OHW during April to June?	☐	☐	
11. Located within Zone 16 AND requires work below OHW during Sept to February?	☐	☐	
12. Located within Zone 17 AND requires work below OHW?			
13. Located within Zone 19?	☐	☐	
14. Is there a wetland impact associated with this project? (Field verify sites located within National Wetland Inventory layer)	☐	☐	
(a) Are the wetland impacts greater than or equal to 0.10 acre?	☐	☐	☐
15. Is the stream listed in WV State 401 Certification, Standard Condition 15?	☐	☐	
16. For bank stabilization, will the quantity of fill below OHW exceed one cubic yard per running foot?	☐	☐	☐
17. For bank stabilization, will the length below OHW exceed 500 linear feet?* *200 linear feet for Standard Condition 15 streams	☐	☐	☐
18. For rock gutters associated with ditch cross-pipes, will the CY of fill below OHW exceed 10 CY?	☐	☐	☐
19. Will additional right of way or easements be required?	☐	☐	
20. Do you expect this work to alter the hydraulic conditions of the stream? (i.e., increasing/decreasing flow area, altering inlet/outlet conditions, etc.)	☐	☐	
21. Is a bridge or bottomless culvert being replaced with a pipe or box culvert?	☐	☐	☐
22. If the work is near a no mowing or spraying area indicate the reason for designation.	☐	☐	
23. If fill is being placed within the 100 year floodplain has the local FEMA coordinator been notified?	☐	☐	☐

A **<u>YES</u>** answer to Level 2 Questions 1-9, 14a require submittal to Engineering Division’s E Section (DDT). A **<u>YES</u>** answer for Level 2 Questions 10-13 please refer to the Environmental Guidelines Sheet for additional steps. A **<u>YES</u>** answer to question 14 but a no to 14a please refer to the Environmental Guidelines Sheet for additional steps. If Level 2, Question 20 is answered **<u>YES</u>**, a hydraulic analysis shall be performed in accordance with the latest version of the WVDOH Drainage Manual. A survey of the delineated wetland shall be performed before Question 14 can be answered.

Comments (attach additional sheet if necessary):____

____

____

____

Have all answers of **<u>Yes</u>** on Level 1 Questions 1-5, 10-11 and 13-15 been resolved? Yes or No
If no, submit to DDE for environmental clearance and to DDT for 404/401 authorization. A **<u>Yes</u>** answer on any other Level 1 Question requires adherence to the Environmental Guidelines Table.

Reviewed by: ________________________________ Date: _______________

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 301 **RIGHT OF WAY PLAN DEVELOPMENT** *January 28, 2021* *Supersedes April 1, 2004*

POLICY FOR

RIGHT OF WAY PLAN DEVELOPMENT

April 1, 2004
Revised January 28, 2021

TABLE OF CONTENTS

10. GENERAL:

10.1 Introduction: Right of way plan(s) are used by engineers, attorneys, appraisers, negotiators, and are presented to property owners who are almost always lay individuals. Right of way plan(s) are **not** construction plan(s) and serve a different purpose.

10.2 Purpose: Right of Way plan(s) are used to:

a. Determine the right of way necessary to construct and maintain the highway;
b. Show property boundaries and current ownership;
c. Show existing and proposed ingress and egress;
d. Determine the value of the acquisition;
e. Write the necessary descriptions, and;
f. Negotiate and acquire the necessary right of way.

10.3 Process:

10.3.1 Determine Boundaries and Ownership: The location is set for the proposed project and the project area is mapped. Preliminary right of way limits are established to determine areas for acquisition. The ownership and boundaries of these areas are determined from courthouse records, field evidence and interviews.

10.3.2 Right of Way Questionnaires: Each affected property owner is interviewed and a completed right of way questionnaire is obtained for each property to be acquired. This information is used to verify ownership, property lines, identify public and private utilities and improvements.

10.3.3 Develop Right of Way Plan(s): The submission and approval process that is to be followed on projects shall be one of the two processes described below and shall be determined by the Project Manager and included in the Scope of Work minutes. Development of right of way plan(s) will typically utilize one of the following submission and approval processes. The submissions will follow the approved project CPM schedule.

10.3.3.1 Typical Process: This process involves the separate submission, review, and approval of RW-1, RW-2, RW-3 and RW-4 plan(s) as described below and in Section 40 of this design directive. The "Typical Process" shall be utilized on all projects unless approval is given by the Project Manager to utilize the "Alternate Process." The "Typical Process" shall be utilized on all projects where there are anticipated involvement of more than five (5) real estate parcels or it can reasonably be expected that design revisions may occur during early phases of the plan development regardless of the number of anticipated real estate parcels.

10.3.3.2 Alternate Process: This process involves the combining of the RW-1 and RW-2 submission per Section 40.4 of this design directive. The “Alternate Process” should not be utilized on projects involving more than five (5) real estate parcels. It should only be used on small bridge replacement or roadway improvement projects where the final alignment can be approximately predicted during the early phases of design. Multi-lane highway projects on new alignment, large bridge replacement projects, or highway projects involving new roadway would normally not utilize this process.

10.3.4 RW-1 Plan(s): The first submission of right of way plan(s) is used to review the documents of ownership, the plotting of the property lines and existing right of way. They may also be used to estimate preliminary right of way, for abstracting, and utility relocation cost and scheduling purposes. This RW-1 submission consists of the Title Sheet, Ownership and Utilities Index Sheet(s), Property Map Sheet(s), and RW-1 Plan Sheet(s). Copies of the R/W Questionnaires and supporting documents are to be included (See Section 40.2).

10.3.5 RW-2 Plan(s): This submission is used to estimate right of way and utility relocations and to review the proposed right of way and easement limits, determine the effect of the project on landowners, and to initiate abstracting. These plans consist of the contents listed above for RW-1 plan(s) plus completely developed Right of Way Plan Sheet(s), Profile Sheet(s), and Typical Section sheet(s) (See Section 40.3) and shall reflect resolution of RW-1, PFR and Slope Review.

10.3.6 RW-3 Plan(s): This submission is for appraisals, negotiations, writing descriptions and acquisition, and shall reflect resolution of all RW-2 and Final Field Review comments (See Section 40.7).

10.3.7 RW-4 Plan(s): This submission is a master set of right of way plan(s) submitted after acquisition is complete and shall reflect the acquired right of way (See Section 40.8).

20 PLAN DEVELOPMENT:

20.1 Considerations: The development of right of way plan(s) must be coordinated with and in conjunction with development of the construction plan(s). When establishing right of way limits on each project, consideration must be given to the following:

20.1.1 Right of Way Limits: Right of way lines must be set beyond the construction limits and to allow for future maintenance of the highway.

In rural areas, on major roadway projects, construction activities and equipment will require approximately 30 feet beyond the construction limits for the construction and maintenance of the slopes, ditches, culverts, fencing, etc. This distance may be reduced or increased after careful review, taking into account the nature of the terrain, the magnitude and stability of the cut or fill, drainage, and/or land value.

In an urbanized area, right of way limits shall be set so as to minimize the area to be acquired and to minimize damage to adjacent properties. Measures, to reduce right of way limits, such as the use of a temporary construction easement, realignment of fencing, etc., can often be taken to reduce right of way damages and facilitate the acquisition process.

Right of Way Division may request adjustment in the final location of right of way lines during negotiations.

20.1.2 Property Ownership and Property Lines: Existing property ownership, property lines and areas must be established from courthouse records, deeds or wills of record, aerial maps, subdivision maps, surveys and plats, and information obtained from field evidence and the Right of Way Questionnaire.

20.1.2.1 Tax Maps: Tax maps may be used only in design and reconnaissance reports and as an aid in the development of the right of way plan(s).

20.1.2.2 Titleholders, Deed and Will Information: It is absolutely necessary that the name(s) of the titleholder(s), and deed book and page number of the full interest owner(s) be correctly determined for each parcel. Deed and/or will research must be performed for all properties affected by the project. The deed for each parcel is obtained and plotted to establish property lines. The project parcel number is to be shown in a circle in the upper right corner of each deed. It is necessary to research previous deeds until a plotable description is obtained. If a plotable description is not available the designer shall prepare a “Property Line Discrepancy Report” per Section 40.2(c) of this directive.

If property has been distributed by virtue of a will, it is also necessary to obtain a copy of the last recorded source deed with a full interest in the property. During the development of the plan(s), land transfers are to be current (within 6 months) at the time of the initial submission of RW-3 plan(s). Later revisions, due to land transfers, may be requested by Right of Way Division.

20.1.2.3 Right of Way Questionnaire (Form 5.01): A separate Right of Way Questionnaire for each parcel is to be completed in full, based on courthouse records and an actual interview with the property owner(s), tenants, or other knowledgeable sources. For example, parcels 2-1 and 2-2 would require separate questionnaires with supporting data attached. This form is to be signed and dated by both the person being interviewed and by the interviewer. If the owner refuses to sign or provide information, state such on the form. This form is available from the Right of Way Division.

Information requested on the right of way questionnaire may be obtained from non-resident owners by telephone contact and so noted on the questionnaire. If the owner cannot be contacted, get an address (i.e.: from the tax ticket) and provide a note with the questionnaire describing all of the methods used in trying to contact the owner.

If information requested on the questionnaire is not applicable, place “N/A” on that line to indicate that it has not been overlooked. Do not use “N/A” to indicate that the information is unknown.

While obtaining these questionnaires, the interviewer shall look for and ask about property line discrepancies, storage tanks, sewage tanks, drain fields, water or gas/oil wells and lines, old graves and cemeteries on the subject or adjacent property, life estate or land contract interests, etc.

If a property is in heirship, this information must also be indicated on the questionnaire, along with a list of the heirs and addresses of each. Minor heirs, if any, shall be identified. If a property has been distributed by virtue of a will, the will book and page number must be provided, along with a reference to the last recorded deed (full interest) in the chain of title. See Section 40.2.e for additional information.

20.1.2.4 Field Evidence: A reasonable search is to be conducted in the field for any evidence of property lines or corners particularly in the area of proposed take. Such evidence, if found, is to be located by survey and identified on the plan(s).

20.1.3 Existing Improvements: An improvement is any addition to land intended to make the property more valuable and/or usable. All above and below ground improvements, within or in close proximity to, the proposed right of way limits are to be shown and clearly labeled as to type. Each improvement (dwelling, garage, barn, storage shed, storage tank, well, sewage system, etc.) must be evaluated with particular emphasis on those improvements lying in the fringe areas of construction. The Designer shall adjust the construction and right of way limits to avoid such improvements, if feasible, without jeopardizing sound design standards.

All properties that are improved with buildings that are, or could be, utilized as inhabited dwellings or commercial establishments are assumed to have all utility services and facilities until otherwise verified. These facilities could include a sanitary sewer line connection to a public sewer, a private sewage system such as a tank and drainage field, an "outhouse," or "shotgun sewer" lines. When the project construction is in close proximity to such a property, each system must be completely shown.

All underground storage tanks and all known or possible hazardous waste sites must be shown and identified on the plan(s). Avoidance of these sites shall be given full consideration in the final approval of project location. Strict adherence with "Guidelines For Identifying And Dealing With Hazardous Waste On Highway Projects" is required (See "Hazardous Waste", DD 302).

20.1.4 Potential Slide Areas: When a geotechnical report indicates an area as a "Potential Slide Area", the limits shall be shown and labeled as such. When new construction will not remove the entire critical area, consideration shall be given to the acquisition of additional area beyond the normal right of way limits, particularly if the road construction might increase the probability of slide development. If the potential slide area will not be worsened by the road construction, it should not be acquired.

20.1.5 Access Control: For projects having grade separation interchanges and/or at-grade intersections, the controlled access line is placed to include the entire interchange area, and shall be continuous throughout the entire controlled access project. The controlled access line is to be set at a minimum of 100 feet beyond the ramp radius return in urban areas and a minimum of 300 feet in rural areas.

The radius return is defined as that point on the ramp or intersection return where the radius or flare joins the tangent line of the edge of pavement of the intersecting roadway. In the case of a future widening of the intersecting roadway, the point shall be determined on the basis of the ultimate design width, even though its construction may be some years hence.

If access is to be provided under bridges or other structures, it shall be noted on the applicable plan sheet(s).

The controlled access line may be located so as to facilitate maintenance of the roadway. It is not necessary for the controlled access line to follow the right of way line or to be located so as to include all construction features.

20.1.6 Legibility: Features must be prominently displayed and easily located, including centerline, stations and offsets, property lines, parcel and tract numbers, construction limits, and existing and proposed right of way and easement lines. Plan presentation shall have weights and symbology as shown on the title sheet conventional signs.

20.2 General Specifications: A standard sheet size (22"x 34", including border area) shall be utilized on all right of way plan(s). The plan sheet(s) shall be in accordance with the WVDOH Engineering Division C.A.D.D Standards, shown in the border cell library (www.wvdot.com), as cell "PLAN". A 1½" border on the left and a ½" border on all other sides is to be used.

20.3 Plan Content: Right of Way Plan(s) shall consist of, and be in the following order:

a. Title Sheet (See Section 30.1)
b. Ownership and Utilities Index (See Section 30.2)
c. Property Maps (See Section 30.3)
d. Right of Way Plan Sheets (See Section 30.4)
e. Cemetery Detail Sheet(s), if applicable (See Section 30.4.20)
f. Reference Point Sheet (See Section 30.7) (If available) Including Survey Marker Table
g. Geometric Layout Sheet (If available) (See Section 30.8)
h. Typical Sections (See Section 30.6)
i. Profile sheets, including detours, side roads, driveways, etc. (See Section 30.5)

20.4 Plan Limits: On all projects, additional features outside the project limits, consistent with the contract plan development, are to be shown on both ends of the project. Topography, such as houses, garages, existing right of way lines, roadways, utility facilities, and other improvements, along with any projected right of way lines for adjoining projects, if they are designed or currently in design but not yet constructed, shall be shown.

20.5 Project Numbers: Notes shall be placed on appropriate plan sheet(s)s indicating the construction project number and limits of work for the corresponding construction project. Right of Way Project termini and right of way project numbers for current adjacent right of way projects shall be indicated on the title sheet, property map sheet(s) and plan sheet(s).

20.6 Text: All text should be of a minimum height and weight so as to be legible when half-size copies of plan(s) are used in condemnation proceedings and when requested by Project Managers. Text should not be upside down or on top of other text or topography.

20.7 Submission/Revision Date: All sheets shall have the submission/revision date indicated near the lower left border.

30 RIGHT OF WAY PLAN CONTENT:

30.1 Title Sheet: The title sheet shall be in accordance with the CADD cell "RTITLE".

30.1.1. Contents: The Title Sheet shall contain the following:

1. Standard Title Block
2. Project Identification Block
3. State District Map with respective county hatched, not shaded
4. State & Federal Project Numbers (inside lower left border of sheet(s) and center top, and Project Identification Block).
5. Executive Secretary Certification Block with State and Federal Project Numbers and Department Signature Block (See current DD-702)
6. Route Numbers and Type
7. Tax District or Corporation and County Name
8. Project Limits, R/W Project Limits and Construction Contract Section Limits
9. Type of Right of Way Plan Submission (under State District Map)
10. Vicinity Map from the WVDOH County Maps (Project Location and Extents)
11. List of <u>public</u> utilities and railroads encountered (See current DD-303)
12. Layout Map with North Arrow, graphic scale, plan sheet(s) outline, and Right of Way Project Termini
13. Controlled Access Note, if applicable
14. Index to Sheets
15. Revision Block
16. Consultants Seal Block sealed by a PE registered in West Virginia, if applicable
17. Horizontal and Vertical Scale and Conventional Signs Legend
18. Submission date (Outside lower left corner)
19. Design Designation Block

30.1.2 Public Utilities: Indicate the type of service provided, in parenthesis, after the name. Example: Ridge Public Service District (Water).

30.1.3 Layout Map: The layout map shall show existing and proposed road alignments with the superimposed project centerline showing the relative sheet coverage by sheet number. All roads are to be labeled with names and route numbers, with directional arrows to the nearest community or intersecting routes. Include streams, corporation, county, state lines, right of way and construction project numbers and work limits, railways, and large industrial or commercial structures and plazas and Right of Way Project Termini.

30.1.4 Controlled Access Note: All projects with controlled access or partially controlled access shall define the locations of access on the title sheet of the Right of Way and Construction Plan(s). A "Fully Controlled Access Project" shall include a note on the title sheet stating the following: "This project is a fully controlled access facility with only vehicular access allowed as shown in these plans." "A Partially Controlled Access Project" shall have a note on the title sheet stating the following: "This project is a partially controlled access facility with access allowed only at the following locations: Sta____ Lt, Sta ____ Rt, etc."

30.2 Ownership & Utilities Index: The Ownership and Utilities Index must be in accordance with the CADD cell "OWNER".

30.2.1 Names of Titleholders: Correct spelling of each property owner's names is imperative. Use the name and spelling of the name as shown in the deed when different spellings appear on other documents. Revisions will then be made if corrections are later found. Holders of Land Contracts or Life Estates are to be included in the Ownership Index.

30.2.2 Parcel Numbers: An individual parcel number shall be assigned to each property to be acquired and to each private utility. Parcel numbers may not be changed or reassigned once they have been assigned, or reused if deleted. The parcels shall be numbered consecutively, starting with Number 1, and shall be placed in the index in numerical order. No Parcel Numbers are to be reserved for future use.

Property under the same ownership must meet all three of the following conditions before a single parcel number is assigned to the entire property: (1) Same Ownership, (2) Same Use, and (3) Contiguity. Noncontiguous parcels having the same ownership shall be identified with the same parcel number utilizing a numerical suffix. Examples of this are: 1-1, 1-2, 1-3, 2-1, 2-2, etc. <u>**NOTE**</u>: Existing highway or railroad right of way will separate a property into noncontiguous parcels.

Deleted parcels are to remain on the Ownership Index, Property Map and Plan Sheet(s) for information only. A horizontal line is to be drawn through the parcel number, name, areas of take removed, and "No Take" entered in the

"Remarks" column. A line is also to be drawn though the parcel number on the Property Map(s) and Plan Sheet(s).

30.2.3 Tract Numbers: Tract number shall be assigned numerically for each parcel from which more than one tract of land is to be acquired. The tract numbers must begin a new for each individual parcel and are assigned consecutively in accordance with the type of acquisition, by priority; i.e., controlled access, noncontrolled access, permanent easements, and temporary easements. All tract numbers shall be complete for each classification before moving to the next classification (Example: Controlled Access – Tracts 1, 2, and 3; Noncontrolled Access – Tracts 4 and 5; Permanent Drainage Easement – Tracts 6 and 7; Permanent Ponding Easement – Tracts 8 and 9; Temporary Construction Easement – Tracts 10 and 11, etc).

30.2.4 Recording Data: Deed and/or Will Book Numbers and Page Numbers must be shown in the "Recorded" column, with the appropriate references all the way back to the deed which conveys a full interest in the title. If a will has a codicil, show its Book Number and Page Number.

Only the current ownership deeds and/or wills, etc. are to be shown on the ownership index. Deeds involved as part of the chain of ownership are to be attached to the back of the deed and questionnaire.

30.2.5 Type of Take: Columns for indicating the area and type of take are provided for "Controlled Access" right of way, and "Noncontrolled Access" right of way. The "Easement" column has subheadings for "Type" and "Area".

30.2.6 Easements: All easements shall be identified in the Ownership Index as to type. Various types of easements and their use are discussed more fully in Section 30.4.4 below.

30.2.7 Areas: The areas of the various tracts to be acquired shall be shown on the Ownership Index in the appropriate column. Areas must be completed for all right of way takes and easements. "Remaining Left", "Remaining Right", "Total Remaining", "Total Taken", and "Parcel Total" are to be shown on the top line of the parcel listing.

Areas less than one (1) acre shall be shown in square feet, rounded to the nearest square foot. Areas one (1) acre or more, shall be shown in acres, to the nearest one-hundredth acre. All parcels in urban areas and defined lots in subdivided areas shall show calculated areas in square feet. If a parcel consists of tracts with take areas of both more and less than one acre, dual units (acres and square feet) are to be shown for each area of less than one (1) acre.

All permanent easement areas excluding Permanent Aerial Easements will be included in the “Total Taken” column. Temporary easement areas are **not** to be included in the “Total Taken” column. If any portion or all of a residual area will be landlocked after construction, a note “Landlocked” shall be added in the Remarks Column.

The “Parcel Total” should, if possible, show the deed area. If the calculated total area is significantly different than the recorded deed area, use the calculated area and show the deed area in the “Remarks” Column, along with an explanation. For a parcel with an area greater than one acre do not show the parcel total in square feet unless shown in the deed.

All areas of acquisition from any agency of the Federal Government shall be the result of a computer calculation or by actual closed survey (See Section 30.4.21).

For noncontiguous parcels, the area shall be calculated and the deed area shall be shown in the remarks column.

30.2.8 Uneconomic Remnants: Small remnants with little apparent value are to be included in the right of way to be acquired. When the value of a remnant is in doubt, a determination as to declaring it “uneconomic” will be made by Right of Way Division.

30.2.9 Utility Index - Public Utilities: All “public” utilities encountered by the project shall be listed on the Utilities Index by correct company legal name, type and size and location of facility, with station/offset and sheet(s) number. The disposition of the utility when clearly known is to be listed and updated as needed, i.e.: “To be relocated by owner”, “To be abandoned in place”, “To remain in service”, “To be relocated by DOH”, etc.

To determine whether or not a particular company is a public utility, refer to www.wvdot.com, or call the Railroad and Utilities Section of Right of Way Division for determination.

30.2.10 Private Utilities: All other utilities are considered to be private and include private transmission lines, service lines, TV cable lines, oil and gas wells, etc. Private utilities are not to be listed in the Utilities Index. A private utility shall be assigned a parcel number and be listed in the Ownership Index, and no areas of take will be shown. A note in the Remarks column shall identify the type of improvement involved. Private utilities under the same ownership as the involved parcel of real estate, will use the same parcel number, differentiating it by the use of a letter suffix, i.e., Parcels 14-A, 14-B, 21-A, 21-B, etc.

30.2.11 Private Water and/or Sewer Lines: Partial acquisitions shall be carefully reviewed to ascertain whether private water and/or sewage systems will be taken. Water wells and sewage systems will not be allowed to remain inside areas of proposed right of way.

30.2.12 Billboards: Each affected billboard is to be identified by owner and permit number. This information should be on the tag attached to the billboard. A note shall be provided on the Right of Way questionnaire if no information tag is found. Billboards are to be assigned a parcel number, which is the underlying owner's parcel number plus an alpha suffix, i.e., Parcel 13-A, Parcel 24-A.

30.2.13 Railroads: Right of way or easements to be acquired from railroads are to be identified with a parcel number and listed in the Ownership Index.

30.2.14 Public Land Corporation: When the centerline of a project crosses over a stream, the Public Land Corporation (PLC) is to be shown as the titleholder on the Ownership Index. Types and areas of take are to be shown, however, no deed reference is given. The name of the affected stream is placed in the "Remarks" column. See Section 30.4.18.

30.3 Property Maps:

30.3.1 Property Map Sheet(s)s: These sheets must show a north arrow, proposed centerlines, route numbers and names of all existing streets and roads and other topographic features, existing and proposed right of way lines, easements of record, entire property boundaries, project parcel and tract numbers(not tax parcel number), major structures, proposed major drainage, existing utility transmission lines (above and below ground), cemeteries, and other topographic features. Each right of way line must be labeled frequently enough to clearly delineate the type of line. The project manager may require the major contours to be shown.

All underground storage tanks and potential hazardous waste sites located within or in close proximity to the existing and/or proposed right of way lines shall be shown. Matching property map sheet(s) numbers and stations are to be shown outside the matchlines. The property maps must be complete and include all corrections and comments presented at field and office reviews. Property Maps may be combined with the Ownership Index on small projects.

All existing right of way shall provide a reference of their source, i.e., "Project Number", statutory right of way, etc. as determined by existing plan(s) and records.

30.3.2 Parcels: The entirety of all parcels affected by the project are to be shown on the property maps, with the appropriate parcel and tract numbers affixed.

Deed tract numbers are to be shown in parenthesis. Names or deed references are not to be shown on the property maps, unless the property involves the U.S. Government.

For those parcels that are too large to show the entirety on a property map, an inset or supplemental sheet(s), at an appropriate indicated scale, must be utilized showing the parcel in its entirety. When using an inset, include properly labeled match or inset lines. If the scale does not facilitate labeling each property line, use a table format to list the property line information. Supplemental inset sheets are to be placed at the end of the Property Maps.

30.3.3 Property Lines: Property lines shall be labeled on the inside of the applicable property line, with deed bearings and distances shown in parentheses for each line. Use a land hook (land tie) symbol to identify interior deed tract lines. If records do not indicate metes and bounds, the distance along the property line shall be scaled, labeled, and indicated as such by adding the letter "(s)", (in parenthesis), after the scaled distance. A calculated or project bearing shall not be shown. If deed distance is significantly different than scaled distance, show both the deed and scaled distances.

30.3.4 Existing Features: Existing features include the following:

1) North arrow.
2) Private and public roads, streets, and alleys with identifying names and route numbers.
3) Existing right of way and easement lines for all roadways, utilities and private right of ways.
4) Access to all parcels.
5) Directional arrows, with distance to the nearest city, town or major route at each end of the project and/or existing road.
6) Bridges and major drainage.
7) Railroads with names, valuation centerlines, stationing, and right of way lines.
8) Corporation and tax district lines and names.
9) Streams with names and flow arrows.
10) Subdivisions with name, bearing and distances (in parenthesis), block numbers, street and road names, lot lines, lot numbers and lot dimensions.
11) Public utility and major private utility transmission lines with company name and type of facility.
12) Deep mines, surface mines and mine roads, including mine entrances and air shafts.
13) Entire property boundary lines of each parcel with property line symbols, deed tract numbers (in parenthesis), and deed bearings and distances (in parenthesis).

14) Land ties on interior deed tract lines.
15) Gas, oil and salt wells and lines along with owner's names and American Petroleum Institute (API) well tag number.
16) Outlines of structures (residential, commercial, schools, churches and public buildings).
17) Cemeteries.

30.3.5 Proposed Construction Features: Include the following:

1) Project centerline or baseline of all access roads, frontage roads, connector roads and temporary detours, with names.
2) Stationing labeled at 500 feet intervals, with 100 feet tic marks.
3) Right of Way project limits with stations.
4) Project Limits, R/W Project Limits and Construction Contract Section Limits
5) Parcel and tract numbers for all property to be acquired, with landlocked residues labeled.
6) Stream relocations or channel changes.
7) Structures such as bridges, major drainage structures, culverts, retaining walls, etc.
8) Proposed controlled access, noncontrolled access, permanent drainage easement, temporary construction easement, temporary structure removal easement lines, etc., with labels.
9) Label any road to be terminated or abandoned as such.
10) Show all proposed access points.

30.3.6 Landlocked Areas: On controlled access projects, all residual areas for which no vehicular or pedestrian access is provided shall be identified as "landlocked". This shall only be done if the residual area was landlocked as a result of activity of the road project.

On non-controlled access projects where restoring vehicular access is impractical, a note shall be added to the ownership index, property map(s) and plan(s), "No vehicular access provided".

Resident areas accessible by public roads other than the proposed project, should not be identified as "Landlocked".

30.3.7 Subdivisions: All recorded subdivisions will be shown, complete with the name of the subdivision, street names, alleys, block numbers and lot numbers. If the involved streets are privately owned, a parcel number must be assigned and a titleholder identified. Lot numbers shall be shown in parenthesis to differentiate them from parcel numbers. Three (3) copies of each subdivision map are to be included with the RW-1 submission.

30.4 Right of Way Plan Sheet(s): The right of way plan sheet(s) may be a duplicate of the construction plan sheet(s) with the addition of the required parcel, tract and property line information. However, it may be necessary to turn off certain layers of construction specific information in order to make the right of way plan(s) legible. Contours are to be screened. Matchline stations and sheet(s) numbers are to be shown on each sheet.

30.4.1 Centerline: The centerline or baseline layout shall be identical to that shown on the construction plan(s). All tangent portions of the centerline shall be identified with a bearing and all curve geometry shall be readily visible on each plan sheet(s). Stations should progress from West to East and/or from South to North, and match exactly those shown on the construction plan(s).

All station equations and the P.I., P.C., P.T., T.S., S.C., C.S., and S.T., etc. of each curve shall be shown. Curves are to be labeled on each sheet in which it appears on the inside of the curve. The centerline of new construction is to be designated as project centerline.

Beginning and Ending stations shall be shown for the Right of Way, Construction and/or Work. These stations should be at the furthest reaches of right of way along the centerline for stand-alone projects. For abutting projects, the right of way project limits will be at the centerline, preferably on a property line crossing, to avoid overlaps and gaps.

30.4.2 Construction Limits: The cut and fill slopes, as designated on the construction plan(s) with standard symbols, are to be reproduced identically on the right of way plan sheet(s).

30.4.3 Right of Way Lines: Existing right of way lines are to be screened. All screened features must be legible. Plans with illegible features may be rejected. The proposed right of way lines shall be placed outside the construction limits, as indicated in Section 20.1.1. All existing and proposed right of way labels shall be shown on the inside of the line.

Proposed right of way lines (controlled or noncontrolled) shall consist of a series of tangent lines having directional changes when necessary to avoid excess acquisition. In establishing the breakpoints of the tangent right of way lines, consideration shall be given to the value of the property versus other factors which may be involved (See Section 20.1.1).

Each breakpoint or change in direction of the right of way lines (controlled and non-controlled access) or easement lines shall be identified by station and offset distance, and both set to the nearest foot. Since this information is subject to change, it is not required on RW-1 submissions. Right of Way markers may also not be shown on RW-1 submissions.

When an interest in railroad property is to be acquired, each highway station and offset must be equated to the railroad valuation station and offset distance. The actual railroad valuation centerline, with stationing, must be shown throughout the immediate area of involvement.

30.4.4 Easements: The future needs of the Division of Highways shall be considered: first, by covering all permanent construction areas with right of way, and then, by utilizing easements, permanent and/or temporary, where additional areas are necessary for a specific use.

All easements shall be identified on the plan sheet(s) as to tract number and type. The reason for the necessity of the easement must be clearly shown on the plan(s).

A **permanent easement** is defined as an area that is necessary for future maintenance of the highway and, in most cases, a permanent change will be made to the topographic features.

A **temporary easement** is an area that will be used for a limited period of time during construction, and no future maintenance in, or access to, that area will be required. The topographical features of a temporary easement are to be returned, as nearly as possible, to their original condition.

Examples and descriptions of typical easements acquired are as follows:

Permanent Drainage Easement (PDE): An area, outside normal right of way, where entry upon the land may be required from time to time to maintain or clean the pipe, ditch, channel, etc. The surface owner cannot construct any structure within this area that may affect the free flow of the water or ponding water.

Permanent Ponding Easement (PPE): An area, outside normal right of way, on the upstream end of a drainage structure, where ponding of water may occur during storms. Limits will be determined by the high water contour, as applicable. There are no provisions for entry on the land, just ponding of water.

Permanent Aerial Easement (PAE): Provides for the construction and maintenance of a structure above the owner's land, while allowing the owner to utilize the land under the structure in any manner that does not interfere with the functioning of the structure. A PAE provides no surface rights. This easement is frequently used at grade separations with a railroad. PAE's are NOT included in the Total Taken column.

Permanent Crossing Easement (PCE): Normally used only with railroads, this easement provides permission for a highway to cross a railroad right of way with an at-grade intersection.

Permanent Roadway Easement (PRE): Provides for construction and maintenance of a roadway and supporting structure on owner's land, while not obtaining full right of way. This type of easement is common when a roadway or embankment is located on railway property and the railway desires to grant permission for the roadway without disposing of the land.

Temporary Construction Easement (TCE): Provides work area for the temporary use of land outside normal right of way that is necessary for construction of the project. The use of this land will be for a specific time period and the purpose of the TCE must be clearly shown on the plan(s). Permanent grading changes are **not** normally performed on areas acquired as TCE.

Temporary Structure Removal Easement (TSRE): This easement provides a temporary work area for the necessary removal of a structure that is partially outside the right of way limits. No other work is to be proposed within this easement.

30.4.5 Parcels and Tract Numbers: All parcels affected by the project are to be shown on the right of way plan sheet(s), with parcel numbers and tract numbers. Names or deed references are not to be shown on the property, unless the acquisition involves an agency of the U.S. Government.

30.4.6 Property Lines: Each property line shall be labeled, with deed bearings and distances shown in parenthesis, inside the applicable property line. If records do not include metes and bounds descriptions, the distances along the property lines shall be scaled, labeled, and indicated as such by adding the letter "(s)", in parenthesis, after the scaled distance. All found field evidence for property lines and corners shall be shown and labeled.

If a property line described in a deed follows the center of a road, or crosses or enters existing right of way, the property line should be terminated at the existing right of way.

Property line intersections with existing or proposed right of way lines or easement lines are to be identified and labeled by station and offset, set to the nearest foot. Only those points necessary to describe the property to be acquired need to be labeled.

Station and offset labeling of all points and lines should be clearly placed in an area where other text or symbols do not interfere with the legibility of the data. Station and offset labels should be located on the same side of the road as the point and labeled horizontally in the order of occurrence.

30.4.7 Subdivisions: All recorded subdivisions must be shown. Information to be shown includes name of the subdivision, street names, alleys, block numbers, lot numbers, etc. Lot lines, not designated as property lines, must be shown with a "land tie" designation in lieu of property line symbology. The deed bearing and distance of each lot line is to be shown in parenthesis, inside each property line. Lot numbers shall be shown in parentheses to differentiate them from parcel numbers. Special diligence is required for the determination of ownership of the streets, which may be owned by a homeowners association. If such is the case, a parcel number shall be assigned to the street.

30.4.8 Existing Features: All existing above and below ground topography that may affect the value of a property shall be shown on the right of way plan sheet(s). These features include all those existing features listed under Property Maps (Section 30.3.4), plus the following:

1) Dwellings, barns, sheds, outbuildings, commercial buildings, industrial buildings and conveyors, walls, wells, etc. along with a label indicating type of structure and use.
2) Edge of roads, driveways, trails and parking lots labeled with type of surface.
3) Property corner monuments (iron pins, concrete, etc.) and deed tract and/or lot numbers (in parenthesis).
4) Screened contour lines.
5) Forested areas.
6) Major trees and shrubs with size and name.
7) Sewage systems and sanitary sewer service mains and size.
8) Septic tank and drain or leach field.
9) Utility transmission and distribution lines, with company ID numbers (See section 30.4.10).
10) Satellite dish antenna.
11) Parcel number for each private utility.
12) Bridges, culverts, and retaining walls.
13) Playgrounds and equipment.
14) Potential hazardous material or sites and type.
15) Fences and retaining walls.
16) Advertising signs. Show owner(s) name and permit ID number.
17) Private improvements within existing right of way are to be labeled "Encroachment" and "To Remain" or "To Be Removed".

30.4.9 Underground Storage Tanks and Hazardous Waste Facilities: Special attention is called to underground storage facilities since it is imperative that these improvements be shown on the plan(s) to allow consideration of their value during preparation of appraisals. All underground storage tanks must be shown and identified as to the size, type and material stored therein, to allow timely testing of the immediate area for leakage and the identification of hazardous wastes. For specific guidelines see “Hazardous Waste”, DD 302.

30.4.10 Utilities: The type, size, location, and company name and identification numbers of all private and public utilities, including service lines, which may be affected by project construction, are to be shown on the plan(s). Include those utilities providing service that lie in close proximity to the project right of way limits, but from which no acquisition is necessary. In the case of total takings in built-up areas, where it is obvious that all properties have full utility service, a note stating this fact may be used in lieu of placing the individual lines on the plan(s). Utilities located within easements or rights of way shall be shown along with the defined easement or right of way limits.

Properties not served by a public water supply may have water wells or springs as their sole source of water. These wells or springs, including any pumps and associated service lines, must be located and shown on the plan(s).

The disposition of utility transmission and distribution lines shall be specifically shown for each location. Use notes indicating disposition of the facility (Not required for RW-1 submissions), such as the following:

1) To be relocated by owner
2) To remain in service
3) To be abandoned in place
4) To be relocated by DOH

30.4.11 Proposed Construction Features: Proposed construction features will include all those listed under Property Maps (Section 30.3.5), plus the following:

1) Construction limits labeled cut (- C -) or fill (- F -).
2) Geometric curve data, centerline bearings and equations.
3) Label all P.I., P.C., P.T., T.S., S.C., C.S., S.T., Etc.
4) Label centerlines and baselines to match construction plan(s).
5) Station and offset, to the nearest foot, for each corner or break in the right of way and easement lines.
6) Right of Way markers and fencing.
7) Demolition item numbers on all structures taken.
8) Pavement, curbs, sidewalks, drop curbs.
9) Sedimentation control ponds.
10) Drainage with type, size, length, flow direction and invert elevations.
11) Drop inlets, manholes, etc.
12) Ditches and channel changes with flow arrows.
13) Vehicle turnarounds.
14) High water contour, as applicable.

15) Major temporary features that are to be removed (such as sediment basins, temporary construction features, etc.) label “To Be Removed”.

30.4.12 Proposed Structures: All proposed structures, such as bridges, culverts, pipes, guardrail, lighting, etc., are to be indicated on the plan(s) to provide the appraiser with relevant information for determination of value. Appropriate high water elevation contours are to be shown for major drainage backwater.

30.4.13 Demolition Numbers: See DD 709 "Numbering of Buildings, Septic Tanks, Wells or other structures” for assigning an identification number to buildings, wells, septic tanks and other structures.

30.4.14 Sidewalks: In an urban area where a sidewalk is to be constructed as a part of the highway facility, careful consideration shall be given to the placement of the right of way line. If minimal change in the ground line topography is made, the right of way line may be placed two feet back of the sidewalk with adequate temporary construction easement shown beyond that line to allow sufficient room to construct the project. If significant changes are to be made on a permanent basis, then a normal placement of the right of way line outside the construction limits shall be made. The placement of all easements and/or right of way lines in urban areas shall be the result of a prudent study, giving consideration to an elevated land value as well as damages that may occur to the smaller urban properties.

30.4.15 Fencing: Where fencing is included in the construction plan(s), it must also be shown in the right of way plan(s). Generally, the fence will run parallel with, and one foot inside, the controlled access line. Refer to the current “Fencing Controlled Access Highways”, DD 309, for specific criteria.

30.4.16 Right of Way Markers: Right of way markers are required whether or not fencing is used and shall be shown on the right of way plan sheet(s) at the outermost corners of the proposed right of way lines. For example, if a right of way line is outside a controlled access line, only the right of way (or outermost) line will be monumented. Marker locations shall be indicated by the right of way marker symbol, as shown in the DOH symbol library as “RWM”. Markers shall not be placed where physically impractical, such as on steep bluffs, in streambeds, etc. Markers are not required at the corners of permanent or temporary easements.

30.4.17 Railroad Property Acquisition: Railroad valuation centerline, with stationing, must be shown throughout the area of involvement. Each highway station and offset must be equated to the railroad valuation station and offset for points on the railroad parcel. If the area includes an existing railroad crossing or bridge, show the DOT Number. All surface drainage shall be shown as “Permanent Drainage Easement”, and the area included in the “Total Taken” column. When establishing proposed right of way lines, within existing railroad right of way, the designer shall coordinate with the Railroad and Utilities Section of Right of Way Division concerning location and type of acquisition.

If a crossing exists, indicate the DOT number. The DOT number is on the signals or cross bucks for at grade crossings and for grade separation structures it can be found on the Bridge Inspection Report or by contacting the Railroad and Utilities Section of Right of Way Division.

30.4.17.1 Railroad Grade Separations: The area of the Permanent Aerial Easement shall **not** be included in the "Total Taken" columns of the Ownership Index. Surface drainage shall be shown beneath the aerial easement as "Permanent Drainage Easement", and the area included in the "Total Taken" column. All other permanent areas of right of way and/or easement shall be included in the "Total Taken" column. Piers and abutments shall be located on a permanent take.

On all controlled access projects involving railroad grade separations, the controlled access line will be carried across the railroad right of way and will be designated and marked as follows: "Controlled access line – aerial easement subject to railroad right of way."

30.4.17.2 Railroad Grade Crossings: The area of the "Permanent Crossing Easement" is to be included in the "Total Taken" column. Only the area of proposed PCE should be included in the "Total Taken" column. Existing PCE should not be included.

30.4.18 Public Land Corporation: When right of way is obtained from an owner, on whose property is located a navigable, floatable, or named stream, an additional acquisition is required from the Public Land Corporation (PLC). The surface owner holds the interest in the surface, while the PLC hold the interest in the streambed. The streambed is normally defined by the normal pool elevation. The common area is to be included in both the PLC take and the surface owner's take, and will have two (2) parcel numbers assigned: one (1) for the surface owner and one (1) for the PLC.

The PLC acts as the titleholder of the beds and all the material beneath them for all navigable or floatable waters within West Virginia. PLC is the agency which provides right of entry or a right of way agreement for all construction activity in a stream.

When any roadway centerline of a project crosses over a stream, the PLC is to be shown as the titleholder on the Ownership Index. The existing stream area, located within the proposed right of way, is generally included.

The area over the stream is shown as “Permanent Easement” and any temporary take is shown as “Temporary Easement”. Each type of take is to be shown on the appropriate plan sheet(s) by a different hatch pattern, and indicated on the sheet(s) by a legend identifying the Parcel Number, Public Land Corporation, and the type of take.

PLC easements are not required for areas within existing right of way.

30.4.19 Special Design Features: All items, not heretofore mentioned, which may affect negotiations with the property owner(s) or which may have a direct effect on the market value of the property to be acquired, shall be indicated on the plan(s). Such items may be walls, steps, etc., that are to be replaced or reconstructed as a part of the project.

30.4.20 Cemeteries: Every reasonable effort should be made to avoid cemeteries. All cemeteries, whether public or private, shall be shown, with the name of the cemetery, on the right of way plan sheet(s) and the property maps. A Cemetery Detail Sheet(s) (CADD Standards cell “CEMTRY”) See Section 20.2 shall be added to the plan(s), following the Right of Way Plan sheet(s). The cemetery location as shown on the property maps and plan sheet(s) will be identified by the cemetery name and be tied by survey to the project centerline. A note will be added referencing the plan reader to a specific sheet(s) in the set of plan(s) for a detail of the cemetery itself. This detail or individual plan of the cemetery will show the actual cemetery boundary and its relationship to the project centerline, construction limits and right of way lines. Temporary exhumation easements shall be shown if the right of way line divides cemetery plots and leaves parts of graves outside the take area, but still necessary for relocation.

A number shall be assigned to all existing graves that shall be located by survey and identified on the plan, complete with headstone and/or footstone. If no stones are in evidence, the gravesite itself shall be shown without identifying markers. In established cemeteries with burial lot layouts, all grave lots will be numbered according to the recorded maps regardless of whether it is occupied or not. The improvements around the cemeteries, such as fencing, walls, flag poles, etc., shall also be shown. Roadways, walkways, etc., will be included in the layout. The cemetery perimeter will be accurately located and shown on the plan(s). If the cemetery is suspect of having unmarked graves, a complete matrix probe, using a five-foot matrix interval or grid, of the cemetery and immediate surrounding area is to be performed.

For cemeteries with undefined perimeters, a cemetery limit line shall be set around the entire cemetery to allow proper documents to be prepared through eminent domain procedures to grant right of entry to the cemetery for matrix probe as well as exhumation purposes.

All known and unknown gravesites are to be numbered consecutively and shown on the detail cemetery layout. These numbers will also appear on an Interment Index (See CADD standards cell "CEMTRY") See Section 20.2, complete with an identification of each decedent. The complete name of the decedent is necessary. If unknown, it shall be so noted. Intensive research shall be made to identify all unknown decedents. In addition, the Interment Index shall provide necessary columns for reinterment data for each grave, including columns for the name of the reinterment cemetery, location of the cemetery, date of reinterment, lot, block, section numbers, etc., also shown by sketch, or stated to be of record and where found. Samples of these indices are available in the Right of Way Division. Right of Way Division must be provided with all documentation of the research and findings for each cemetery, including copies of work diaries verifying efforts to identify unknown decedents. The survey books locating all graves shall also be submitted with the RW-3 tracings.

30.4.21 Federal Lands: Projects requiring the acquisition of right of way from an agency of the U.S. Government shall portray that proposed acquisition by procedures as outlined in the Federal-aid Policy Guide. These procedures include, but are not limited to, the requirement of providing bearings and distances for the entire area to be acquired, whether right of way or easement. State Plane Coordinates may be required for all corners. Examples of U.S. agencies are U.S. Forest Service, U.S. Corps of Engineers, U.S. Department of Interior, etc.

30.5 Profile Sheet(s)s: Profile sheet(s) shall be provided for all proposed mainline, detours, connector roads, frontage roads, access roads, relocated roads, driveways, bridges, etc. Profiles for bridges will show the abutments and piers and include the clearance information.

30.6 Typical Sections: Typical section sheet(s) shall be provided for the proposed mainline, detours, connector roads, frontage roads, access roads, relocated roads, driveways, etc.

30.7 Reference Point Sheet(s): Reference Point Sheet(s) shall be provided to allow layout of the centerline, and Right of Way Limits.

30.8 Geometric Layout Sheet(s): Geometric Layout Sheet(s), from the construction plan(s), shall be provided to aid in the layout of the Right of Way.

30.9 Cross Sections: Cross sections are not a formal part of right of way plan(s) but prints are required with the RW-3 submission. See DD-202 for distribution.

40 SUBMISSION OF PLAN(S):

40.1 Submission Distribution: Submissions shall be in accordance with the "Plan Distribution Schedule" of the current design directive "Field And Office Reviews For Initial Engineering And Final Design", DD 202,

40.2 RW-1 Plan(s): This submission is to be made as shown on the approved project CPM and as soon as the information below is assembled by the Designer. It normally occurs prior to the Preliminary Field Review. The submission may be requested in a roll format. All supporting documents shall be labeled with the state project number.

The following information shall be provided as a minimum:

a. **Title Sheet(s):** Showing project numbers, project name, layout map, latest signature block, and list of public utilities and railroads involved.

b. **Ownership and Utilities Index:** Include all parcel numbers, names of owners, deed or will references, and only "Parcel Total" areas are required.

c. **Property Maps:** Refer to Section 30.3, for required content. The proposed right of way lines shall be shown based upon the best information available at the time of submission. A Property Line Discrepancy Report is to be prepared when there are significant gaps and overlaps in property lines. The report should show how these discrepancies were resolved. Problems are to be identified, and the method of resolution presented. Information submitted should include weight given to conflicting evidence, and work plots of each parcel plotted per deed with **NO** adjustments are to be a part of the report.

d. **RW-1 Plan Sheet(s):** The proposed Right of Way plan sheet(s) shall be provided with the following information.

- Existing Property Lines
- Existing Right of Way Lines
- Existing Topographic and Physical Features
- Preliminary Roadway Centerline with stations shown
- Major Contours

e. **Right of Way Questionnaire and Supporting Documents:** Three (3) separate sets of the Right of Way questionnaire and deeds/wills (current within 6 months), properly collated, are to be provided. Include copies of all plats or maps referenced in deeds. If a plat does not exist, make note "Not Found" on deed, adjacent to plat reference, and sign and date. All questionnaires, deeds, wills, etc., are to be submitted single side only. No double-sided documents are to be submitted.

All supporting documents sorted and attached, are to be stapled to each corresponding questionnaire. Each severed parcel, i.e., Parcel 4-1 and parcel 4-2, requires an individual questionnaire with all supporting data attached.

Three (3) copies of pertinent subdivision maps, one (1) copy of the railroad valuation maps, and one (1) full size copy of the appropriate tax map are also to be included. Include existing right of way plan(s) or documentation of the statutory right of way width, determined by existing plan(s) and records.

After review, one set of redlined (marked or highlighted) plan(s), indicating corrections and additional information needed shall be returned to the designer. No additional writing, by the designer, is to be added to these redlines plan(s). This redlined set of plan(s) is to accompany the RW-2 submission.

40.3 RW-2 Plan(s): The primary purpose of this submission is to enable the review of the right of way and easement limits the effect of the project right of way on the properties and landowners, and to initiate abstracting of the affected parcels. It is necessary to label the stations and offsets of the right of way line breaks and show right of way markers on this submission. The RW-2 submission shall be made after the slope review and in conjunction with the submission of final field review plan(s).

This submission shall be in accordance with the "Plan Distribution Schedule" of the current "Field And Office Reviews For Initial Engineering And Final Design", DD 202, and shall include the returned redlined RW-1 plan(s). These plan(s) are to be virtually complete in every detail, with the contents as listed in Section 20.3, including type and area of take, and area remaining.

The most important items on these plan(s) are the centerline(s) and baseline(s), property lines, existing and proposed right of way lines, easement lines and construction limits, proposed major drainage structures, parcel and tract numbers, and property lines. The construction limits shall be accurately depicted, and all topographic features shall be current and verified as of the specified date of submission.

After review, the comments shall be provided by the Division of Highways reviewer on one (1) set of redlined (marked) RW-2 plan(s), indicating revisions and additional information needed. No additional writing, highlighting, or marking is to be added to these redlined plan(s) by the designer. These redlined plan(s) are to be returned with the RW-3 submission

40.4 RW-1 & RW-2 Combined Plan Submission: The Project Manager may choose to combine RW-1 and RW-2 submissions into one submission. When this combined submission is requested, all of the requirements for Sections 40.2 and 40.3 must be met. Generally a combined RW-1 & RW-2 submission should not be used on large projects or projects where revisions are likely in the early phases of design. See section 10.3.3 of this design directive for further guidance on utilizing a combined RW-1 and RW-2 submission. This submission is generally made at the Preliminary Field Review however, it shall be in accordance with the approved CPM Schedule for the project.

40.5 RW-2 Revisions: After the RW-2 submission, but before the RW-3 is requested, changes that affect the number of parcels involved are to be forwarded with four (4) prints of each affected sheet(s), consisting of a new reproducible; one print highlighted in color, showing all changes since the last revision; and two clean prints. Revised sheet(s) are to be trimmed to be identical size and borders of previous submissions, and holes punched. These revisions shall be forwarded with a transmittal letter listing and explaining the parcel changes or corrections, along with three (3) sets of questionnaires and deeds for any added parcels. **After RW-2 plan(s) have been submitted, no changes in parcel numbers will be allowed.**

40.6 Advanced Acquisition Plats: These plats may be requested by Right of Way Division to acquire "hardship case" parcels. Examples of these plats and other required supporting documents are available from the Project Manager.

40.7 Whole Take Plan(s): Prior to the submission of RW-3 tracings, when it becomes obvious or apparent that a substantial number of parcels will be taken in total, a set of RW-3 reproducibles for "Whole Takes Only" for specific parcels may be requested to initiate the acquisition process. Such plan(s) shall meet all criteria and requirements as listed below for an RW-3 submission.

40.8 RW-3 Plan(s): The purpose of this submission is to enable the preparation of property descriptions, perform appraisals and begin acquisition of the right of way necessary for the project, and shall reflect the resolution of all RW-2 and final field review comments. RW-3 mylars shall be hole punched. This submission is normally made prior to the Final Office Review however, it shall be in accordance with the approved CPM Schedule for the project.

Where construction limits or right of way lines for a particular parcel are uncertain or unknown, omit the areas of take and remaining on the Ownership Index and show only the total area of the property. Place a "Hold Acquisition" note in the "Remarks Column" with the reason.

40.9 R/W-3 Revisions: RW-3 Plan revisions should be held to a minimum since the appraisal and acquisition processes will have begun. **Verify with the Project Manager whether a particular parcel has been appraised or acquired before submitting revisions.** Revisions to the RW-3 plan(s) shall contain one (1) full size mylar and ten (10) prints of each revised sheet(s); one (1) of which shall be highlighted in color, showing the changes or revisions.

All revisions shall be forwarded with a transmittal letter listing and explaining, in parcel order, the changes or corrections. Examples describing the area changes are available from the Project Manager. Revised sheet(s) are to be trimmed to be identical size and borders of previous submissions, and holes punched to match previous submissions. Inconsistent holes and sheet(s) sizes may be a cause for rejecting the submission.

When additional tract(s) are added as a revision to the RW-3 plan(s), the added tract(s) shall be placed in the proper order. The original tract numbering shall not be changed after an offer has been made to the property owner. The status of acquisition can be obtained from the Project Manager.

40.10 RW-4 Plan(s): This submission is a full size master set of mylar right of way plan(s) and shall be submitted only after acquisition is essentially complete and will reflect the acquired right of way. These plan(s) shall be identical with the working RW-3 plan(s) and the transmittal letter shall certify that these right of way plan(s) agree with the construction plan(s) in every aspect, with the exception of minor construction details. All dates previously placed along the lower left border shall be replaced with the RW-4 submission date on all sheet(s).

This submission becomes the record set of "As Acquired" right of way, and is to be a reverse image on double matte quality mylar, acceptable for archiving.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-302
HAZARDOUS WASTE
October 1, 2003

Attached is the Division of Highways policy on "Hazardous Waste". These procedures shall be used on all applicable projects.

Attachment

HAZARDOUS WASTE

The West Virginia Department of Transportation, Division of Highways has adopted "Guidelines for Identifying and Dealing with Hazardous Waste on Highway Projects." A copy of this document may be obtained from the Engineering Division.

Reference is made to the letter included as a part of the above mentioned Guidelines, dated December 4, 1989, by Mr. Fred VanKirk, Acting Commissioner - State Highway Engineer, which states the following:

> *"These Guidelines are the policy for implementing specific procedures for identifying and dealing with Hazardous Waste on Highway Projects. Directives, procedures, specifications and other documents will have to be developed for the various subjects encountered in this field."*

It will be the Designer's responsibility to become familiar with these guidelines and all directives, procedures, specifications and documents resulting therefrom on all phases of a highway project.

Certain highway projects should be submitted to the Environmental Section of the Engineering Division for a review of the following lists for potential impacts:

1. Solid waste (landfills);
2. Leaking underground storage tanks;
3. Hazardous waste generators;
4. CERCLIS (super fund sites); and
5. Registered storage tanks.

The following types of projects will normally require a Hazardous Waste list review:

1. A new controlled access freeway;
2. A highway project of four or more lanes on a new location;
3. Any highway or bridge improvement project on a new location; and
4. Any highway or bridge improvement project requiring additional right of way or easement (permanent or temporary).

The following types of projects that do not require new right of way or easements (permanent or temporary) will not normally require a hazardous waste review:

1. Pavement resurfacing, repair or joint repair, widening, and slide restoration;

2. Bridge replacement, bridge deck repair or replacement;

3. Highway safety or traffic improvement projects;

    a. Improving curbing,
    b. Removing trees, rock outcrops or boulders,
    c. Flattening or grading slopes or gore areas,
    d. Improving crossovers,
    e. Minor drainage improvements,
    f. Maintenance activities,
    g. Lighting, signing, and pavement striping,
    h. Traffic signalization, and
    i. Railroad devices and improved crossing surfaces.

4. Landscaping;

5. Utility installations;

6. Construction of bicycle and pedestrian facilities;

7. Preliminary engineering;

8. Planning activities;

9. Highway training and research;

10. Emergency relief projects (normally from flooding); and

11. Disposal and joint or limited use of excess right of way.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-303
RAILROAD AND UTILITY INVOLVEMENT
October 1, 2003

In the development of highway plans, it is necessary that coordination with utility and railroad companies be made at the earliest possible date. The attached guidelines are considered a minimum for proper coordination.

Attachments

RAILROAD AND UTILITY INVOLVEMENT

RAILROADS

A. **General**

1. Submission of plans to the railroad is to be in accordance with the current issue of DD-202.

2. This submission is to include title sheets, typical sections, plan sheets, pipe profiles and cross-sections of the areas of involvement.

3. Affected railroads are to be shown under "Utilities Encountered" on the title sheet.

B. **Special Requirements**

1. Any details such as common right of ways, pipes, inlets, pipe outlets, overhead structures, etc., are to show both highway stations and offsets and railroad valuation stations and offsets.

2. The top of rail elevations and cover over drainage structures, are to be shown on pipe profiles.

3. Where the railroad parallels the highway, all rails and drainage are to be shown on the cross-sections through areas of involvement.

4. On skewed crossings, a separate site plan showing proposed construction features may be required for the railroad to analyze plans for the placement of proposed flashing light signal masts, relay cases, battery box wells, and surface lengths.

5. Special attention should be given when redecking or repairing existing bridges along or above the railroad facilities to insure coordination of this activity with the railroad. A field review may be necessary.

UTILITIES

A. **General**

1. Plans are to be provided to all potentially affected utilities for verification of facilities as soon as they have been located on the preliminary plans.

2. Copies of all correspondence regarding utilities shall be furnished to both the Project Manager and the Utilities Section.

3. A list of the utility companies operating in West Virginia along with the names of liaison personnel is available from the Engineering Division, Utilities Section. All utilities shown on the plan sheets will be shown under "Utilities Encountered" on the title sheet.

B. **Special Requirements**

1. When developing highway or bridge plans, the following procedures shall be used for utilities:

   a. Designer will locate by field surveys, available maps or other means all existing utilities both public and private affected by the proposed facility.

   b. Designer will submit plans to each utility, showing their facilities and request their verification of ownership and approximate location. If verification is not promptly received from the utility, the Designer will renew the request.

   c. Upon receiving verification of ownership and location from a utility, the Designer will submit a request to the Utilities Section of the responsible Division, to notify the utility that preliminary engineering has been authorized. The letter from the Utilities Section of the responsible Division to the utility, will state that the Designer will submit plans to the utility to assist in the performance of preliminary engineering. A copy, sent to the Designer, will be notification that the utility has been authorized.

   d. Notify each utility promptly of any changes in construction plans which involve its facilities.

   e. Promptly review submission of the relocation plans of each utility as to the location of replaced facilities and conflict with proposed locations of other utilities or construction details.

   f. Be able to discuss all utility relocations at the final field review. Designer on any major or complicated utility relocation may request a special session the day before or the day after the final field review. A representative from the utility will be invited.

   g. Place the profile and cross-section of all utility relocations in the final plans.

   h. The Designer will furnish all interested parties with minutes of all meetings and copies of all correspondence between Designer and utility as each event occurs.

2. All existing utilities will be shown on both construction and right of way plans and profiles, and on bridge situation plans.

3. Special emphasis shall be given to the location of existing utilities in the vicinity of pier or wall footings in order that all conflicts will be obvious.

4. The disposition of all utilities shall be shown by note on the construction and right of way plans. Notes such as the following will suffice:

    a. To be relocated by the telephone company;

    b. Gas line to be abandoned; and

    c. Power lines on Spring Street will be relocated by the power company.

5. The disposition of service line information will enable the appraiser to determine the status of each property with regard to future utility service. Therefore, all service lines will be shown on the construction and right of way plans as follows:

    a. In the case of total takings in developed areas where it is obvious that all properties have full utility service, a note stating this fact may be used in lieu of placing the service lines on the plans.

    b. In the case of partial takings, all service lines are to be shown on the plans.

6. The existing right of way width for all utility lines is to be shown when a specific width exists.

7. When deemed necessary, the Utilities Section of the responsible Division will arrange a utility coordination meeting with all affected utilities. The latest set of construction plans will be submitted to the utility companies prior to this meeting.

8. Upon resolution of all matters pertaining to utility relocations and receipt of relocation plans from the utility, this information is to be added to the construction plans. The date it was made a part of the plans shall be shown on the title sheet.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-304
RAILROAD-HIGHWAY GRADE CROSSINGS
October 17, 2006

The following guidelines are to be used when a railroad-highway grade crossing is contained within a project.

1. Part 8 of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) will be used for proper traffic control devices. As a minimum, two reflectorized crossbucks will be placed.

2. The DOT Inventory Number of each crossing must be shown on the plans.

3. The signal house for the crossing should be designed and located outside the clear zone.

4. Guardrail should not be used for shielding new signals or signal house. If guardrail is required for other reasons, the signals and house will be installed behind the guardrail.

5. If the railroad-highway grade crossing is near an intersection controlled by highway traffic signals, provisions shall be made to preempt the highway traffic signals for the crossing signals.

6. Intersections should be no closer than 75 feet to a railroad-highway grade crossing. Adequate storage distance must be provided for the longest vehicle expected to use the crossing.

7. Roadway shoulders shall be carried across the railroad track without interruption. If no shoulder exists, the crossing shall extend 3 feet beyond the traveled way on each side of the road, measured perpendicular to the road.

8. Roadway drainage should not be directed onto the crossing surface or tracks. Ditches or drainage systems near the crossing must be designed to permit the crossing underdrain to outlet.

9. Roadway profile grades at the crossing should be as flat as possible, but must match the cross slope of the tracks.

10. Additional roadway drainage shall not be put in the railroad's drainage system without considering the effect on the railroad's drainage system.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-305
WATERLINE AND SANITARY SEWER RELOCATIONS
October 1, 2003

Attached for your use is the Division's policy on Waterline and Sanitary Sewer Relocations. These procedures shall be used on all applicable projects.

Attachment

WATERLINE AND SANITARY SEWER RELOCATIONS

A. STUDY PHASE

1. The Designer shall study and establish a suitable system for "Equivalent Replacement in Kind," in conjunction with the affected utility to assure that their desires and objectives of the relocation will be met.

2. In cases where the affected utility desires "Betterment" or improvement to the system beyond the "Equivalent Replacement in Kind", (i.e, Pipe Size Increase, Special Material) the "Betterments" shall be requested in writing by the affected utility through the Engineering Division, and be subject to the review and approval of the Division of Highways (DOH) prior to incorporation into contract plans.

3. Upon DOH approval of the "Betterment" design, the Designer shall determine quantities of all items involved and prepare an estimate of cost for the "Equivalent Replacement in Kind" and the "Betterment," with costs separated to reflect individual construction contracts. Actual final design of the system selected shall not begin until written approvals of the affected utility and the DOH are received.

B. DESIGN PHASE

1. Current DOH Specifications (Sections 670 and 675) and bid items are to be used for waterline and sanitary sewer relocations.

2. Designer shall prepare Special Provisions for those situations or conditions not covered under standard DOH Specifications, subject to utility and DOH review and approval. Specifications of individual utilities may be considered as a supplement or revision to the DOH Specifications on a project-by-project basis.

   When it is considered necessary to specify a utility item by trade name, three or more suppliers of acceptable quality materials, followed by the statement "or equal," shall be specified to assure opportunity for competition among equivalent materials. Should it be necessary to specify a proprietary brand, full justification for its use must be submitted to the DOH and approval obtained prior to specifying or noting such product on the plans.

3. Utility pipe lines under state highways will be designed in accordance with the current issue of the DOH Manual "Accommodation of Utilities on Highway Right of Way" with the exception that pipe trenches will be repaved in accordance with the current issue of the DOH Manual "Typical Sections and Related Details."

4. Waterline and/or sanitary sewer relocations shall be shown on separate stable base reproducibles for clarity and detail with the location also shown on the cross-sections. The simplified location of existing and relocated waterlines and/or sanitary sewers shall be shown on the roadway plans for coordination, with cross-reference to the detailed utility plans.

5. The existing system(s) shall be shown on the reverse side of the reproducibles as completely and clearly as feasible. Elevations shall be determined as accurately as possible by field location of valve boxes or other visible appurtenances, pipe detectors or test excavations when necessary. Verification by the utility shall be obtained, if possible, as to pipe size, class, lining and/or coating, maximum and minimum operating pressures and other unusual features necessary to design the "Equivalent Replacement in Kind." Service boxes, meters and meter boxes, type of service pipe (copper, galvanized steel, plastics) shall also be verified where possible.

6. Relocation plans not parallel to or adjacent to the roadway centerline may be stationed and tied thereto by paper location.

7. Standard bends (90, 45, 22½, and 11¼) shall be used for changes in direction in waterline and/or forced main sanitary sewer relocations.

8. Plans shall show profile of relocated waterlines and/or sanitary sewers with location of vertical bends/manholes identified by station.

9. Plans shall show vertical and horizontal clearances from structures or other controls which may be significant.

10. The proposed location and fitting required shall be shown at connections and changes in horizontal and vertical alignment.

11. Thrust blocks or other anchorage may be required at valves, fire hydrants, horizontal and vertical bends and connections to existing or relocated mains. Details of the required anchorage should be shown and calculations submitted. A typical anchorage detail sheet will be furnished by the DOH.

12. Thrust blocks shall be calculated using test pressure requirement as described in Item 13 below, with joints not backfilled. Earth resistance will be based upon the project boring information.

13. The minimum hydrostatic test pressure at which the relocated mains are to be tested shall be the normal operating pressure in the main plus fifty psi or plus fifty percent of the normal operating pressure, whichever is greater. This information will be shown on the plans.

14. A detail of connections should be shown if the connection is out of the ordinary. Care should be taken that adequate detail is provided when connecting to existing mains as outside dimensions, different types of pipe material and/or special fittings may be required.

14. When casing pipe is required, it shall be of sufficient size for placement of the specified carrier pipe. Minimum wall thicknesses for steel casing pipe are: 0.1875 inches for 8-inch to 20-inch diameter casing; 0.2500 inches for 24-inch to 30-inch casing; and 0.3125 inches for 36-inch to 52-inch diameter casing.

15. An estimate of quantities and a bill of material for non-bid items will be shown on the plans.

16. The DOH shall obtain approval of the Bureau for Public Health for all waterline and sanitary sewer relocations.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-306
APPROVAL PROCEDURE FOR SEWER AND/OR WATER SUPPLY INSTALLATIONS OR RELOCATIONS
March 1, 2006

The following procedures have been established to expedite the review and approval of sewage collection and treatment systems and/or public water system distribution and treatment installations or relocations by the Bureau for Public Health. The Bureau for Public Health is the primary state review agency for sewage collection and public water system (distribution and treatment) installations and relocations. The Bureau for Public Health and the Department of Environmental Protection are responsible for the review and approval of sewage treatment facility installations or relocations.

PROCEDURE FOR THE APPROVAL OF SEWER AND/OR WATER SUPPLY INSTALLATIONS OR RELOCATIONS

SEWERS

SEWAGE COLLECTION AND TREATMENT PROCEDURES

The following guidelines are for determining when sewer collection and/or treatment permits are required:

1. A permit will be required when one of the following conditions are met:

   a) More than 1,000 LF of sewer gravity lines are to be installed or modified, with either the replacement (relocated) sewer line being increased or decreased in size compared to the existing sewer line.
   b) The replacement (relocated) gravity sewer line slopes are changed as much as 0.20% as compared to the existing sewer line.
   c) The depth of replacement (relocated) gravity sewers changes as much as three (3) feet as compared to the existing sewer line.

2. A permit will be required when a sewage force main, sewage pump station or sewage treatment facility is involved.

3. A permit may be required when two (2) or more residences or businesses have their sewage collection or treatment facilities (such as on-site soil absorption systems or surface water discharge sewage treatment facilities) disturbed or replaced. The design engineer should contact the Bureau for Public Health central office Environmental Engineering Division permit review staff to determine if a permit will be required.

Note that all plans must be signed and sealed by a West Virginia Registered Professional Engineer.

Sewage collection and treatment systems modifications or relocations must be designed in accordance with the Bureau for Public Health "Sewage Treatment and Collection Systems Design Standards." If the sewage facilities cannot be designed to meet the design standards, the design engineer should contact the Bureau for Public Health central office Environmental Engineering Division permit review staff to determine the best design, prior to submission of an application package.

If an existing sewage treatment facility is modified or relocated and the sewage treatment plant size or treatment process is changed a Department of Environmental Protection "Municipal/Private Sewage Treatment Wasteload Allocation" will have to be filled out and be submitted to the Division of Water & Wastewater Management, Department of Environmental Protection. New sewage treatment facilities will also require a "...wasteload allocation." After the Division of Water & Wastewater Management has determined the "...wasteload allocation..." the allocation is to be submitted the application package to the Bureau for Public Health. The design engineer should contact the Bureau for Public Health central office Environmental Engineering Division permit review staff to determine the minimum sewage treatment facility design requirements, prior to development of an application package and plans.

<u>Sewage Collection Installation or Relocation Application Forms*</u>

Form ES-77A: Sewer Line and/or Water Line Extensions, Forms and Required Information
Form ES-69: Application for Permit to Construct Or Modify A Wastewater Collection And/Or Treatment System
Form EG-4: Sewage System Information and Design Data Sheet

*Require four (4) sets for application forms, specifications and plans and a $300 application fee (check or inter-governmental transfer) to be submitted to the Bureau for Public Health. The Bureau for Public Health may require two (2) sets of an engineering report with hydraulic and sizing calculations if a sewage pump station and/or sewage force main is in the project.

<u>Sewage Treatment Installation Or Relocation Application Forms With or Without Sewage Collection**</u>

Form ES-77D: Sewage Collection and Treatment Systems & Water Treatment and Distribution Systems, Forms and Required Information
Form SJ: Application for Permit
Form Municipal/Private Sewage Treatment Wasteload Allocation Form

** Require eight (8) sets of application forms, specifications and plans and $300 application fee (check or inter-governmental transfer) to be submitted to the Bureau for Public Health. The Department of Environmental Protection may also require an application fee. The Bureau for Public Health and the Department of Environmental Protection may require eight (8) sets for an engineering report with hydraulic and sizing calculations if a sewage treatment facility is in the project.

WATER SYSTEMS

WATER DISTRIBUTION AND/OR TREATEMENT SYSTEM PROCEDURES

The following guidelines are for determining when water distribution and treatment permits are required:

1. A permit will be required when one of the following conditions apply:

   a) More than a 1,000 LF of water line is installed or relocated.
   b) When six (6) inch or larger diameter water line is installed or relocated.
   c) When crossing a stream that is wider than 15 feet.
   d) When a road bore of longer than 60 feet is required.

2. A permit will be required if there are any installations or relocations of water booster stations, water storage facilities, main line pressure reducing stations, master water meter stations and water treatment facilities.

3. A permit will be required if new or relocated raw water intake sources are proposed

Note that all plans must be signed and sealed by a West Virginia Registered Professional Engineer.

Water distribution and/or treatment system modifications or relocations must be designed in accordance with the Bureau for Public Health "Public Water System Design Standards." If the water facilities cannot be designed to meet the design standards, the design engineer should contact the Bureau for Public Health central office Environmental Engineering Division permit review staff to determine the best design, prior to submission of an application package.

<u>Water Distribution and/or Treatment System Installation or Relocation Application Forms*</u>

Form ES77A: Sewer Line and/or Water Line Extensions, Forms and Required Information
Form EW-100: Public Water Supply Application for a Permit to Construct, Alter, or Renovate
Form EG-%: Water System Design Information and Data Sheet

* Require four (4) sets of application forms, specifications and plans and a $300 application fee (check or inter-governmental transfer) to be submitted to the Bureau for Public Health. The Bureau for Public Health may require two (2) sets of an engineering report with hydraulic and sizing calculations if a water booster station, water storage facility, main line pressure reducing station, master water meter station or water treatment facility is in the project.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-307
ACCESS DETERMINATION/RESOLUTION
November 1, 1994

Access problems shall be reviewed at field reviews and statements shall be included in the official notes as to the resolution of each problem.

If it is obvious to the review team that access cannot be provided, the note should read similar to:

(37) Access to Parcel 51 left of Stations 36 to 41 will not be provided as the property is not developed, damages will not exceed $50 per acre for 12 acres or $600 and any access road would have to be constructed for 1,000 feet through cuts up to 30 feet, the cost exceeding many times the right of way cost.

If the review team has doubts to the solution, the note should read similar to:

(38) A complete Access Analysis will be prepared for Parcels 67 and 68 right of Station 32+50.

If it is obvious that access should be provided, the note should be similar to:

(39) Access will be provided to Parcel 72, which contains three acres of bottom land and a two story brick house valued in excess of $15,000. The access road will be approximately 320' long costing less than $5,000 and will provide access to Route 93. The road will have a maximum 4% grade with a 16' roadbed of 6" crushed stone.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-308
DRIVEWAYS ON DIVISION OF
HIGHWAYS' RIGHTS-OF-WAY
August 1, 2003

The current edition of the manual entitled "Rules and Regulations for Constructing Driveways on State Highway Rights-of-Way," is to be used to design driveway entrances. Copies may be obtained from the Traffic Engineering Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

309
FENCING CONTROLLED ACCESS HIGHWAYS
April 3, 1995

Fencing of controlled access highways is warranted in order to provide safety of traffic movement. Fencing will be specified on controlled/partially controlled highways in order to:

1. Keep bicyclists, pedestrians, and children off the highway.

2. Keep livestock and other animals off the highway.

3. Prevent objects from being thrown off an overhead structure onto the roadway below (see DD-806).

Fencing should be provided where there is a potential for an encroachment. Fencing need not be specified in areas where natural barriers or precipitous slopes exist.

Standard Detail Book, Volume I, contains details for both chain link and farm-field fencing. Chain link should be specified for developed areas or areas anticipated to develop in a reasonable time frame. Farm-field should be used elsewhere. A project may contain both types of fencing. Changes in type at short intervals are undesirable.

The fence shall generally be located 1' inside the right of way line. For continuity sake, irregular right of way corners may not be fenced and the fence may be installed on a continuous line.

Gates are also detailed in the Standard Details. Gates are not desirable and their use should be kept to a minimum.

On renovation and restoration projects which contain right of way fence, the condition of the fence shall be evaluated and considered for repair and/or replacement. A serviceable fence shall be a priority in all urban areas, areas adjacent to rural grazing and crop lands, and for at least one-half mile on both sides of other inhabited areas. Maintenance, repair and/or replacement of fence in rural uninhabited areas of mostly forest lands shall be a lower priority.

WEST VIRGINIA DEPARMTENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

310
UTILITY STATUS NOTES
NON-NHS PROJECTS
October 1, 2003

On **Non-NHS projects ONLY** (regardless of funding) where the majority of work is to be within existing right of way and no utility relocations or adjustments are anticipated, one of the following two notes, as applicable to existing utilities, may be placed on the project plans:

1. The contractor is advised that existing utilities **are not** located on the plans. The contractor is responsible for notifying any utility within the limits of the project of all work to be performed. Utility companies will normally locate and mark their existing facilities on the ground within three (3) working days. The engineer will make every effort to adjust the proposed guardrail or other installations to avoid conflicts with or relocations by the utility. If utility relocations are required, they will be given at least ten (10) days to start and/or finish their work.

OR

2. The contractor is advised that all known existing utilities **are** located on the plans. The contractor is responsible for notifying any utility within the limits of the project of all work to be performed. Utility companies will normally locate and mark their existing facilities on the ground within three (3) working days. The engineer will make every effort to adjust the proposed guardrail or other installations to avoid conflicts with or relocations by the utility. If utility relocations are required, they will be given at least ten (10) days to start and/or finish their work.

All other Non-NHS projects will require a Utility Status Report as prepared by the responsible Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

311
UTILITY STATUS REPORT
NHS PROJECTS
October 1, 2003

All NHS projects (regardless of funding) will require a Utility Status Report.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

312
DEED DESCRIPTION PREPARATION FOR
DIVISION OF HIGHWAYS PROPERTY ACQUISITION
October 1, 2006

Attached is the West Virginia Department of Transportation, Division of Highways policy on "Deed Description Preparation for Division of Highways property Acquisition," dated October 1, 2006.

The following procedures have been established for the preparation of deed descriptions to be used in the acquisition of property on highway projects. It is the responsibility of the designer to prepare and submit deed descriptions per these procedures.

Attachment

DEED DESCRIPTION SUBMITTAL AND PREPARATION REQUIREMENTS

1.0 Submittal Requirements:

1.1 The designer shall submit deed descriptions corresponding to proposed takes shown in the RW-3 "*Ownership Index*." This submittal, and all subsequent revisions shall be in electronic format as described below on media acceptable to the Division. The deed description files shall be formatted per the following:

1) Microsoft Word version as required by the Director of Right of Way Division at the time of submission.

2) Disk shall be set up as a continuous document of all tracts within any given parcel.

3) Descriptions shall make use of the "header" feature of Microsoft Word.

4) "Times New Roman" or "Arial" text font.

5) Font shall be 12 point letter size.

1.2 All deed descriptions shall be submitted within fourteen (14) calendar days following acceptance of the RW-3 plans. Partial submissions of deed descriptions may be accepted upon approval by the Division.

1.3 The designer shall submit all tracts within any given parcel together. Submittals containing part of the tracts for any parcel will not be accepted.

1.4 Following review of the submittal, the designer shall make all required revisions to the deed descriptions and resubmit for purposes of property acquisition.

1.5 The designer shall submit revised deed descriptions with all subsequent revised right of way plan submissions.

1.6 The designer shall submit deed descriptions for all parcels shown in the RW-3 "Ownership Index." This includes any parcels identified as owned by the "Public Land Corporation".

1.7 The Division will print the hard copy of all descriptions for submittal to the Right of Way Division. Deed descriptions shall be prepared on 8 ½" X 14" redline paper. The top and bottom margins shall be 1½ " and the body of the description shall be double spaced.

2.0 **Description Preparation Requirements:** The deed preparation requirements shown below are intended to provide guidance for the writer. Several sample descriptions are provided in the "Appendix" to aid the writer. Specific language for any particular deed must be tailored to the project situation. Therefore, customizing or altering of phrases shown herein may be necessary to fully meet the requirement of any particular deed. The designer shall follow these guidelines, however, deed phrases must be customized to fit project specific requirements.

2.1 The designer shall use only RW-3 plans for the purpose of writing deed descriptions. The stations and offsets used in the deed description shall match exactly those shown on the RW-3 plans. Projects which require the deeds to be prepared in metric units shall follow the guidelines specified herein. On metric projects, the unit of meter(s) shall be substituted for feet in all phrases. The distance in feet shall be shown in parentheses immediately following the metric distance (see example).

2.2 The plan centerline/baseline shall be used as the basis for all deed descriptions.

2.3 When possible, all descriptions should begin at the lowest station (usually in the lower left corner) of the parcel in regard to the centerline/baseline stationing.

2.4 Descriptions shall be written in a clockwise direction, and shall include all corners of the subject parcel and all right of way break points.

2.5 Instead of using bearing and distance descriptions, generally the Direction of a line shall be determined by the following descriptive terms:

Line Azimuth	Descriptive Term
00° 00' — 22° 30'	Northerly
22° 30' — 67° 30'	Northeasterly
67° 30' — 112° 30'	Easterly
112° 30' — 157° 30'	Southeasterly
157° 30' — 202° 30'	Southerly
202° 30' — 247° 30'	Southwesterly
247° 30' — 292° 30'	Westerly
292° 30' — 337° 30'	Northwesterly
337° 30' — 360° 00'	Northerly

The direction of a line which is described as being "parallel to centerline/baseline" shall be the corresponding centerline/baseline bearing.

2.6 The first paragraph of the deed description shall always contain a description of the reference centerline/baseline. The reference shall be as follows:

…***(proposed/existing)*** ***(Frontage Road/Approach Road/County Route number/WV Route number/ US Route number/ etc.)***

This description shall also be included anywhere there is a change in centerline/baseline reference, and where there is more than one centerline/baseline in close proximity to the parcel on the plans.

2.7 The following shall be used in establishing distances and areas:

1) Distances shall be stated per the following:

   English Projects: Distances shall be rounded to the nearest foot.

   Metric Projects: Distances shall be rounded to one (1) decimal place, with feet in parentheses rounded to the nearest foot.

2) Areas shall always be stated per the following:

   English Projects:

   Areas one acre or more use acres rounded to two (2) decimal places.
   Areas less than one acre use square feet rounded to the nearest square foot.

   Metric Projects:

   Areas greater than 10,000 square meters use hectares rounded to three (3) decimal places with acres in parentheses rounded to two (2) decimal places.

   Areas less than 10,000 square meters use square meters rounded to an even square meter with square feet in parentheses rounded to the nearest square foot for conversion purposes only.

Note: The areas shall be checked to insure that they agree with those in the Ownership Index.

2.8 All deed descriptions shall be per the following outline:

I. Heading

II. Opening Statement (Not required for partial takes.)

III. Deed Descriptive Body for Each Tract (Not required for total takes of sub-division or city lots.)

A. First paragraph.

B. Subsequent Paragraphs (One for each tract line.)

C. Last Paragraph.

IV. Source Quote (Placed only at the end of the final tract description for Each parcel, see example; not required for "Public Land Corporation" parcels.)

2.9 Heading:

2.9.1 First Page of Individual Tracts:

2.9.1.1 Parcel with One Tract:

Upper Right:
Project ***(State Project Number), (Federal Project Number)***
Parcel ***(Parcel Number)***
(Title Holder) [1, 2]

Upper left above first paragraph:
(TYPE OF TAKE) (This line to be all caps and underlined**)**

2.9.1.2 Parcel with Two or More Tracts:

Upper Right:*
Project ***(State Project Number), (Federal Project Number)***
Parcel ***(Parcel Number)***
(Title Holder)[1, 2]

*Note: For each tract, start the page numbers over. On the first page of all tracts, the page number and tract number shall not be shown in the upper right.

Upper left above first paragraph:
TRACT ***(TRACT NUMBER) - (TYPE OF TAKE)*** (This line to be all caps and underlined)

2.9.2 Second and Subsequent Pages of Individual Tracts:

2.9.2.1 Parcel with One Tract:

Upper Right:
Project *(State Project Number), (Federal Project Number)*
Parcel *(Parcel Number)*
(Title Holder)[1, 2]
Page *(Page Number)*

2.9.2.2 Parcel with Two or More Tracts:

Upper Right:
Project *(State Project Number), (Federal Project Number)*
Parcel *(Parcel Number)*
(Title Holder)[1, 2]
Tract *(Tract Number*), **Page *(Page Number)***

[1] Writer may use "et.al." where multiple property owners exist. The first name shown as Title Holder must be the first name shown on recorded document.

[2] Title Holder must include names of holders of all land contracts and life estates.

2.10 Opening Statement:

2.10.1 Total Takes - Subdivision or City Lots:

BEING all of lot(*s*) (*lot numbers*) of (*Subdivision/Plat*), situate in (*Magisterial or Taxing District Name*) District, (*County Name*) County, West Virginia, said lot(*s*) lying to the (*right/left/right and left*) of (*proposed/existing*) (*road name*) (*centerline/baseline*) between Station (*000+00*) and Station (*000+00*), and containing (*area*) (*square feet/acres*), more or less, as shown on Project (*State Project Number*), (*Federal Project Number*).

2.10.2 Total Takes using Deed Descriptions or Metes and Bounds utilizing Station offsets:

BEING all of (*that/those*) tract(*s*) or parcels of land, situate in [(*City Name*) or **(*Magisterial or Taxing District Name*) District, (*County Name*) County], West Virginia, said parcel lying to the (*right/left/right***

***and left*)** **of** **(*proposed/existing*)** **(*Road Name*)** **(*centerline/baseline*)** **between Station (*000+00*) and Station (*000+00*), as shown on Project (*State Project Number*), (*Federal Project Number*), and being more particularly described as follows:**

2.11 Deed Descriptive Body:

A deed descriptive body shall be required for all tracts. The tracts for each parcel shall be numbered and described in the following order if applicable:

1) Controlled Access

2) Noncontrolled Access

3) Permanent (Type) Easement

4) Temporary (Type) Easement

2.11.1 Station Offset Description

2.11.1.1 First Paragraph:

BEGINNING at a (*point/corner*) (*common to and*)[1] in the [division line between (*abutting land owner*)[2] and (*property owner*)][3], said point being in the [(*northern/southern/eastern/western*)[4] (*proposed/existing*) (*controlled access/noncontrolled access*) (*right of way line/easement line*) of (*road name*)][3] and (*distance*) feet [(*right/left*) *of and at right angle to*/*radially (right/left) of*)] (description of reference centerline/baseline per Section 2.6) **(*centerline/baseline*) at Station (*000+00*), Project (*State Project Number*), (*Federal Project Number*), (*County Name*) County, West Virginia;**

1 To be used only where three or more property lines intersect.

2 List all abutting landowners in a clockwise order.

3 The two phrases labeled with superscript "3" are to be included only when applicable. The order they appear in the first paragraph is dependent upon which line is

described in the second paragraph. The second paragraph line shall be the last line in the first paragraph. (See Example "Parcel 115, Tract 1").

[4] The writer shall use the general direction of the whole road when distinguishing between (north, south, east or west) location of right of way or easement line.

2.11.1.2 Subsequent Paragraphs shall be per the following:

1) Start a new paragraph for each tract line being described.

2) Begin all paragraphs with:

   thence, (*direction*),

3) Do not use abbreviations in describing points except P.C., P.T., T.S., S.T., etc. or when referring to a specific map or plat and quoting or referring to abbreviations therein.

4) Offset points on tangent and at P.C., P.T., T.S., S.T., etc. shall be described as:

   (*distance*) feet (*right/left*) of and at right angle to (*centerline/baseline*) (*P.C./P.T./T.S./S.T., etc.*)[1] at Station (*000+00*);

   [1] Only when applicable.

5) Offset points within a curve shall be described as:

   (*distance*) feet radially (*right/left*) of (*centerline/baseline*) at Station (*000+00*);

6) Distances between points should always be labeled as:

   (*distance*) feet, more or less, to a point…

7) Lines between property owners shall be described as:

   division lines.

8) Lines, which are right of way or easement lines, shall be described as:

(*northern/southern/eastern/western)(proposed/existing*) *(controlled access/noncontrolled access)* (*right of way/temporary construction easement/permanent drainage easement/temporary structure removal easement*) lines…

9) Uncertain existing property/division/right of way lines shall be measured by scale and described as:

   meandering with said (*line description*), (*distance*) feet, more or less, to a point…

10) Proposed lines following with a curve shall be described as:

   with a curve to the (*left/right*) running concentric to (*centerline/baseline*) and having a radius of (*distance*) feet, with (*line description*) (*arc distance*) feet, more or less, to a point …

11) When the line being described is an easement or right of way and is parallel to the reference centerline/baseline, the following shall be used:

   thence, (*reference centerline/baseline bearing*) with said (*line description per Note 8 above*) parallel to(*centerline/baseline*) (*distance*) feet, more or less…

12) When an interest in railroad property is to be acquired, the railroad valuation stations and offset distance must also be included in the description as follows:

   …said point being (*distance*) feet (*left/right*) of and at right angle to (description of reference centerline/baseline per section 2.6) **(*centerline/baseline*) at Station (*000+00*) equals (*distance*) feet (*left/right*) of Railroad Valuation (*centerline/baseline*) at Station (*000+00*).**

2.11.1.3 Last Paragraph:

The final tract line in the description shall be ended with the following:

….(*__distance__*) feet, more or less, to the place of beginning and containing (*__area__*) (*__square feet/acres__*), more or less.

2.11.2 Metes and Bounds Description (Used only with Total Takes where the Parcel and Property Description are identical.)

1) Use the parcel owner's deed description per recorded deed.

2) Set off deed description by further indentation of left and right margins and single spacing. (See Example "Parcel 12".)

2.12 Source Quote:

2.12.1 Present Owner Acquired Title by Deed:

The (*__tract[s]/parcel[s]__*) of land hereinabove described (*__is/are) (all/a portion__*) of that same real estate conveyed unto (*__Grantee's Name__*), *__(Grantee Identifiers from deed, i.e. his wife, as joint tenants with right of survivorship, corporation, etc.)__*, from (*__Grantor's Name__*), *__(Grantor Identifiers from deed, i.e. his wife, as joint tenants with right of survivorship, corporation, etc.)__*, by deed dated (*__deed date__*), of record in the Office of the Clerk of the County Commission of (*__County Name__*) County, West Virginia, in Deed Book (*__Number__*), at Page (*__Number__*). [The said (*__Grantor's Name__*) died (*__date of death__*) and in accordance with the survivorship clause contained in said deed said real estate became vested in (*__Grantee's Name__*), (*__relationship__*).][1] [The said (*__Grantee's Name__*) is currently married to (*__Spouse's Name__*)][2]

[1] This statement required if Grantee acquired property by a deed survivorship clause.
[2] This statement required if Grantee's spouse is not listed as a property owner.

2.12.2 Present Owner Acquired Title by Will:

The (*tract[s]/parcel[s]*) of land hereinabove described (*is/are*) (*all/a portion*) of that same real estate conveyed unto *(Deceased Name)*, from (*Grantee to Deceased*), by deed dated (*Deed Date*), of record in the Office of the Clerk of the County Commission of (*County Name*) County, West Virginia, in Deed Book (*Number*), at Page (*Number*).

The said (*Deceased Name*) died (*testate*)[1] (*Date of Death*), [and in accordance with the survivorship clause contained in said deed or **and devised unto *(Heir Description*) interest in the] said real estate [became vested in *(Survivor)(relationship)*.** or **by will dated (*Will Date*), of record in the Office of the Clerk of the County Commission of (*County Name)* County, West Virginia, in Will Book (*Number*), at Page (*Number*).] [The said (Grantee's Name) is currently married to (Spouse's Name)][2]**

Note: Repeat second paragraph until heir or survivor corresponds to current Title Holder.

[1] Only when applicable.

[2] This statement required if Grantee's spouse is not listed as a property owner.

APPENDIX

DD-312

SAMPLE

DESCRIPTIONS

NOTE: Sample Descriptions are 8 1/2 " X 11" reduced versions of actual 8 1/2" X 14" documents for illustrative purposes only.

Project S306-17-4.98
Parcel 1
Barbara E. Edwards

NONCONTROLLED ACCESS RIGHT OF WAY

BEGINNING at a point in the northern existing right of way line of US Route 60, said point being in the western proposed noncontrolled access right of way line of relocated Cabell County Route 17 and 117 feet radially left of relocated US Route 60 baseline at Station 97+50, Project S306-17-4.98, Cabell County, West Virginia;

thence, northeasterly, with said proposed noncontrolled access right of way line 148 feet, more or less, to a point 180 feet left of and at right angle to relocated Cabell County Route 17 centerline at Station 11+20;

thence, northeasterly, continuing with said proposed noncontrolled access right of way line 189 feet, more or less, to a point 90 feet left of and at right angle to centerline at Station 12+86;

thence, southeasterly, continuing with said proposed noncontrolled access right of way line 74 feet, more or less, to a point 30 feet left of and at right angle to centerline at Station 13+30;

thence, N 40° 26' E, continuing with said proposed noncontrolled access right of way line, parallel to centerline 10 feet, more or less, to a point in the division line between Public Land Corporation, and Barbara E. Edwards, and in the southern low water mark of Mud River, said point being 30 feet left of and at right angle to centerline at Station 13+40

thence, southeasterly, meandering upstream, with said division line and said low water mark 60 feet, more or less, to a point in the eastern proposed noncontrolled access right of way line, said point being 30 feet right of and at right angle to centerline at Station 13+42;

thence, S 40° 26' W, with said proposed noncontrolled access right of way line, parallel to centerline 12 feet, more or less, to a point 30 feet right of and at right angle to centerline at Station 13+30;

Project S306-17-4.98
Parcel 1
Barbara E. Edwards
Page 2

thence, southeasterly, continuing with said proposed noncontrolled access right of way line 119 feet, more or less, to a point 140 feet right of and at right angle to centerline at Station 12+85;

thence, S 40° 26' W, continuing with said proposed noncontrolled access right of way line, parallel to centerline 139 feet, more or less, to a point in the northern existing right of way line of US Route 60, said point being 140 feet right of and at right angle to centerline at Station 11+46;

thence, westerly, meandering with said existing right of way line 450 feet, more or less, to the place of beginning and containing 1.32 acres, more or less.

The tract of land hereinabove described is a portion of that same real estate conveyed unto Norma W. Ellis and Barbara E. Edwards, her daughter, as joint tenants with right of survivorship, from Norma W. Ellis, by deed dated April 22, 1988, of record in the Office of the Clerk of the County Commission of Cabell County, West Virginia, in Deed Book 896 at Page 395. The said Norma W. Ellis died January 3, 1990, and in accordance with the survivorship clause contained in said deed, interest in said real estate became vested in Barbara E. Edwards, her daughter. The said Barbara E. Edwards is currently married to Hiram S. Edwards, Jr.

Project U306-60-19.72, NH-0060(245)
Parcel 3
Harold H. Hunter

PERMANENT DRAINAGE EASEMENT

BEGINNING at a point in the southern proposed permanent drainage easement line of relocated US Route 60, said point being in the southern existing right of way line of US Route 60 and 44 feet right of and at right angle to relocated US Route 60 centerline at Station 190+10, Project U306-60-19.72, NH-0060(245), Cabell County, West Virginia;

thence, N 40° 05' 31" E, with said existing right of way line, parallel to centerline 59 feet, more or less, to a point in the southern proposed permanent drainage easement line, said point being 44 feet right of and at right angle to centerline at Station 190+69;

thence, southeasterly, with said proposed permanent drainage easement line 6 feet, more or less, to a point 50 feet right of and at right angle to centerline at Station 190+69;

thence, southeasterly, continuing with said proposed permanent drainage easement line 41 feet, more or less, to a point 90 feet right of and at right angle to centerline at Station 190+60;

thence, S 40° 05' 31" W, continuing with said proposed permanent drainage easement line, parallel to centerline 50 feet, more or less, to a point 90 feet right of and at right angle to centerline at Station 190+10;

thence, northwesterly, continuing with said proposed permanent drainage easement line 46 feet, more or less, to the place of beginning and containing 2,535 square feet, more or less.

The tract of land hereinabove described is a portion of that same real estate conveyed unto Harold H. Hunter, from Mock Brothers, Inc., by deed dated March 3, 1995, of record in the Office of the Clerk of the County Commission of Cabell County, West Virginia, in Deed Book 986 at Page 271.

Project U301-250-16.58
Parcel 12
Emma Jane Mayle and
Barbara Ellen Newman

TOTAL TAKE – NONCONTROLLED ACCESS RIGHT OF WAY

BEING all of that parcel of land, situate in Philippi District, Barbour County, West Virginia, said parcel lying to the right and left of proposed Philippi Bypass centerline between Station 76+01 and Station 77+10, as shown on Project U301-250-16.58, and being more particularly described as follows:

> BEGINNING at a stake on the west side of Chestnut Street and running with the Street N. 13° 30 E. 60 feet to Carlin's (now Wilson's) corner; thence leaving the street and with Carlin's (now Wilson's) line N. 79° 15 W. 120 feet to a stake; thence S 13° 30 W. 60 feet to a stake near an Ash stump on the west side of Anglin's Run; thence S. 79° 15 E. 120 feet to the beginning and containing 26.4 poles (7,200 square feet).

The parcel of land hereinabove described is all of that same real estate conveyed unto John Newman, from Ralph Gum, by deed dated November 2, 1974, of record in the Office of the Clerk of the County Commission of Barbour County, West Virginia, in Deed Book 252 at Page 615.

The said John Newman died intestate on February 4, 1981, and his interest in the said real estate became vested in his nine (9) children. The said real estate was then conveyed unto Emma Jane Mayle and Barbara Ellen Newman, from Rosabell Croston, widow; Stephen Newman and Lotita Newman, his wife; Eloise Dalton and Bernard Dalton, her husband; Leona Mayle and Vincent Mayle, her husband; Josephine Summerfield and Jack Summerfield, her husband; Wanda Lott, widow; and Ernestine Newman; by deed dated February 17, 1982, of record in the aforesaid Clerk's Office, in Deed Book 298 at Page 150.

Project U301-250-16.58
Parcel 17
Georgia A. Hatfield, et. al.

TOTAL TAKE – NONCONTROLLED ACCESS RIGHT OF WAY

BEGINNING at a point in the division line between Sylvia E. Boyles and Georgia A. Hatfield, said point being in the western existing right of way line of Chestnut Street (Berkeley County Route 30) and 24 feet right of and at right angle to proposed Philippi Bypass centerline at Station 78+73, Project U301-250-16.58, Barbour County, West Virginia;

thence, southwesterly, with said existing right of way line 10 feet, more or less, to a point 29 feet right of and at right angle to centerline at Station 78+82;

thence, southwesterly, continuing with said existing right of way line 224 feet, more or less, to a point in the division line between the City of Philippi/Philippi Municipal Building Commission and Georgia A. Hatfield, said point being 10 feet radially left of relocated Chestnut Street centerline at Station 13+26;

thence, northwesterly, with said division line 27 feet, more or less, to a point in the western proposed noncontrolled access right of way line of relocated Chestnut Street, said point being in the western proposed noncontrolled access right of way line of proposed Philippi Bypass and 256 feet right of and at right angle to proposed Philippi Bypass centerline at Station 79+09;

thence, northwesterly, with said proposed noncontrolled access right of way line of proposed Philippi Bypass 26 feet, more or less, to a point in the division line between the City of Philippi/Philippi Municipal Building Commission and Georgia A. Hatfield, said point being 272 feet right of and at right angle to centerline at Station 78+91;

thence, easterly, with said division line 96 feet, more or less, to a point 179 feet right of and at right angle to centerline at Station 78+67;

Project U301-250-16.58
Parcel 17
Georgia A. Hatfield, et. al.
Page 2

thence, northerly, continuing with said division line 70 feet, more or less, to a point 196 feet right of and at right angle to centerline at Station 78+00;

thence, northeasterly, continuing with said division line 104 feet, more or less, to a point 95 feet right of and at right angle to centerline at Station 77+75;

thence, southeasterly, continuing with said division line 14 feet, more or less, to a point common to the City of Philippi/Philippi Municipal Building Commission, Sylvia E. Boyles, and Georgia A. Hatfield, said point being 87 feet right of and at right angle to centerline at Station 77+86;

thence, southeasterly, with the division line between Sylvia E. Boyles and Georgia A. Hatfield 110 feet, more or less, to the place of beginning and containing 18,895 square feet, more or less.

The tract of land hereinabove described is all of that same real estate conveyed unto Franklin A. Hatfield, from Sharon M. Golden and Georgia A. Hatfield, Executrices of the Estate of Hazel B. Sturm, deceased, by deed dated May 23, 1996, of record in the Office of the Clerk of the County Commission of Barbour County, West Virginia, in Deed Book 360 at Page 558.

The said Franklin A. Hatfield died intestate, April 30, 1997, leaving the following heirs at law: Georgia A. Hatfield, daughter; Louise A. Hatfield-Anderson, daughter; Susan A. Hatfield, daughter; and Franklin A. Hatfield, Jr., son.

Project X354-D-7.00, APD-0282(101)
Parcel 26
Clark D. and Molly B. Powell

TOTAL TAKE - CONTROLLED ACCESS RIGHT OF WAY

Being all of Lot No. 17 of Little Farms Addition No. 1, situate in the City of Parkersburg, of record in the Office of the County Clerk of Wood County, West Virginia, in Plat Book 2 at Page 70, said lot lying to the right of proposed US Route 50 centerline between Station 2422+41 and Station 2423+24, and containing 8,000 square feet, more or less, as shown on Project X354-D-7.00, APD-0282(101);

The parcel of land hereinabove described is all of that same real estate conveyed unto Clark D. Powell and Molly B. Powell, husband and wife, from Clay H. Powell and Edna J. Powell, husband and wife, by deed dated February 3, 1964, of record in the aforesaid Clerk's Office in Deed Book 485 at Page 473.

Project U306-64-19.72, NH-0641(245)
Parcel 37
Huntington Mall Company

TRACT 12 - TEMPORARY CONSTRUCTION EASEMENT

BEGINNING at a point in the southern proposed temporary construction easement line of proposed Ring Road, said point being in the southern proposed noncontrolled access right of way line of proposed Ring Road and 22 feet radially right of proposed Ring Road centerline at Station 80+75, Project U306-64-19.72, NH-0641(245), Cabell County, West Virginia;

thence, northeasterly, with said proposed noncontrolled access right of way line 26 feet, more or less, to a point 22 feet right of and at right angle to centerline at Station 81+00;

thence, northeasterly, continuing with said proposed noncontrolled access right of way line 80 feet, more or less, to a point 27 feet right of and at right angle to centerline at Station 81+80;

thence, southeasterly, continuing with said proposed noncontrolled access right of way line 25 feet, more or less, to a point in the southern proposed temporary construction easement line, said point being 42 feet right of and at right angle to centerline at Station 82+00;

thence, southwesterly, with said proposed temporary construction easement line 127 feet, more or less, to a point 32 feet radially right of centerline at Station 80+75;

thence, northwesterly, continuing with said proposed temporary construction easement line 10 feet, more or less, to the place of beginning and containing 1,392 square feet, more or less.

The tracts of land hereinabove described are a portion of that same real estate conveyed unto Huntington Mall Company, from Neighborgall Corporation Company, by deed dated February 1, 1978, of record in the Office of the Clerk of the County Commission of Cabell County, West Virginia, in Deed Book 784 at Page 721.

Project U340-34-11.06, F-0034(043)
Parcel 40
Clarice E. Bayliss

TRACT 1 - NONCONTROLLED ACCESS RIGHT OF WAY

BEGINNING at a point in the northern existing right of way line of WV Route 34, said point being in the division line between Columbia Gas of West Virginia (Mountaineer Gas) and Clarice E. Bayliss and 7.0 meters (23 feet) radially left of relocated WV Route 34 centerline at Station 1+111.4, Project U340-34-11.06, F-0034(043), Putnam County, West Virginia;

thence, northwesterly, with said division line 9.2 meters (30 feet), more or less, to a point 15.7 meters (52 feet) radially left of centerline at Station 1+108.5;

thence, southwesterly, continuing with said division line 4.6 meters (15 feet), more or less, to a point common to Columbia Gas of West Virginia (Mountaineer Gas), Patrick W. Miller, et ux, and Clarice E. Bayliss, said point being 15.6 meters (51 feet) radially left of centerline at Station 1+103.9;

thence, northwesterly, with the division line between Patrick W. Miller, et ux, and Clarice E. Bayliss 2.4 meters (8 feet), more or less, to a point in the northern proposed noncontrolled access right of way line, said point being 17.9 meters (59 feet) radially left of centerline at Station 1+103.2;

thence, northeasterly, with said proposed noncontrolled access right of way line 27.0 meters (89 feet), more or less, to a point 17.0 meters (56 feet) radially left of centerline at Station 1+130.0;

thence, northeasterly, continuing with said proposed noncontrolled access right of way line 16.8 meters (55 feet), more or less, to a point in the western existing right of way line of Putnam County Route 34/29 (Sunny Brook Road), said point being 26.0 meters (85 feet) radially left of centerline at Station 1+144.0;

thence, southerly, with said existing right of way line 19.6 meters (64 feet), more or less, to a point in the northern existing right of way line, said point being 7.5 meters (25 feet) radially left of centerline at Station 1+138.0;

thence, southwesterly, with said existing right of way line 26.6 meters (87 feet), more or less, to the place of beginning and containing 358 square meters (3,854 square feet), more or less.

Project U340-34-11.06, F-0034(043)
Parcel 40
Clarice E. Bayliss

TRACT 2 - PERMANENT DRAINAGE EASEMENT

BEGINNING at a point in the northern proposed noncontrolled access right of way line of relocated WV Route 34, said point being in the division line between Patrick W. Miller, et ux, and Clarice E. Bayliss and 17.9 meters (59 feet) radially left of relocated WV Route 34 centerline at Station 1+103.2, Project U340-34-11.06, F-0034(043), Putnam County, West Virginia;

thence, northwesterly, with said division line 11.8 meters (39 feet), more or less, to a point in the northern proposed permanent drainage easement line, said point being 29.0 meters (95 feet) radially left of centerline at Station 1+099.4;

thence, northeasterly, with said proposed permanent drainage easement line 7.0 meters (23 feet), more or less, to a point 35.0 meters (115 feet) radially left of centerline at Station 1+103.0;

thence, southeasterly, continuing with said proposed permanent drainage easement line 18.6 meters (61 feet), more or less, to a point in the northern proposed noncontrolled access right of way line, said point being 17.7 meters (58 feet) radially left of centerline at Station 1+110.0;

thence, southwesterly, with said proposed noncontrolled access right of way line 6.8 meters (22 feet), more or less, to the place of beginning and containing 90 square meters (969 square feet), more or less.

The tracts of land hereinabove described are a portion of that same real estate conveyed unto J. M. Bayliss, from Stuart W. Thomas and Catharine Y. Thomas, his wife, by deed dated January 17, 1955, of record in the Office of the Clerk of the County Commission of Putnam County, West Virginia, in Deed Book 120 at Page 126.

The said J. M. Bayliss died testate on January 30, 1971, and by the terms of his Last Will and Testament, dated March 15, 1967, of record in the aforesaid Clerk's Office, in Will Book 276 at Page 452, interest in said real estate was devised unto Clarice E. Bayliss.

Project X354-D-4.73, APD-0282(115)
Parcel 73
CSX Transportation, Inc.

CONTROLLED ACCESS RIGHT OF WAY

BEGINNING at a point in the northern existing controlled access right of way line of WV Route 68, said point being in the southern existing CSX railroad right of way line and 53 feet radially left of proposed US Route 50 centerline at Station 2337+00 equals 53 feet right of Railroad Valuation centerline at Station 6796+00, as shown on Project X354-D-4.73, APD-0282(115), Wood County, West Virginia;

thence, northerly, with said existing CSX railroad right of way line 15 feet, more or less, to a point in the northern proposed controlled access right of way line of proposed US Route 50, said point being 68 feet radially left of proposed US Route 50 centerline at Station 2337+00 equals 38 feet right of Railroad Valuation centerline at Station 6795+98;

thence, easterly, with said proposed controlled access right of way line104 feet, more or less, to a point 68 feet radially left of proposed US Route 50 centerline at Station 2338+00 equals 31 feet right of Railroad Valuation centerline at Station 6797+04;

thence, easterly, continuing with said proposed controlled access right of way line 105 feet, more or less, to a point 67 feet radially left of proposed US Route 50 centerline at Station 2339+00 equals 31 feet right of Railroad Valuation centerline at Station 6798+11;

thence, easterly, continuing with said proposed controlled access right of way line 19 feet, more or less, to a point in the northern existing right of way line of WV Route 68 and in the southern existing CSX railroad right of way line, said point being 67 feet radially left of proposed US Route 50 centerline at Station 2339+18 equals 32 feet right of Railroad Valuation centerline at Station 6798+31;

Project X354-D-4.73, APD-0282(115)
Parcel 73
CSX Transportation, Inc.
Tract 1, Page 2

thence, southerly, with said existing right of way line of WV Route 68 and said existing CSX railroad right of way line, more or less, to a point 26 feet radially left of proposed US Route 50 centerline at Station 2339+14 equals 72 feet right of Railroad Valuation centerline at Station 6798+26;

thence, westerly, continuing with said existing WV Route 68 right of way line and said existing CSX railroad right of way line 77 feet, more or less, to a point in the northern existing controlled access right of way line of WV Route 68, said point being 17 feet radially left of proposed US Route 50 centerline at Station 2338+38 equals 81 feet right of Railroad Valuation centerline at Station 6797+46;

thence, westerly, meandering with said existing controlled access right of way line and said existing CSX railroad right of way line 118 feet, more or less, to a point 50 feet radially left of proposed US Route 50 centerline at Station 2337+28 equals 53 feet right of Railroad Valuation centerline at Station 6796+30;

thence, westerly, continuing with said existing controlled access right of way line and said existing CSX railroad right of way line 29 feet, more or less, to the place of beginning and containing 8,119 square feet, more or less.

The tract of land hereinabove described is a portion of that same real estate conveyed unto CSX Transportation, Inc., from The Chesapeake and Ohio Railway Company, by a deed dated September 2, 1987, of record in the Office of the Clerk of the County Commission of Wood County, West Virginia, in Deed Book 879 at Page 832.

Project X354-D-4.73, APD-0282(115)
Parcel 78
Freda R. Smithton

TRACT 2 - UNECONOMIC REMNANT

BEGINNING at a point in the division line between Baker Neal Jr. and Freda R. Smithton, said point being in the southern proposed controlled access right of way line of proposed US Route 50 and 130 feet radially right of proposed US Route 50 centerline at Station 2364+65, Project X354-D-4.73, APD-0282(115), Wood County, West Virginia;

thence, easterly, with said proposed controlled access right of way line 42 feet, more or less, to a point in the division line between Jackie L. and May E. Rake and Freda R. Smithton, said point being 123 feet radially right of centerline at Station 2365+04;

thence, southwesterly, with said division line 127 feet, more or less, to a point 247 feet radially right of centerline at Station 2364+83;

thence, northwesterly, continuing with said division line 40 feet, more or less, to a corner common to Jackie L. and Mary E. Rake, George Baker Neal Jr., and Freda R. Smithton, said point being 241 feet radially right of centerline at Station 2364+48;

thence, northeasterly, with the division line between George Baker Neal, Jr. and Freda R. Smithton 112 feet, more or less, to the place of beginning and containing 4,772 square feet, more or less.

The tract of land hereinabove described is all of that remaining residue lying to the right of proposed US Route 50 centerline and conveyed unto Freda R. Smithton, from Rupert G. Harvey, by deed dated June 15, 1937, of record in the Office of the Clerk of the County Commission of Wood County, West Virginia, in Deed Book 217 at Page 204.

Project S355-97-0.01, F-0097(001)
Parcel 115
John Smith

TRACT 1 - NONCONTROLLED ACCESS RIGHT OF WAY

BEGINNING at a point in the northern existing right of way line of WV Route 97, said point being in the division line between Georgia Pacific Corporation and John Smith and 16 feet radially left of relocated WV Route 97 centerline at Station 632+11, Project S355-97-0.01, F-0097(001), Wyoming County, West Virginia;

thence, northwesterly, with said division line 137 feet, more or less, to a point in the northern proposed noncontrolled access right of way line, said point being 148 feet radially left of centerline at Station 632+45;

thence, northeasterly, with said proposed noncontrolled access right of way line 326 feet, more or less, to a point in the northern existing right of way line of WV Route 97, said point being 130 feet left of and at right angle to centerline at Station 635+90;

thence, southwesterly, meandering with said existing right of way line 400 feet, more or less, to the place of beginning and containing 26,896 square feet, more or less.

Project S355-97-0.01, F-0097(001)
Parcel 115
John Smith

TRACT 2 - NONCONTROLLED ACCESS RIGHT OF WAY

BEGINNING at a point in the northern existing right of way line of the Norfolk and Western Railway Company, said point being in the division line between Georgia Pacific Corporation and John Smith and 28 feet radially right of relocated WV Route 97 centerline at Station 632+01, Project S355-97-0.01, F-0097(001), Wyoming County, West Virginia;

thence, northwesterly, with said division line 4 feet, more or less, to a point in the southern existing right of way line of WV Route 97, said point being 23 feet radially right of centerline at Station 632+02;

thence, northeasterly, meandering with said existing right of way line 2,950 feet, more or less, to a point 29 feet right of and at right angle to centerline at Station 658+69;

thence, southeasterly, continuing with said existing right of way line 31 feet, more or less, to a point in the southern proposed noncontrolled access right of way line, said point being 60 feet right of and at right angle to centerline at Station 658+69;

thence, S 41° 22' 49" W, with said proposed noncontrolled access right of way line, parallel to centerline 190 feet, more or less, to a point 60 feet right of and at right angle to centerline at P.T. Station 656+78.90;

thence, southwesterly, continuing with said proposed noncontrolled access right of way line 360 feet, more or less, to a point 35 feet right of and at right angle to centerline at P.C. Station. 653+26.74;

Project S355-97-0.01, F-0097(001)
Parcel 115
John Smith
Tract 2, Page 2

thence, southwesterly, continuing with said proposed noncontrolled access right of way line 522 feet, more or less, to a point 40 feet right of and at right angle to centerline at P.T. Station. 648+05.16;

thence, southwesterly, continuing with said proposed noncontrolled access right of way line 305 feet, more or less, to a point 80 feet right of and at right angle to centerline at Station 645+00;

thence, S 45° 58' 56" W, continuing with said proposed noncontrolled access right of way line, parallel to centerline 250 feet, more or less, to a point 80 feet right of and at right angle to centerline at Station 642+50;

thence, southeasterly, continuing with said proposed noncontrolled access right of way line 40 feet, more or less, to a point in the northern existing right of way line of the Norfolk and Western Railroad Company, said point being 117 feet right of and at right angle to centerline at Station 642+38;

thence, southwesterly, meandering with said existing railroad right of way line 1,047 feet, more or less, to the place of beginning and containing 4.75 acres, more or less.

Project S355-97-0.01, F-0097(001)
Parcel 115
John Smith

<u>TRACT 3 - NONCONTROLLED ACCESS RIGHT OF WAY</u>

BEGINNING at a point in the northern existing right of way line of WV Route 97, said point being in the northern proposed noncontrolled access right of way line of relocated WV Route 97 and 185 feet left of and at right angle to relocated WV Route 97 centerline at Station 640+37, Project S355-97-0.01, F-0097(001), Wyoming County, West Virginia;

thence, northeasterly, with said proposed noncontrolled access right of way line 778 feet, more or less, to a point 140 feet left of and at right angle to centerline at P.T. Station 648+05.16;

thence, N 49° 18' 14" E, continuing with said proposed noncontrolled access right of way line, parallel to centerline 522 feet, more or less, to a point 140 feet left of and at right angle to centerline at P.C. Station 653+26.74;

thence, northeasterly, continuing with said proposed noncontrolled access right of way line 658 feet, more or less, to a point in the northern existing right of way line, said point being 98 feet left of and at right angle to centerline at Station 660+00;

thence, southwesterly, with said existing right of way line 128 feet, more or less, to a point 97 feet left of and at right angle to centerline at Station 658+72;

thence, southeasterly, continuing with said existing right of way line 84 feet, more or less, to a point 13 feet left of and at right angle to centerline at Station 658+72;

thence, southwesterly, meandering with said existing right of way line 1,940 feet, more or less, to the place of beginning and containing 5.37 acres, more or less.

Project S355-97-0.01, F-0097(001)
Parcel 115
John Smith

TRACT 4 - PERMANENT DRAINAGE EASEMENT

BEGINNING at a point in the southern proposed permanent drainage easement line of relocated WV Route 97, said point being in the southern proposed noncontrolled access right of way line of relocated WV Route 97 and 53 feet radially right of relocated WV Route 97 centerline at Station 656+25, Project S355-97-0.01, F-0097(001), Wyoming County, West Virginia;

thence, northeasterly, with said proposed noncontrolled access right of way line 56 feet, more or less, to a point in the southern proposed permanent drainage easement line, said point being 60 feet right of and at right angle to centerline at P.T. Station 656+78.90 ;

thence, southeasterly, with said proposed permanent drainage easement line 62 feet, more or less, to a point in the northern existing right of way line of the Norfolk and Western Railroad Company, said point being 122 feet right of and at right angle to centerline at P.T. Station 656+78.90;

thence, southwesterly, with said existing railroad right of way line 57 feet, more or less, to a point in the southern proposed permanent drainage easement line, said point being 120 feet radially right of centerline at Station 656+25;

thence, northwesterly, with said proposed permanent drainage easement line 67 feet, more or less, to the place of beginning and containing 3,613 square feet, more or less.

The tracts of land hereinabove described are a portion of that same real estate conveyed unto John Smith, from Georgia Pacific Corporation, by deed dated February 9, 1976, of record in the Office of the Clerk of the County Commission of Wyoming County, West Virginia, in Deed Book 300 at Page 128.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 313
ASBESTOS INSPECTION REPORTS
November 14, 2019
Supersedes October 1, 2006

This Design Directive provides guidance on when an asbestos inspection report is necessary, procedures for obtaining someone to do an inspection and prepare a Complete Inspection Report, a standard format for the report, procedures for preparing a Contract Bidding Report to be included in the proposal, and a quality control compliance plan to confirm accuracy and thoroughness of the reports.

10. Determining when an Asbestos Inspection Report is required:

An Asbestos Inspection is required on any structure, as defined, and listed below, when that structure is to be renovated or demolished. A structure is defined by state law as "A building or other man-made structure means a building or a part of a building or a group of buildings on the same premises, or any other type of man-made construction, such as a pipeline, barn, shed, trailer, or appurtenance to a building or man-made structure."

Buildings (residential, commercial, industrial, or storage)
Houses
Sheds
Barns
Garages
Trailers or Mobile Homes
Bridges
Pipelines (utility)
Lighted sign structures
Light structures
Any other structure that may contain asbestos

20. Obtaining an Inspection:

20.1 The Project Manager shall contact the Consultant Services Group of the Engineering Division via email at doh.consultantservices@wv.gov to request an asbestos inspector be selected. The email should be prominently marked **ATTN: Asbestos Coordinator**. The Engineering Division currently has two resources for obtaining an asbestos inspection report; *Division of Highways Inspectors* (already employed in each of the Districts) and from a list of Prequalified *Asbestos Inspection Firms*. The Division of Highways Inspectors are to only inspect bridge structures.

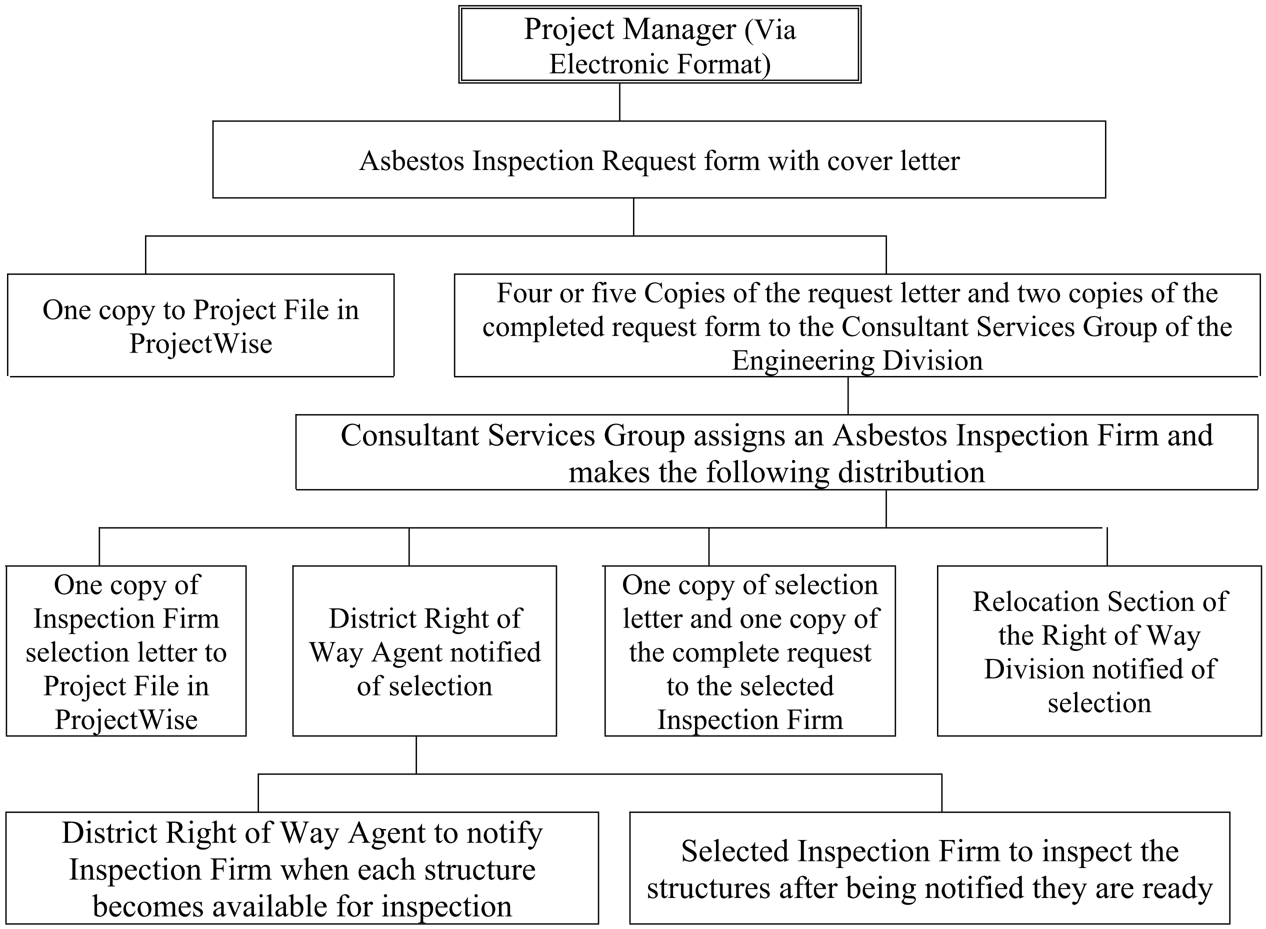
20.2 To submit a request the Project Manager shall provide the Consultant Services Group with a memo on or before the RW-3 submission. Provide the following information for each structure that is to be purchased and inspected (see Page 12 of 12):

Project Manager (name and contact information)
State Project Number
Federal R/W Number (if applicable)
Building Demolition Number (assigned per DD-709). If the structure does not have a building demolition number, the Project Manager must assign a number to the structure before the inspection can be requested.
Street address of the structure
Short description of the project purpose (demolition, renovation)
Half-scale plan sheet indicating the affected structure(s)
Labeled photos of the front of each Structure

20.3 The Consultant Services Group Asbestos Coordinator will select and assign one firm for the entire project. This firm will be responsible for the inspection of all applicable structures purchased within the right of way. The District Right of Way Agent working with the project will be given the contact information of the Inspection Firm and will notify the firm as the structure(s) becomes available for inspection. The Right of Way Agent shall maximize the number of structures in the notifications so that the Inspection Firm can minimize the number of trips to the field to obtain the samples. The Inspection Firm will coordinate with the District Right of Way Agent for the keys to obtain access into the structures.

The following flow chart shows the required distribution of the asbestos inspection request and project information.

<u>Asbestos Inspection Request Flow Chart:</u>



30. Asbestos Inspector and Inspection Requirements:

An Asbestos Inspector and the Inspection must comply with Title 64 of the West Virginia Code of State Rules Series 63.

40. Inspection Report Format:

The Project Manager is responsible for reviewing the inspection reports after they are submitted. This section gives a format and suggestions to aid in this review. Asbestos Inspection reports shall be submitted as two separate documents; a *Contract Bidding Report* and a *Complete Inspection Report*.

40.1 Contract Bidding Report: The contract bidding report shall be included in the contract proposal when the project is advertised for bid. This report shall consist of the following:

a. *Title page* - This shall be on the Inspection Firm's company letterhead bearing the project name, state project number, federal right of way number, building demolition numbers, and date. The narrative shall contain description, sampling protocol, and any other pertinent information. The report shall be signed by the report's author and the firm's internal reviewer. The narrative shall state that *'This report is for the solicitation of bids; a complete inspection report will be provided at the pre-construction meeting'*.

b. *Summary Table* - Only structures that contain positive samples are included in this report. The table shall contain the project name, state project number, building demolition numbers, address, structure description, material description, sample number, location, approximate quantity in linear feet or square feet or cubic feet, and percent asbestos. This table does not show samples taken that did not contain asbestos (see Page 8 of 12).

c. *Floor Plan* - One floor plan for each level of the structure that had samples containing asbestos showing the sample locations and numbers with the building demolition numbers and the room name or number. Asbestos containing material (ACM) shall be shown as a colored circle. The floor plans shall be arranged in the order the structures are shown in the Summary Table (see Page 9 of 12).

d. *Plan Sheet* - Shall be an 8.5 x 11 photocopy (not reduced) of the plan sheet showing the structure(s). The plan sheet shall show only the structure(s) with positive samples as crosshatched and labeled with the building demolition number.

e. Color photos of the positive sample locations and the front of the structure shall be included.

f. Photocopy of inspector's license and current certification and a photocopy of the testing laboratory's license and current certification.

40.2 Complete Inspection Report: The complete asbestos inspection report shall comply with the following requirements, in addition to any state and/or federal regulations.

Section I:

a. Title page shall be on company letterhead bearing the project name, state project number, federal right of way number, building demolition numbers, and date. A narrative containing description, sampling protocol, and any pertinent information and signatures of the report's author and the firm's internal reviewer.

b. Table of Contents.

c. Master Summary Table shall be complete with all structures inspected and shall contain the project name, state project number, building demolition numbers, address, structure description, material description, sample numbers, location, approximate quantity represented in linear feet or square feet or cubic feet of all materials assumed to contain asbestos that were sampled, and percent asbestos found (see Page 10 of 12).

Section II: Each structure shall have its own section arranged in the order of the structures in the Master Summary Table.

a. Vicinity Map.

a. Plan sheet shall be an 8.5 x 11 photocopy (not reduced) of the plan sheet showing the structure(s) that were sampled as cross hatched and labeled with the building demolition number.

b. Homogeneous area tables shall detail the location and approximate quantity represented in linear feet or square feet or cubic feet of all materials assumed to contain asbestos that were sampled.

c. Sample table shall show all samples taken with a unique identifying sample number and homogeneous area (see Page 10 of 12).

d. Floor plan(s) for each level of structure, with sample locations labeled and shown as positive (colored circle) or negative (empty circle) (see Page 11of 12).

e. Color photos of the front of the structure and each of the sample locations and numbers.

Section III: All lab testing and chain of custody numbers shall match sample numbers (Indexed).

a. Laboratory sample results and chain of custody record.

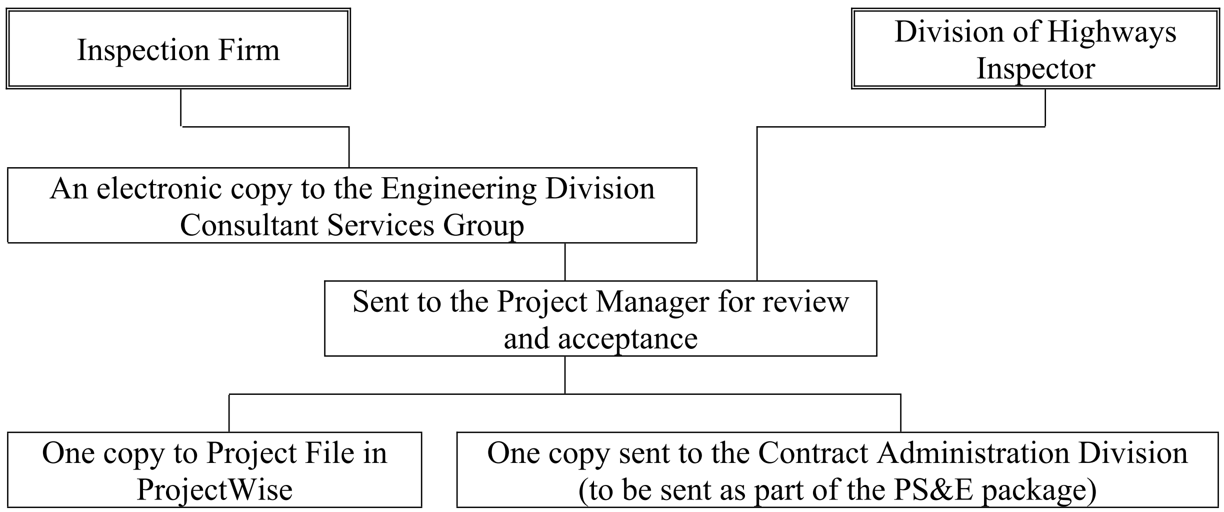
b. Photocopy of inspector's license and current certification.

c. Photocopy of laboratory's license and current certification.

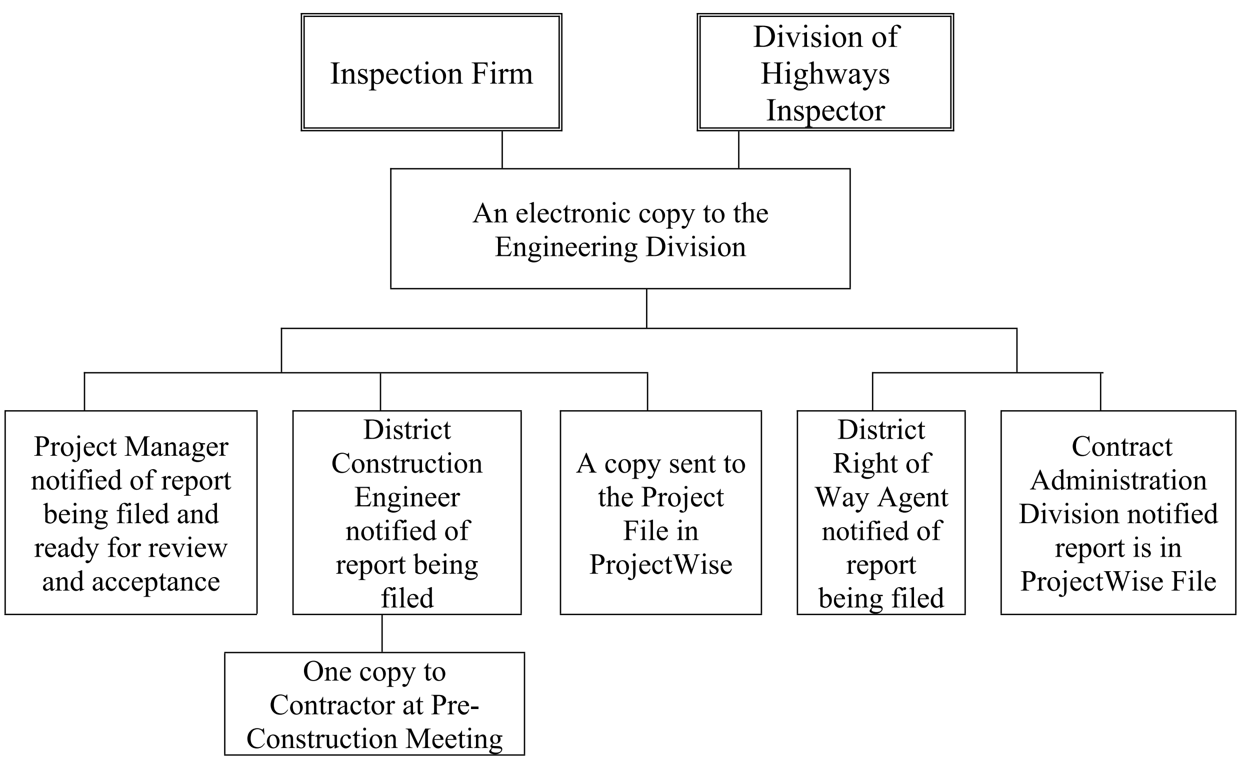
d. Copy of Inspectors' Field Sample Sheets.

<u>50. Report Distribution:</u>

50.1 Contract Bidding Report:



50.2 Complete Asbestos Report:



60. Inspection Standards Compliance:

As part of the Engineering Division's quality control program, random asbestos reports will be audited. The audit will include, but not be limited to, a clerical review, a structure review, and a sampling and testing results review.

The clerical review will verify that the report has been prepared using the standard format and is clear and concise. The building demolition number, sample and room numbers must be consistent and should cross-reference from the structure section with photo, sample table, floor plan, chain-of-custody, and laboratory testing results.

The structure review will be performed shortly after the report is submitted and before the bidding advertisement. This review will be to verify each sample from the report is clearly marked on the structure, each sample location was photographed, and is consistent with the floor plan. Samples will be taken nearby the marked samples for a laboratory audit. The location map and structure address will be checked for accuracy. The Engineering Division auditor will inspect the structure for possible presumed ACM that has not been sampled and obtain samples to be lab tested if needed.

The sampling and testing results review will be a check of the certified sampling laboratory with comparative sample testing.

Project Name:
State Project:
Federal Project:

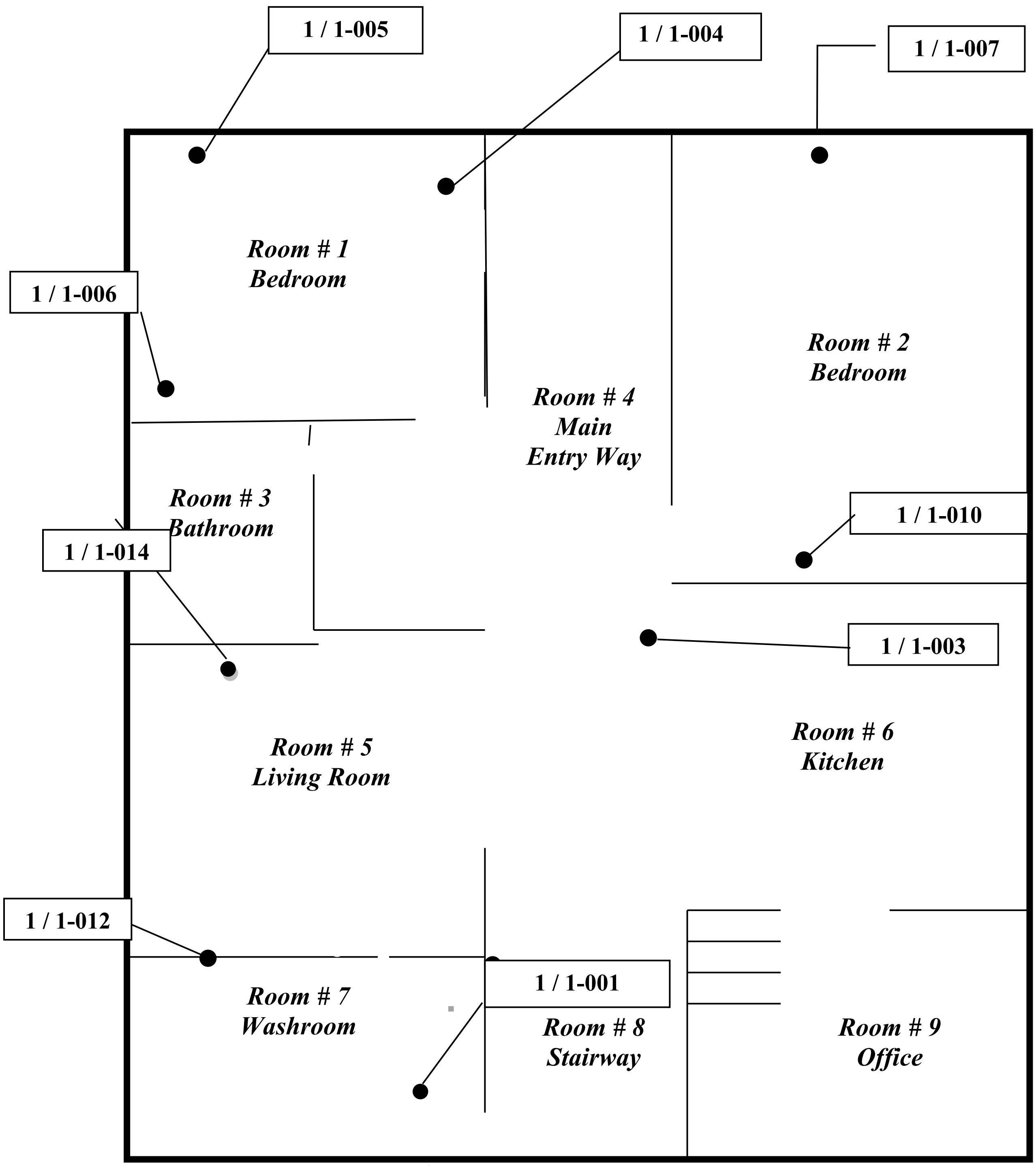
EXAMPLE OF A ***SUMMARY TABLE FOR THE CONTRACT BIDDING REPORT***

BLDG DEMO NUMBER	**ADDRESS**	**STRUCTURE DESCRIPTION**	**SAMPLE NUMBER**	**QUANTITY REPRESENTED**	**MATERIAL DESCRIPTION/ LOCATION**	**% ASBESTOS**
BLDG 1/1	174 King St.	1 Story Brick	1/1-001 THRU 1/1-003	250 FT. ^{2}	Yellow Linoleum Room #7	38
			1/1-004 THRU 1/1-011	1005 FT. ^{2}	Plaster/Rooms #1, 2, 3	5
			1/1-012 THRU 1/1-014	250 FT. ^{2}	Brown Linoleum Layer 2nd layer of 3 Room #4	38
BLDG 5/1	122 King St.	1 Story Brick	5/1-001 THRU 5/1-015	1005 FT. ^{2}	HVAC Insulation Throughout System	10

Project Name:
State Project:
Federal Project:
BLDG 1/1

Sample Floor Plan
For Contract Bidding Report

Key ● = Asbestos



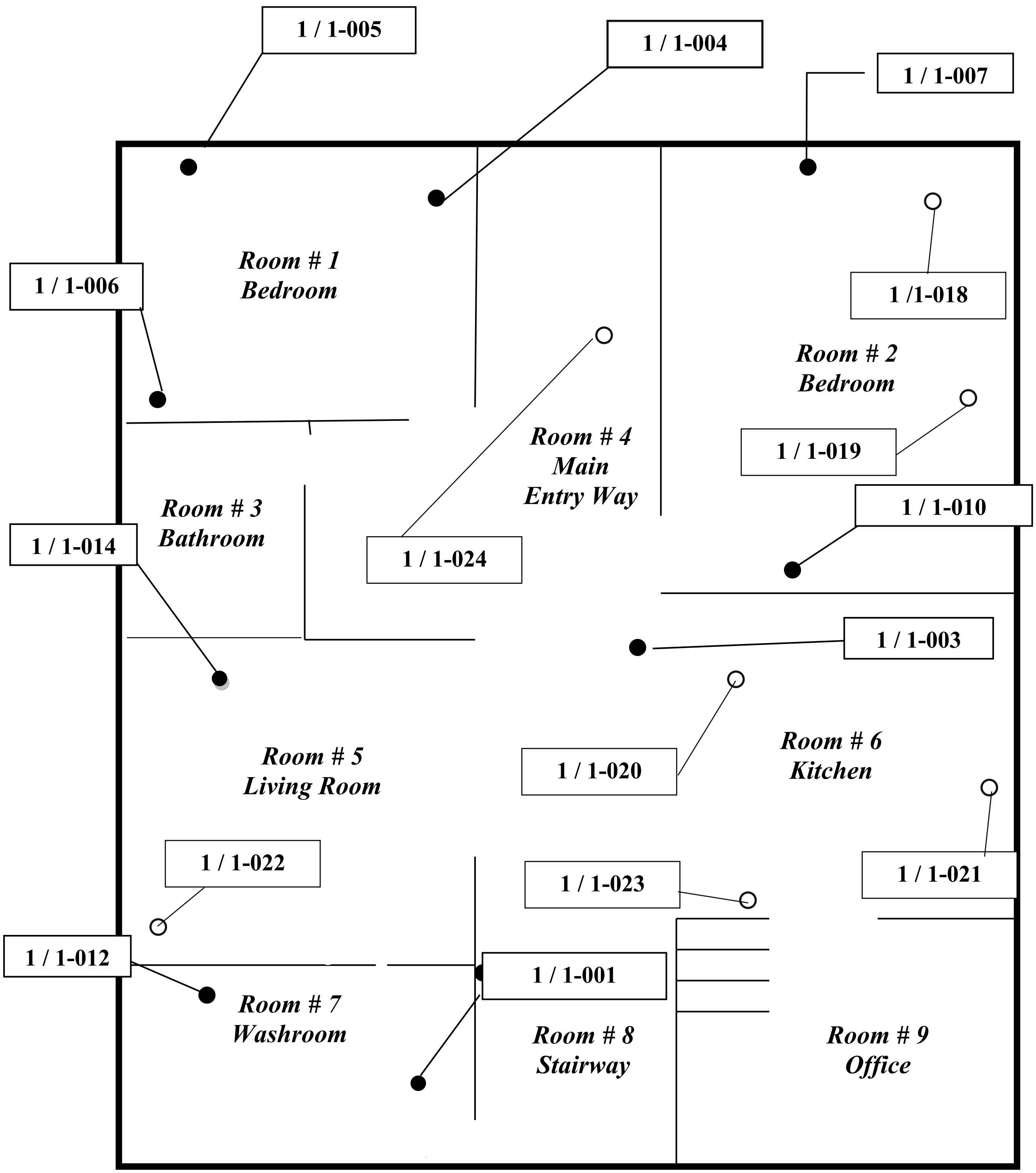
Project Name:
State Project:
Federal Project:

EXAMPLE OF A MASTER SUMMARY TABLE FOR THE COMPLETE INSPECTION REPORT

BLDG DEMO NUMBER	ADDRESS	STRUCTURE DESCRIPTION	SAMPLE NUMBER	QUANTITY REPRESENTED	MATERIAL DESCRIPTION/ LOCATION	% ASBESTOS
BLDG 1/1	174 King St.	1 Story Brick House	1/1-001 THRU 1/1-003	250 FT. ^{2}	Yellow Linoleum Room #7	38
			1/1-004 THRU 1/1-011	1005 FT. ^{2}	Plaster/Rooms #1, 2, 3	5
			1/1-012 THRU 1/1-014	250 FT. ^{2}	Brown Linoleum Layer 2nd layer of 3 Room #4	38
			1/1-015 Thru 1/1-017	1500 FT. ^{2}	Attic Insulation	0
			1/1-018 Thru 1/1-021	625 FT.^{2}	Ceiling Plaster, Rooms #2, 9	0
			1/1-022 Thru 1/1-024	900 FT.^{2}	Ceiling Plaster, Rooms #4, 5, 6	0
BLDG 1/2	174 King St.	Wood Frame Storage Building	**NONE TAKEN**	--	**NO SUSPECT ACM FOUND**	**0**
BLDG 5/1	122 King St.	1 Story Brick House	5/1-022 Thru 1/1-024	1005 FT ^{2}	HVAC Insulation Throughout System	**10**
BLDG 5/2	122 King St.	Wood Frame Storage Building	**NONE TAKEN**	--	**NO SUSPECT ACM FOUND**	**0**
BLDG 7/1	180 King St.	1 Story Frame House	7/1-001 THRU 7/1-014	925 FT ^{2}	Brown Floor Tile, Rooms #1 thru 4	0
			7/1-015 THRU 7/1-021	765 FT	Ceiling Plaster, Rooms #4, 5, 6	**0**
			7/1-022 THRU 7/1-034	1100 FT 2	Wall Plaster, Rooms #1, 3, 5, 6 and 8	**0**

Project Name:
State Project:
Federal Project:
BLDG 1/1

Sample Floor Plan
For Complete Inspection Report
Key ○ = No Asbestos ● = Asbestos



ASBESTOS INSPECTION REQUEST FORM

Project Name	**State Project #**	**Federal R/W #**	**Date Requested:**
			Date Requested By:

Contact Information

Project Manager:	**Phone:**
Org. #	**Fax:**
email:	

Project Information

Building Demo Number	Structure Description	Street Address	R/W Plan Sheet #(s)

Send this **completed** form and 2 copies of the Right of Way Plan Sheets to the Consultant Services Group of the Engineering Division, Attention Asbestos Inspection Coordinator.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-401
PROCEDURE FOR CORE BORING CONTRACTS
July 1, 2006

The following procedure has been established to facilitate the development and review of core boring programs and related documents. While the procedure spells out steps to be taken by Consultants, generally the procedures apply equally well to plans developed by Division of Highways personnel.

Attachments

PROCEDURE FOR CORE BORING CONTRACTS

1. Prepare core boring layout and contract documents. The boring layout may be done on available mapping or on plans. Contract documents and specifications are available from the Division. The exact specifications as furnished by the Division shall be used and supplemented by special provisions as needed on individual projects.

2. The Consultant shall submit to the Director of Engineering Division, for review and approval two copies of the layouts, contract documents, specifications and special provisions. All forms are to be completed except for the Free Competitive Bidding Affidavit and any form requiring dates.

3. In addition to the items mentioned above, the Consultant shall submit two copies of the following:

    a. Detailed cost estimate;

    b. List of prospective bidders (if negotiating); and

    c. Time table of proposed work.

4. Upon approval by the Division, the Consultant will be given verbal authorization (followed by written confirmation) to advertise and receive bids for the proposed work. The advertisement shall include the following statement:

    "The West Virginia Department of Transportation, Division of Highways hereby notifies all bidders that it will affirmatively insure that in any contract entered into, pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award."

5. The legal requirements of the Division can be satisfied by advertising once a week for three consecutive weeks in two newspapers that are circulated in the area where the work is to be performed. In addition, the Division encourages other forms of advertising, such as trade publications, construction advertising services, etc.

6. With the approval of the Division, the Consultant may solicit quotes from core boring contractors on certain projects. A minimum of three quotes are required.

7. In addition to fulfilling the criteria outlined in Items 2 and 3 above, the Consultant is to provide the Division with copies of all letters of invitation to bid.

8. In both the advertisement and solicitation cases, the Consultant is to inform the Division of the date, time and place where bids are to be received and opened.

9. Upon determination of the low bidder the Consultant shall inform the Division of such, with a recommendation that the bid be accepted. The Consultant shall submit three copies of all bid tabulations and a statement that all contract documents have been properly and fully completed.

10. The Consultant shall advise all bidders of the outcome and enclose a copy of the bid tabulation. Except for the three lowest bidders, all bid bonds or certified checks are to be returned. The bonds or checks of the three lowest bidders will be returned as soon as the contract bond has been furnished and the contract has been executed.

11. The Consultant shall advise the low bidder that the contract has been awarded once approval has been received from the Division.

12. Once the low bidder has furnished the Consultant with the performance bond, certificate or insurance and certificate of West Virginia Workmen's Compensation; the Consultant shall submit two copies of **all** documents, specifications and plans to the Division with a request to issue a "Notice to Proceed."

13. Upon receipt of approval by the Division, the Consultant shall issue a formal "Notice to Proceed." The Contractor is to advise you in advance of starting work so that arrangements for inspection can be completed.

14. Contractor may submit partial invoices at thirty day intervals. The Consultant shall verify all work by the Contractor prior to paying any invoice. Bid items of the boring contract may be invoiced to the Division using the complete invoice and BF-2 Form, on the basis of thirty day intervals or a $1,000,000 minimum, in the event no Consultant items under the design contract are to be invoiced. A **paid** invoice from the Contractor **must** accompany the Consultant's invoice.

15. The Consultant shall submit the final invoice from the Contractor upon completion and acceptance of all work. The Contractor's invoice must show amounts previously withheld. The Consultant shall return the contract bond with final payment.

16. The Consultant or his Contractor will be required to notify the appropriate Corps of Engineers District their intent to do core drilling operations on a navigable waterway in order that a "Notice to Navigators" can be issued. See Appendix A for a listing of navigable waters and addresses of the Corps of Engineers Districts.

17. Core drilling operations are covered by a nationwide permit on all streams and rivers. However, a State 401 Water Quality Certification is required on certain streams and rivers. The Division will be responsible for acquiring this certification prior to commencement of any drilling operations.

18. A listing of Core Boring Subcontractors will no longer be published as a Design Directive. However, a current listing will be maintained in the Engineering Division office and is available upon request. As in the past, this listing will not preclude other firms from bidding.

19. The Consultant, nor a core boring firm that is providing geotechnical services to a Consultant, **will not** be permitted to bid or be solicited to bid any core drilling contract on that project.

APPENDIX A

Core drilling operations on a navigable waterway are covered by a Nationwide Permit. However, the driller must send a letter to the Corps of Engineers of their intent to work in the waterway at least two weeks prior to commencing operations. This letter is to include location, starting and ending dates as well as a contact person. The Corps of Engineers will issue a "Notice to Navigators" of the proposed work. This notice has to be issued a minimum of two weeks before work may proceed.

River	Length From Mouth
Ohio River	Entire Length
Kanawha River	Entire Length
Big Sandy River	10.0 Miles
Elk River	4.5 Miles
Guyandotte River	1.0 Mile
Little Kanawha River	14.0 Miles

Letters notifying the Corps of Engineers of proposed core drilling within the limits of the above rivers are to be addressed as follows:

Ms. Ginger Mullens, Chief
Regulatory Branch
Huntington District, Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701-2070

The Pittsburgh Corps of Engineers District is to be notified of core drilling on the following navigable rivers:

River	Length From Mouth
Ohio River	Entire Length
Monongahela River	Entire Length
Tygart Valley River	3.0 Miles
West Fork River	2.0 Miles

Letters are to be sent to:

Mr. Michael Cummings, Chief Regulatory Branch
US Army Corps of Engineers, Pittsburgh District
William S. Moorhead Federal Building
100 Liberty Avenue
Pittsburgh, Pennsylvania 15222-4186

The dividing line between the Huntington and Pittsburgh Districts on the Ohio River is the most southern corporation line of New Martinsville.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-402
SOIL AND GEOLOGIC DATA
December 23, 2005

The "Soil and Geologic Data" shall be prepared in accordance to the following guidelines:

1. The West Virginia standardized symbols shall be presented on a preface sheet, an example of which is attached, and are to be used to depict the soil, rock and other information on the plan view and the graphical presentation of the borings.

2. A plan view of the borings shall be prepared on contour mapping, where such mapping is available. The preferable mapping is 1"=50' scale with 2' contours, reduced to 1"=100' scale. The second choice is 1"=200' scale mapping with 5' contours. If no mapping is available, reproducibles of the plan sheets shall be used. The plan view shall be incorporated into the plans and noted "For Informational Purposes." A reproducible of the roadway profile is to be included showing all borings plotted at the appropriate elevation and scale.

3. Boring logs and tests shall be bound separately and referenced as an attachment to the soils report. Ten sets shall be submitted.

4. The designer shall submit along with any plans containing a recommended slope design for review, cross sections with the borings plotted thereon and utilizing the appropriate symbols indicated on the preface sheet.

   The graphical presentation of borings shall be no less than 0.2" nor more than 0.4" in width.

   The designer shall also submit all work profiles and summaries of the borings and test data developed during his studies. It is desirable that the summaries include the interpretations of the soils engineer and/or geologist of all borings in both soil and rock. Also all calculations and analyses utilized in the development of designs for soil slope and foundation stability shall be submitted.

   The borings shall be shown on the final cross-sections included in the contract plans with appropriate statements on the plans that they are for informational purposes.

5. Three draft copies of the narrative report shall be presented with the final field review plans and five copies of the final narrative report shall be presented with the final plan submission. Additionally, a set of five compact discs containing the final narrative report in Portable Document Format (PDF) shall be presented with the final plan submission. The narrative shall summarize all the studies and include the recommendation used for design along with supporting data used.

6. The designer shall prepare cut bench profiles and submit for review at final field and final office review stages. The cut bench profiles shall be included in final contract plans.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-403
GUIDE FOR DESIGN IN CUT
SECTIONS THROUGH BEDROCK
July 1, 2006

Transmitted herewith for your information and use is the Guide for Design In Cut Sections Through Bedrock, dated July 1, 2006.

Attachment

GUIDE FOR DESIGN IN CUT SECTIONS THROUGH BEDROCK

July 1, 2006

CONTENTS

INTRODUCTION

This cut slope design guide for bedrock is general in nature and is intended to provide some of the philosophy for designing bedrock cuts. These guidelines are not inflexible. Design guidance for all situations is not to be expected.

This guide has been developed over many years and to provide some insight into past concepts that still hold true, excerpts from R. F. Baker's presentation at the "3rd Annual Symposium of Geology as Applied to Highway Engineering" held in February of 1952 are as follows:

> "One of the most troublesome problems in the design of highways in West Virginia is the proper slope to be used in rock excavations. The problem is confused by several factors. One of these is the wide variety of sedimentary rocks that are present. The formations range in strength from the indurated clays of the Creston Red Shales of the Dunkard Series to the hard limestones of the Greenbrier formation and the equally hard Berea Sandstone of the Portage Series.
>
> West Virginia like all other states must satisfy the tug-of-war between the construction and maintenance costs. If construction costs were no problem it would be simple to design a road that was maintenance free insofar as the rock cuts are concerned. The ideal solution, however, is to cut construction costs until there is no more excavation than necessary to achieve a condition requiring no maintenance."

PRINCIPLES OF SLOPE DESIGN IN ROCK CUTS

Initially, it would be well to summarize some of the basic principles that are involved in arriving at the proper design of slopes in rock excavation. These principles are essential to a highway problem but may not be applicable to other types of problems.

1. The primary purpose of a good design is to eliminate or minimize maintenance costs due to the weathering of exposed bedrock. One should remember that if this purpose is not fundamental, there is no problem to designing slopes. The debris from the exposed face tends to (1) clog ditches that result in pavement failures, (2) block shoulders that lead to a more dangerous and less useable highway, and (3) produce rock-falls onto the pavement proper, leading to dangerous conditions for drivers and vehicles.

2. The constructed slope must be as steep as possible in order to keep construction costs at a minimum. This second requirement combined with the first forms the bracket for the design problem. One factor that influences the design is the relative costs of removing material by contract versus that of maintenance. In West Virginia the cost per cubic yard of excavation by contract ranges from 1/3 to 1/4 that required for maintenance forces to remove the debris. The figure will vary from state to state, but contract work will be less expensive due to the larger quantities involved with contract work, and the more localized nature of the earth moving.

3. The proper design of slopes is directly related to the physical characteristics of the bedrock. While there can be little argument with this statement, there is considerable question as to what measurable characteristic of the bedrock is most suitable for correlation with the slope design problem. In addition, the effects of climate, type of blasting, and erosion are related to the proper slope design. It is the opinion of the writer that there is no reliable technique for determining the ultimate slope of an exposed bedrock, unless there is an exposure of the same material in the same area and the exposure has been open for a period practically equivalent to the design life of the proposed grade.

Through experience, field reconnaissance, and the use of proper references, an adequate design can be completed. The need to observe and study existing cuts and natural slopes cannot be over emphasized.

REFERENCE MATERIAL

The West Virginia Geological and Economic Survey has numerous maps and books that detail the bedrock characteristics of the State. Many counties have been surveyed by the Natural Resources Conservation Service, and reports have been compiled that describe the engineering characteristics of the soils.

The Federal Highway Administration sponsors research into rock and soil design. This research has been used to prepare manuals that recommend design procedures. One such manual, detailing rock slope design, is Rock Slopes: Design, Excavation, Stabilization, No. FHWA-TS-89-045. A useful reference to help in the designing of soil cuts is Landslides, Analysis and Control, Special Report 176, sponsored by the Transportation Research Board, National Academy of Sciences.

Rock and soil mechanics text books are excellent sources of design information.

GEOLOGIC DESIGN INFLUENCES

Red Shales

Cuts to be designed in the red shale beds of the State must be carefully considered, or there will be future maintenance problems. These shales can weather rapidly and contain weaknesses that are zones of possible failure. It is not unusual to find slickened surfaces from past movement. Slopes in this material generally must be 1:1 or flatter to ensure adequate performance. It is mandatory that areas of proposed cuts be field checked and existing slope areas be studied.

A large percentage of the red shale beds are found in the Division of Highways Districts 1, 3, 4, 6 and 7.

Sandstone

Massive sandstone beds can generally be designed with steep slopes -½:1 and steeper. Seldom does the lithology and composition of the rock require slopes to be flatter. However, many times the structure of the rock will dictate flatter slopes.

Many massive sandstone beds are located in the counties south of the Kanawha and New Rivers.

Limestone

Another major concern for the road designer is the limestone bedrock of the State. The eastern counties of the State - Monroe, Greenbrier, Pocahontas, Randolph, Pendleton, Berkeley and Jefferson Counties - contain major outcroppings of limestone. Cuts must be designed considering the solution channels and residual clay soils. These conditions must be evaluated in design to prevent post-construction failures that result from sink holes, slope collapse, and erosion.

Permian Period Bedrocks

In the northwest area of the State, Jackson County north to Ohio County and eastward as far as Doddridge County, there is a collection of bedrock that is possibly of the Permian Period. The strata requires detailed study to ensure stable designs. Many of the shales are weak and the soils that form from them are prone to instability. Slopes must generally be flattened and benches used to catch debris. Designs generated for this area should be verified by field observations of existing slopes.

Lake Sediments

Two areas of the State have major remnants of ancient lake deposits. These sediments are unstable, and many landslides have formed.

One area is located along the Monongahela, Cheat, West Fork, and Tygart Valley rivers. In addition, some lake soils may be found along smaller tributaries. These soils were deposited in an ice age lake, Lake Monongahela. The lake covered major portions of Monongalia, Marion, and Preston Counties. Isolated areas of sediments are found in adjacent counties.

The other major lake deposits are found along a valley that runs through portions of Kanawha, Putnam, Cabell, and Wayne Counties. These deposits resulted when Teays Lake existed.

Proposed cuts for the areas where these lakes existed must be designed taking into consideration the highly unstable soils that occur there. A designer must ensure that evaluations have taken into consideration high clay percentages, low shear strengths, high liquid limits, and high moisture contents before a design is finalized. Slopes of 5:1 have failed in these deposits.

DESIGN OF CUTS IN BEDROCK

Bedrock Type

Four bedrock types are considered in the cut slope design. The types are not classified along distinct geologic standards; rather, they are typed according to slope angles considered appropriate. Thus Type 1 encompasses rock that will stand on a 1/6:1 slope. Type 2 is rock that can be cut at ½:1. Type 3 is rock that will stand on ¾:1. Type 4 is rock that will stand on 1:1.

Type 1 - Hard and Medium-Hard Limestone and Sandstone and Hard Shale Compressive Strength: 8000 and above psi.

This bedrock occurs in massive and laminated formations varying in the degree of dip. In some instances, soft seams of other types of material, such as coal or shale, may occur.

Some types of shale are harder and more resistant to weathering than medium-hard sandstone. These shales are basically located in the eastern portion of the State and are in Ordovician, Silurian and Devonian time periods. The Slake Durability Index of these shales should be above 95 percent.

Type 2 - Soft Limestones and Sandstones, Medium-Hard Shale and Siltstone or Interbedded Combinations. Compressive Strength: 4000-8000 psi.

This classification encompasses a large percentage of the material encountered in West Virginia. In many areas of the State, coal and soft shale seams are prevalent in these formations.

The Slake Durability Index of the shale in this type would be between 51 and 94 percent.

Type 3 - Soft Shale Interbedded with Siltstone, Sandstone or Limestone. Compressive Strength: 1000-4000 psi.

The shale beds in this bedrock are not massive and the interbedded, harder bedrock may vary significantly in thickness. Without the interbedded seams of siltstone, sandstone or limestone, this would be a Type 4 bedrock.

Type 4 - Soft and Very Soft Shale. Compressive Strength: 1000 psi.

These shales, especially the very soft ones, are considered indurated clays by some when fissility is lacking. When soaked in water, they usually disintegrate into particles quite rapidly. The Slake Durability Index for these shales would be between 0 and 50 percent.

The beds of this rock are usually massive and do not contain interbedded seams of siltstone or sandstone. However, there may be seams or harder shales.

Dip

A major portion of the State's bedrock design will be in areas where the dip is flat, usually 5° or less.

There are localized areas within the southern, central and northern parts of the State where the bedrock dip may exceed 5°. In the Eastern Panhandle and along the eastern border there are extensive areas where the dip is in excess of 5°.

When the bedrock is flat, the design slope ratios and benches will generally follow the design guide chart.

On projects that contain bedrock with dips that are in excess of 5°, it will be necessary to determine the relationship between the dip and the roadway centerline. The orientation of these features will influence the design.

Bedrock dipping into the roadway may require the use of a slope ratio that equals the dip angle, otherwise rock slides may occur. In a cut slope that contains bedrock dipping away from the roadway, it may be possible to more nearly follow the design guide chart. It should be kept in mind that the cuts made in dipping bedrock may have rough slopes and irregularly shaped benches.

The angle between the dipping bedrock and the roadway can occur at a multitude of values, therefore, it may be necessary for the designer to devise several alternatives.

Fractures

When faults and joints are encountered, they must be considered in the design. In many cases the design may be treated as in dipping bedrock. Also, reference should be made to rock mechanics manuals. Several have been sponsored by the FHWA and are in print.

Benching and Backslopes

Slopes designed on a ratio of 2:1 or flatter normally will not require benches. The main purpose to include benches would be to catch boulders that might roll down the slope.

Slopes designed on a ratio of 1½:1 generally should have a bench near the roadway grade. However, if it is felt that eroded material from the slopes will be minimal and rolling boulders will not be a problem, the low bench could be deleted. Intermediate benches may be necessary if strata are present from which boulders could be formed. These benches should be located along the base of the boulder generating zones.

Generally, slopes designed with ratios of 1:1 and steeper should have a bench 5 feet above the ditch grade and at intermediate intervals. There may be exceptions to this, especially if cuts are being designed in hard to median hard rock. In these cases the bench 5 feet above the ditch may not be required. This bench may be set at 5 feet above the ditch grade regardless of the material involved at the discretion of the Engineering Division.

Bench levels paralleling the road may be essentially horizontal and controlled by backslope height to bench width ratios or may be variable in elevation when controlled by lithology, feature attitudes, or roadway grade changes. The benches should be sloped toward the roadway on a slope of 15:1. There may be exceptions, however, these would be infrequent and would be handled as individual cases.

Bench Elevation

The height of the first bench above the ditch grade will generally be 5 feet. However, there are times when this height will be controlled by the contact surface between different strata. These contact surfaces may be the result of hardness, lithology, feature attitudes, etc. Also, there are times when the condition may be the result of a changing roadway grade. Geometrical constraints may require a bench 5 feet above the ditch even though a contact surface dictates otherwise, for example a bench to ensure sight distance. See the design guide chart for general conditions.

Bench Width

Benches are needed to provide impact areas to reduce rock rolling and to retain material weathering or sloughing from the slopes.

The first bench above the ditch and intermediate ones should not be less than 15 feet wide when used on arterial routes. On local service and collector routes the minimum width can be 10 feet.

The width of a bench used at the base of the overburden layer, along the top of the cut, may be a minimum of 10 feet for all route types.

Backslope Height

The height of slopes between benches, above the first bench, is generally held to a maximum of 50 feet. However, under certain conditions this interval may be extended to 60 feet or even 70 feet. This should only occur for limited intervals, along the roadway, when massive, competent bedrock is encountered or when slope ratios are 1½:1 or flatter.

The backslope vertical height in relation to bench width should be calculated using the following ratios:

Rock Type	Bench Width	Backslope Vertical Height
1	1	2½
2	1	2½
3	1	2¼
4	1	2

The backslope height obtained by use of this calculation should be rounded up to the next even value, if odd or fractional values are obtained.

Since changes in rock type and height of cut make it difficult to adhere to any exact ratio, the guides are suggested as an aid in determining a stable slope with minimum maintenance.

Overburden Zone

General

Materials in this zone are soils and bedrock - weathered or unweathered - that possess the stability characteristics of soil.

Preferably slopes in the overburden should be on a ratio of 2:1; however, 1½:1 ratios may be adequate in dry overburden and open terrain. The use of slopes flatter than 2:1 are not uncommon and are required in the soil portion of the overburden with weak strength parameters. The deciding factors in choosing a slope ratio will be the condition of the overburden and its properties, at the time of design, as well as that estimated for the future.

The strength parameters or the location of an overburden deposit may mandate that a detailed investigation and analysis be completed before a design is recommended. Colluvium, especially in those areas where subsurface seepage exists, requires detailed analysis. Certain regions that contain Permian red shales, lacustrine deposits, coal refuse, waste sites, reclaimed land, poorly drained soils, soft or fissured clays, impermeable soils, and landslides - active or dormant - will require detailed study before slope ratios are decided upon.

A safety factor of 1.25 is generally the minimum value acceptable for long term stability and is used for collector and local service class roads and areas where failure would not damage existing facilities of substantial cost or significance. On roads of higher class - arterial - or in areas where failure might cause damage to substantial facilities, a safety factor of 1.50 should be used.

Slope

When possible, the slope in the overburden should be on a 2:1 ratio. Flatter slopes should be considered if there is any possibility of instability. When the length of the backslope would become excessive and some sloughing could be tolerated, a ratio of 1½:1 would be acceptable. A rule of thumb definition for excessive backslope would be "a slope above the bench or the break point of a ratio break/bedrock to soil that is about 100 feet in length."

In some designs, it may be necessary to use a slope ratio steeper than 1½:1. This condition would occur where the existing ground surface is steeper than or almost equal to 1½:1. Steeper slopes would be considered when excess sloughing would not create hazardous conditions or extensive maintenance. If the steeper slopes were not used, hillside scalping would occur. These cases would be considered as economic risk areas. Sloughing of overburden would be expected, but the benches would accommodate the material with some maintenance expected.

Design Type

In most overburden design situations, one of three methods will generally be recommended for use: (1) benching; (2) ratio break/bedrock to soil (broken backslope); or (3) rounding.

Rounding is the least desirable treatment for overburden areas. Whenever possible, the ratio break/bedrock to soil should be used in lieu of the rounding. Rounding could be used when overburden is less than 5 feet deep.

If the overburden at the top of the rock cut is 5 feet to 10 feet deep, consideration should be given to using a ratio break/bedrock to soil design.

When the overburden at the top of the rock cut is over 10 feet thick, the design should generally consist of a 10-foot wide bench with a backslope on a 2:1 ratio, whenever possible.

When the overburden at the top of the rock cut is more than 10 feet thick, it may be necessary to analyze the stability of the overburden before a design is recommended. Generally, benches are necessary along with flat backslopes. In these situations, the overburden bench may have to be more than 10 feet wide.

Table of Design for Cut Sections Through Bedrock and Overburden

This table is an outline that should be followed when designing bedrock cuts. All situations are not covered, but with its use, observations of existing cuts, and the application of the state of the art soil and rock mechanics principles, an adequate design will be possible.

Upper case letters with lower case letter subscripts are used to identify slope height (H), backslopes ratios (S), and bench width (W). Subscript lettering for the design characteristics will be between a and r. The subscripts between s and w are reserved for benches and slopes in the overburden.

The base of the cut design may start from a V-ditch; however, hydraulic or geotechnical requirements may dictate alternate widths. The table outlines the use of a 4-foot wide ditch. Ditches wider than 4 feet are an exception for geotechnical reasons, and are designed on a case by case basis.

Bench widths are designed considering both backslope heights and type or roadway. Higher standard roads with high traffic volumes will require wider benches.

TABLE FOR DESIGN OF CUT SECTIONS THROUGH BEDROCK AND OVERBURDEN							
TYPE OF BEDROCK	**HEIGHT OF CUT IN FEET**	**HEIGHT BETWEEN BENCHES IN FEET**		**WIDTH OF BENCHES IN FEET**		**BACKSLOPE RATIO HORZ./VERT.**	
		Ha[1]	**Hb Hc etc.**	**Ws (min.)**	**Wb Wc etc[2]**	**Sa**	**Sb Sc etc.[4]**
1. Medium hard to hard sandstone and limestone, and hard shale	over 50	5-50	50±	10	10-20	1/6:1	1/6:1
	under 50	-----	-----	10	-----	1/6:1	-----
2. Soft sandstone, medium hard shale, soft limestone, siltstone or an interbedded combination	over 50	5-25	50±	10	10-20	3/4:1	½:1
	25-50	5-25	20-45	10	10-20	3/4:1	½:1
	under 25	-----	-----	10	-----	1:1	¾:1
3. Soft shale interbedded with siltstone, sandstone, or limestone	over 50	5	45±[3]	10	10-20	1:1	¾:1
	25-50	5	20-45	10	10-20	1:1	¾:1
	under 25	-----	-----	10	-----	1 ½:1	-----
4. Soft shale[5]	over 45	5	40±[3]	10	-----	1 ½:1	1:1
	25-45	5	20-40	10	10-20	1 ½:1	1:1
	under 25	-----	-----	10	-----	2:1	-----
NOTE: SEE NARRATIVE AND FIGURES FOR DETAILS.							

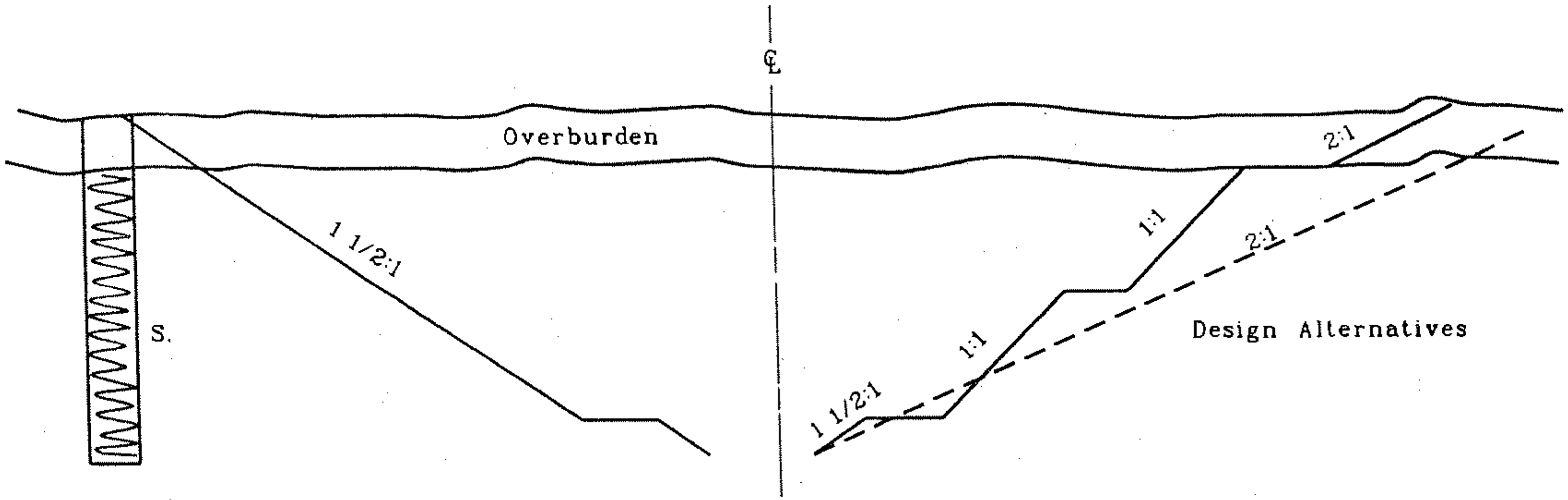
1. For Types 3 and 4, five feet may be added to Ha when a 4-foot wide roadway ditch is used. Use a minimum 4-foot roadway ditch for Type 1 when Ha is over 25 feet.

2. Roads classified as arterial should have benches designed as follows: When the backslope above the bench is 25 feet or less, use a minimum 15-foot wide bench. When the backslope above the bench is greater than 25 feet, use a minimum 20-foot wide bench. Lower standards may be used on individually determined cases.

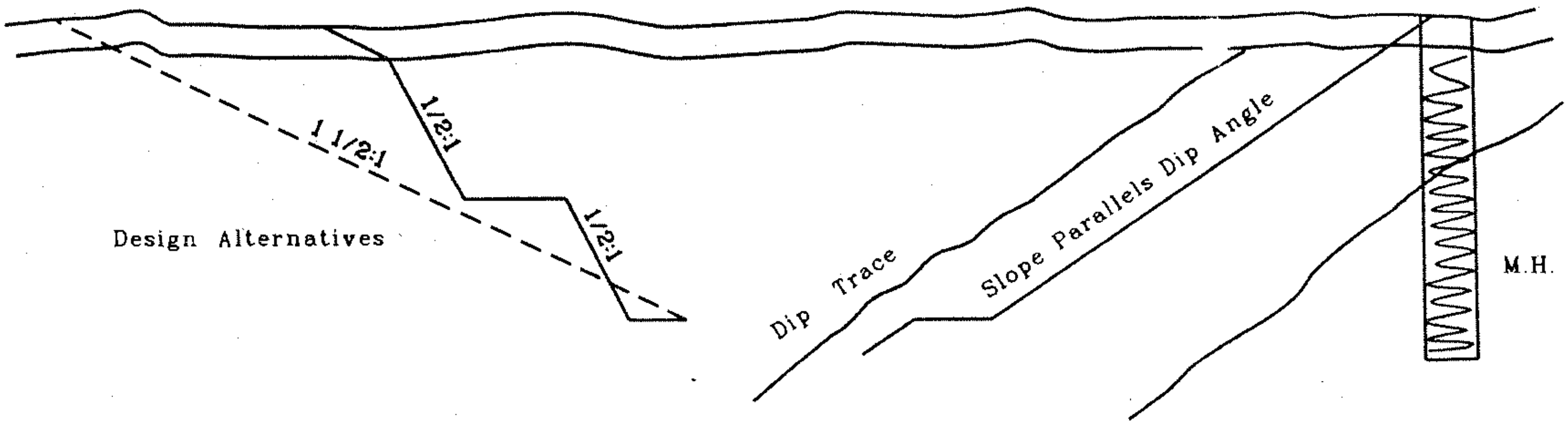
3. In individually determined cases, the slope may be daylighted on a 1½:1 or flatter ratio for heights in excess of noted maximums.

4. The slope ratio in the overburden (Ss) should be 2:1, whenever possible.

5. Alternate designs acceptable (See narrative and figures).



If boulder generation zone present, benches may be desirable.



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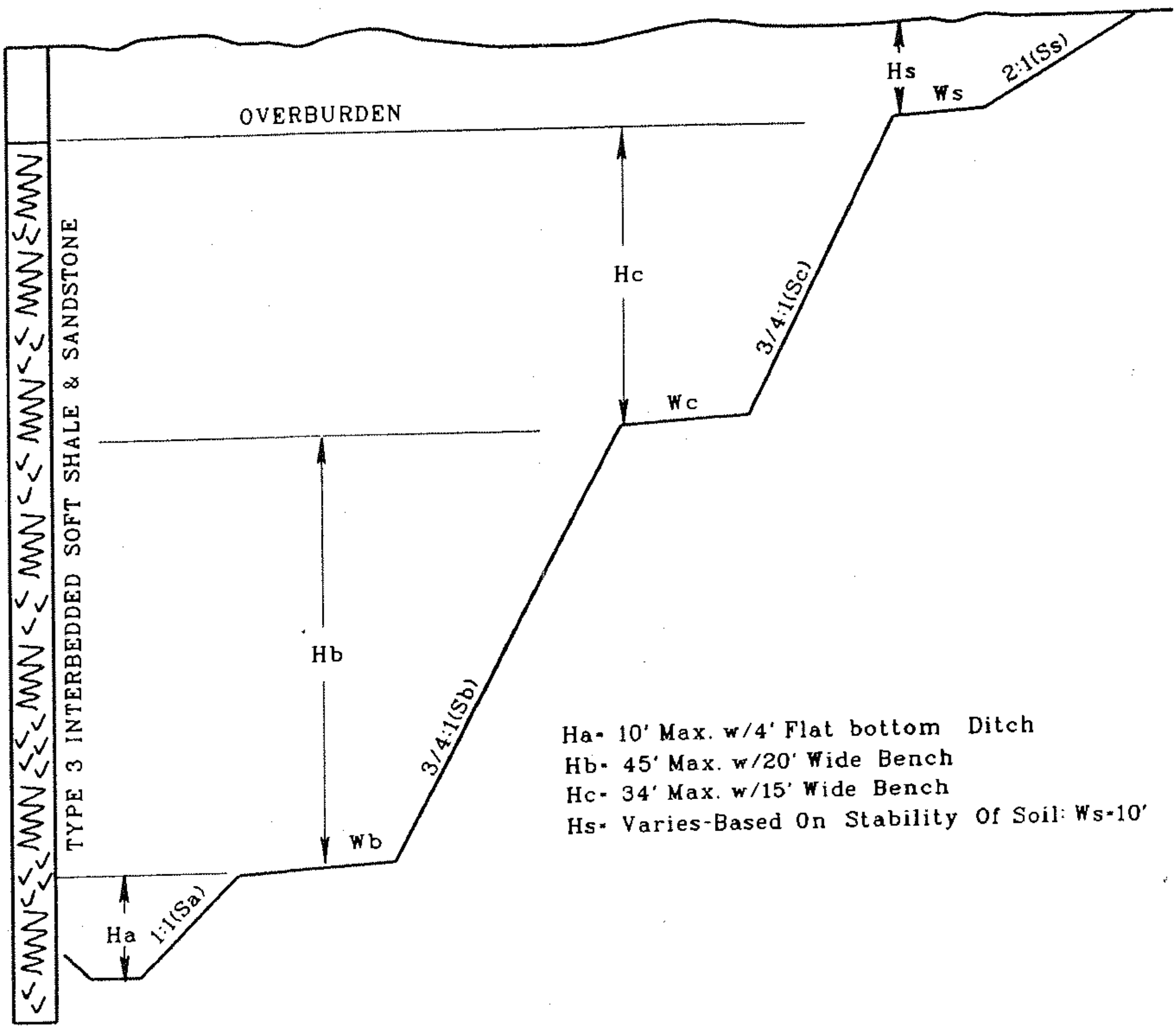
TYPE 3 BEDROCK HORIZONTAL BEDDING



Ha- 10' Max. w/4' Flat bottom Ditch
Hb- 45' Max. w/20' Wide Bench
Hc- 34' Max. w/15' Wide Bench
Hs- Varies-Based On Stability Of Soil: Ws-10'

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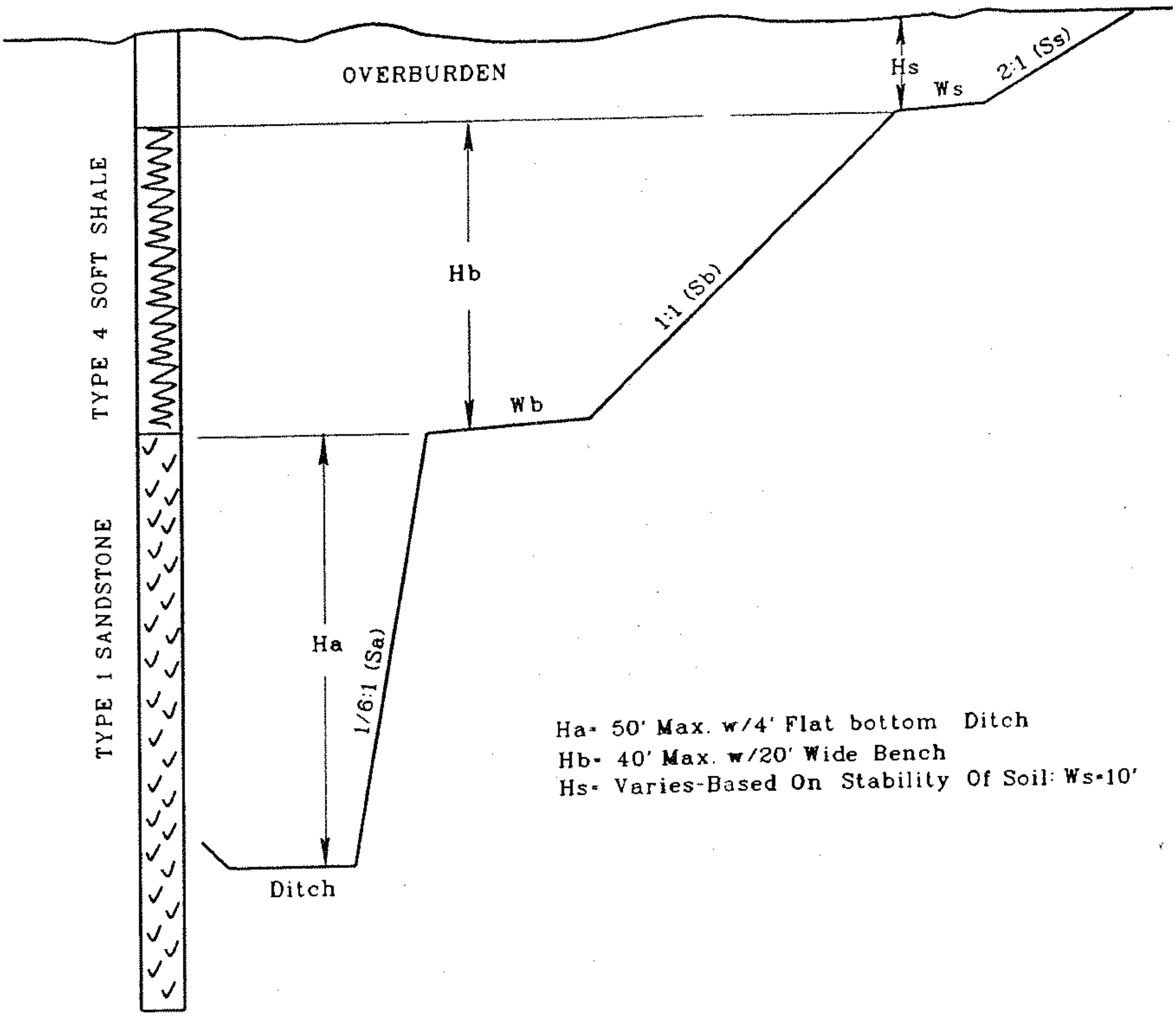
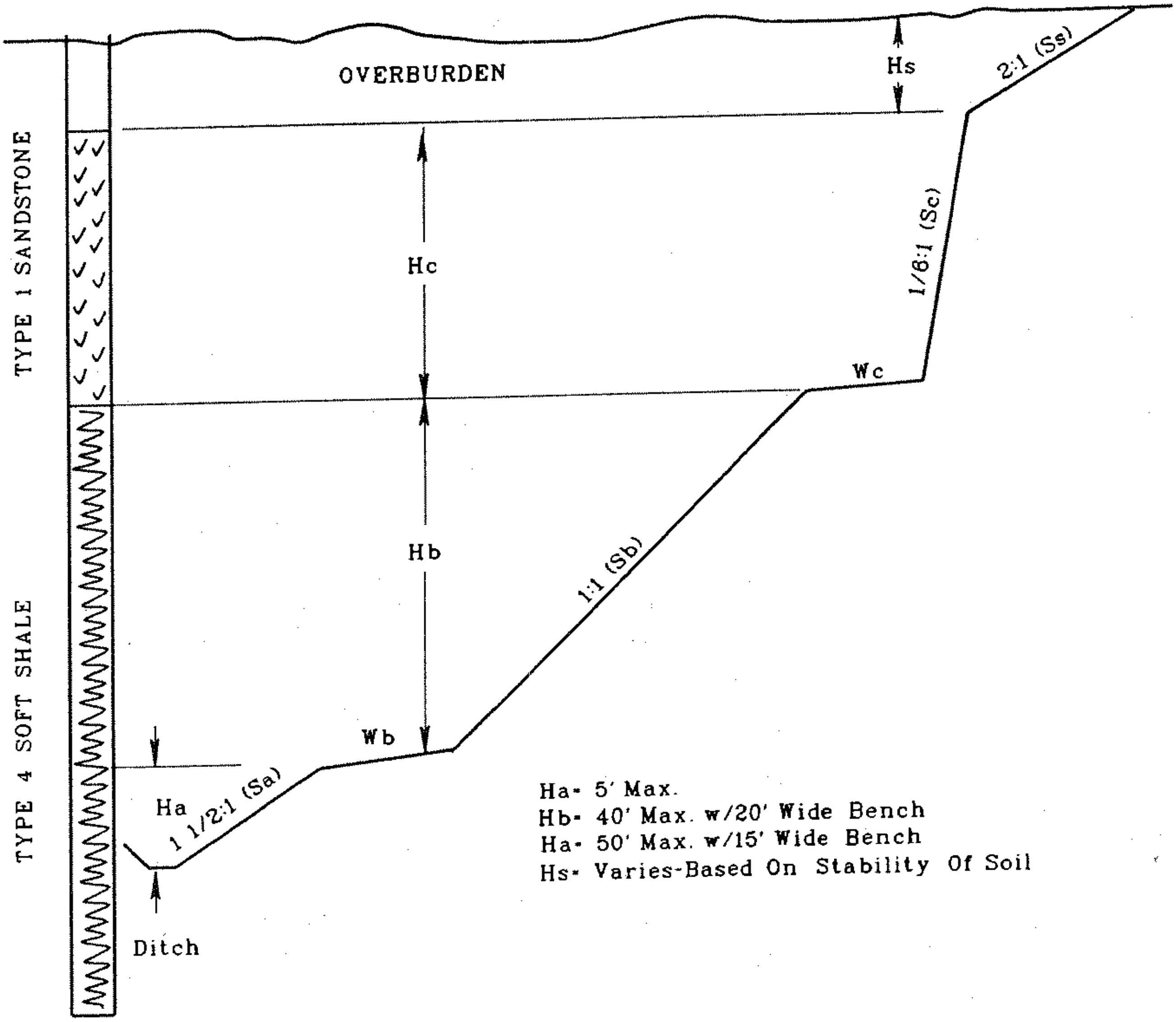
TYPE 1 & TYPE 4 BEDROCK
HORIZONTAL BEDDING



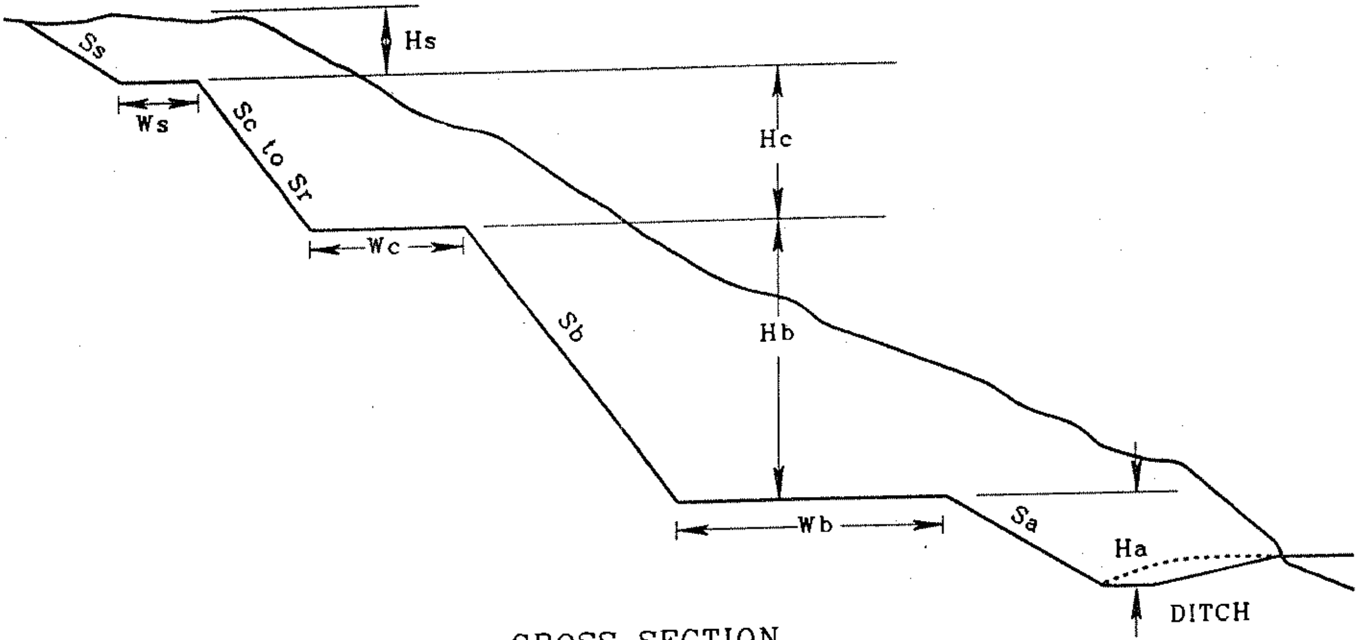
DD-403

TYPE 4 & TYPE 1 BEDROCK
HORIZONTAL BEDDING

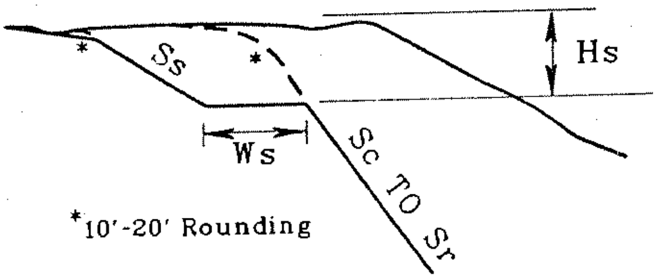


DD-403

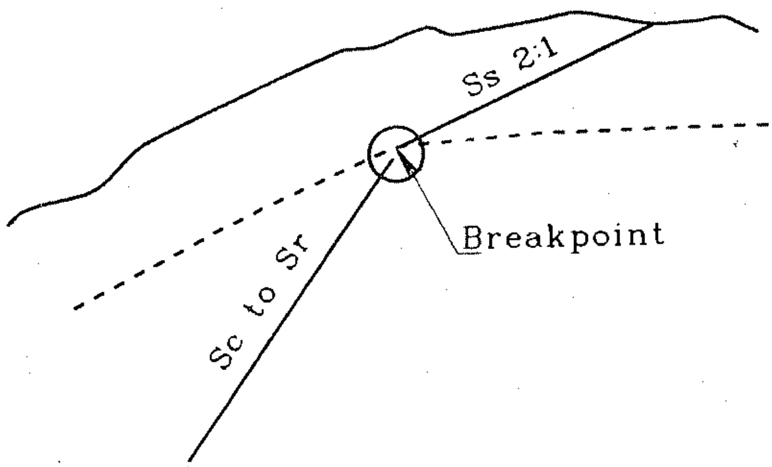
DESIGN OF CUT SECTIONS THROUGH BEDROCK & OVERBURDEN



CROSS SECTION



ROUNDING DETAIL

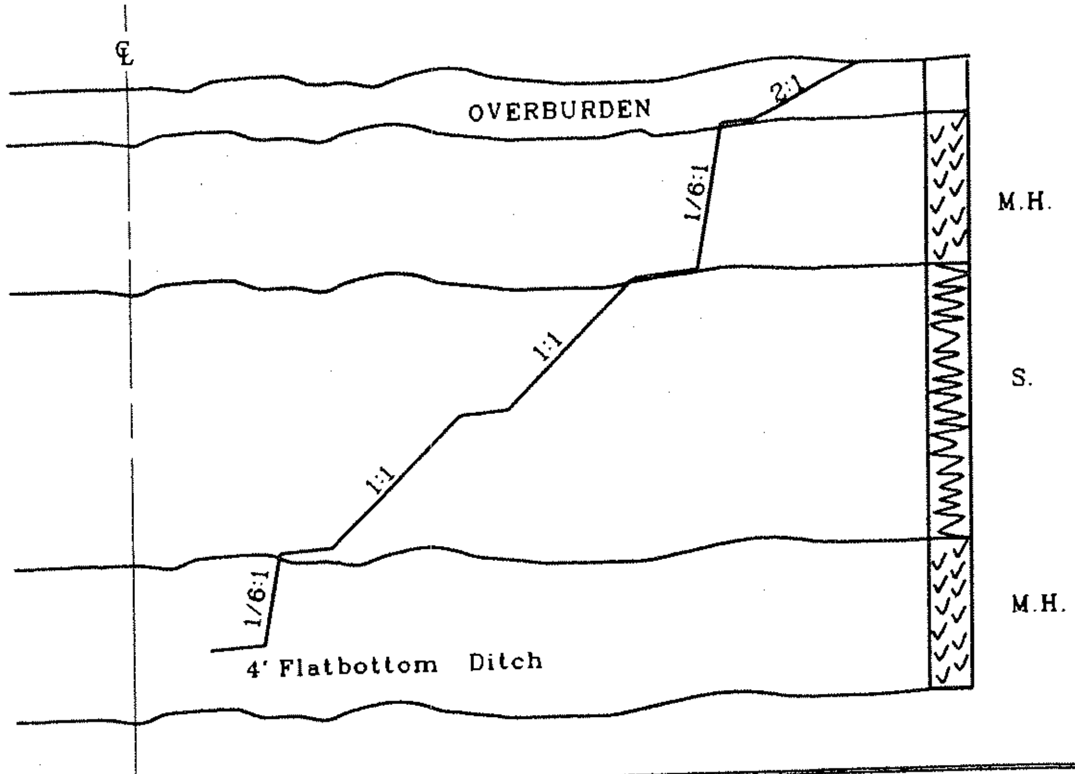


RATIO BREAK/BEDROCK TO SOIL DETAIL

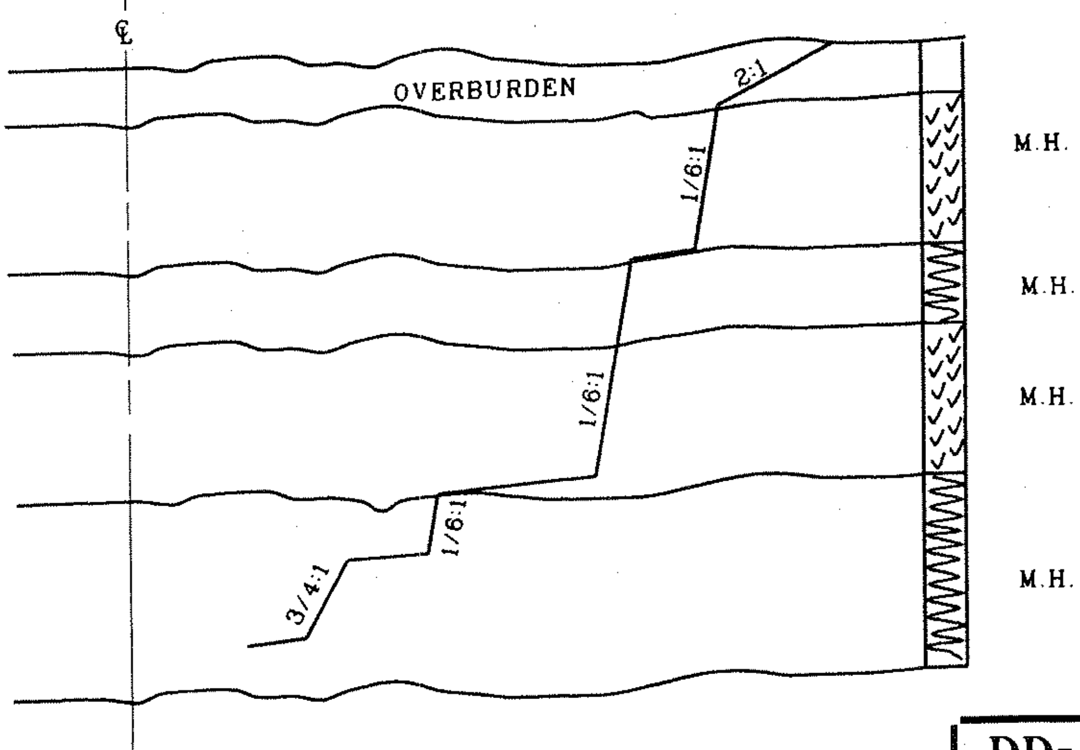
(Broken Backslope)

DD-403

SANDSTONE & SHALE HORIZONTAL BEDS



SANDSTONE & SHALE HORIZONTAL BEDS



DD-403

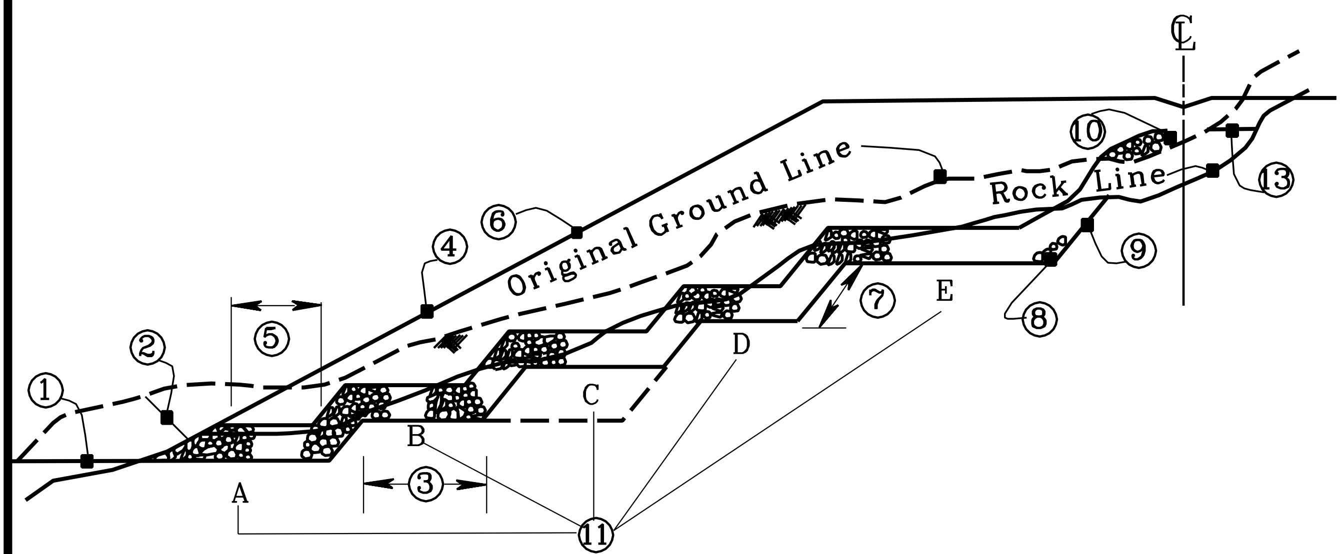
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-404
TYPICAL FILL BENCH AND BERM DESIGN
November 1, 1994

The attached drawings and accompanying notes are for your guidance in fill bench and berm design.

Attachment

TYPICAL FILL BENCH DESIGN



⑫ Note: All Lettered Or Numbered Fill Benches To Be Constructed in Bedrock Or Shale

1. Where possible daylight the excavation on a 20:1 slope away from the embankment.

2. When right-of-way or other considerations dictate, excavation for the toe may be as shown. In some situations, this excavation would be backfilled, and in others left open. Drainage of the Select Embankment should always be obtained either longitudinally or by occasional lateral trenches if the toe is backfilled.

3. Minimum width of the excavated bench is 12'. It is sloped away from the embankment at 20:1.

4. Actual width designed should be a compromise between excavation costs of a few large benches and engineering (survey) cost of many smaller ones.

5. The minimum width of backfill anywhere in the embankment is 12' if all rock, and 12' plus the width of the Select Embankment layer where both the Select Embankment blanket and random material are used. During construction, the width of the Select Embankment blanket may be increased provided that either the full width of the embankment is constructed of rock or that the minimum 12' width of earth backfill shall be retained to allow proper compaction.

6. Select Embankent blankets will be continuous with a minimum thickness of 4' perpendicular to the neat line of the excavation.

7. Height of backslope is variable depending on slope of rock and soil contact. Slope ratio is also variable but since benches are backfilled quickly, the slopes are usually cut steeper than in roadway cuts in comparable rock.

8. The last bench should terminate in the vicinity of the outside edge of the pavement.

9. Slope in soil is variable, but should be flat enough to prevent failure during construction.

10. Select Embankment should be continued on the existing ground as far as considered necessary to provide adequate drainage and stability at the base of the fill.

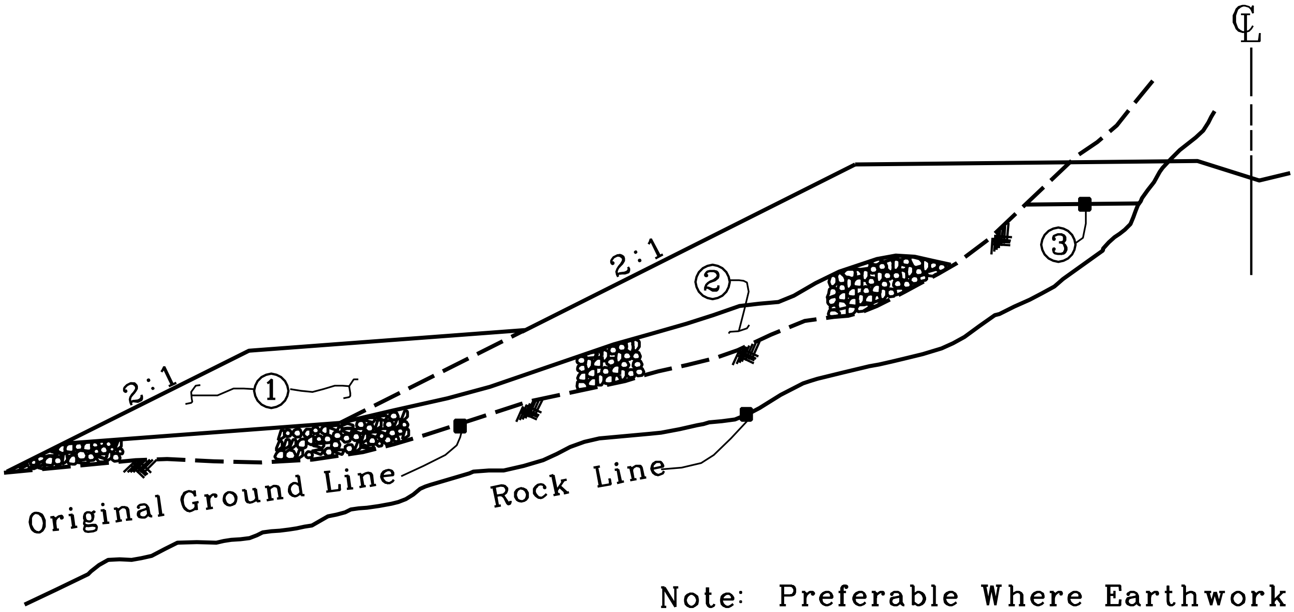
11. The benches are intended to be generally horizontal longitudinally. Because changes in terrain often cause significant change in the number of benches required on individual cross sections within the same fill, a method of indicating how benches are to be transitioned or eliminated is necessary. This shall be accomplished by lettering or numbering the benches.

12. To eliminate misunderstandings due to the fact that some fill benches are designed to facilitate construction and are not intended to provide stability for the embankment, the note shown on the drawing should be included on each cross section sheet where applicable.

13. Where the roadway template transitions from cut to fill on the cross sections, a transition bench below grade will be designed in the original ground. The bench, intended to reduce the effects of differential settlement, will be shown in the soil portion of the outer slope. It should be 5' deep and terminate either at the rockline or beneath the shoulder. Backfill with random material.

DD-404

TYPICAL BERM DESIGN



Note: Preferable Where Earthwork Balance Is In Waste

1. Berm size is to be determined by a stability analysis. The stability of the berm itself must be checked, as well as its ability to support the roadway embankment.

2. A minimum 4' blanket of Select Embankment should be used under the fill and the berm.

3. Where the roadway template transitions from cut to fill on the cross section, a transition bench below grade will be designed in the original ground. The bench, intended to reduce the effects of differential settlement, will be shown in the soil portion of the outer slope. It should be 5' deep and terminate either at the bedrock line or beneath the shoulder if the bedrock line is beyond the roadway template. Backfill with random material.

DD-404

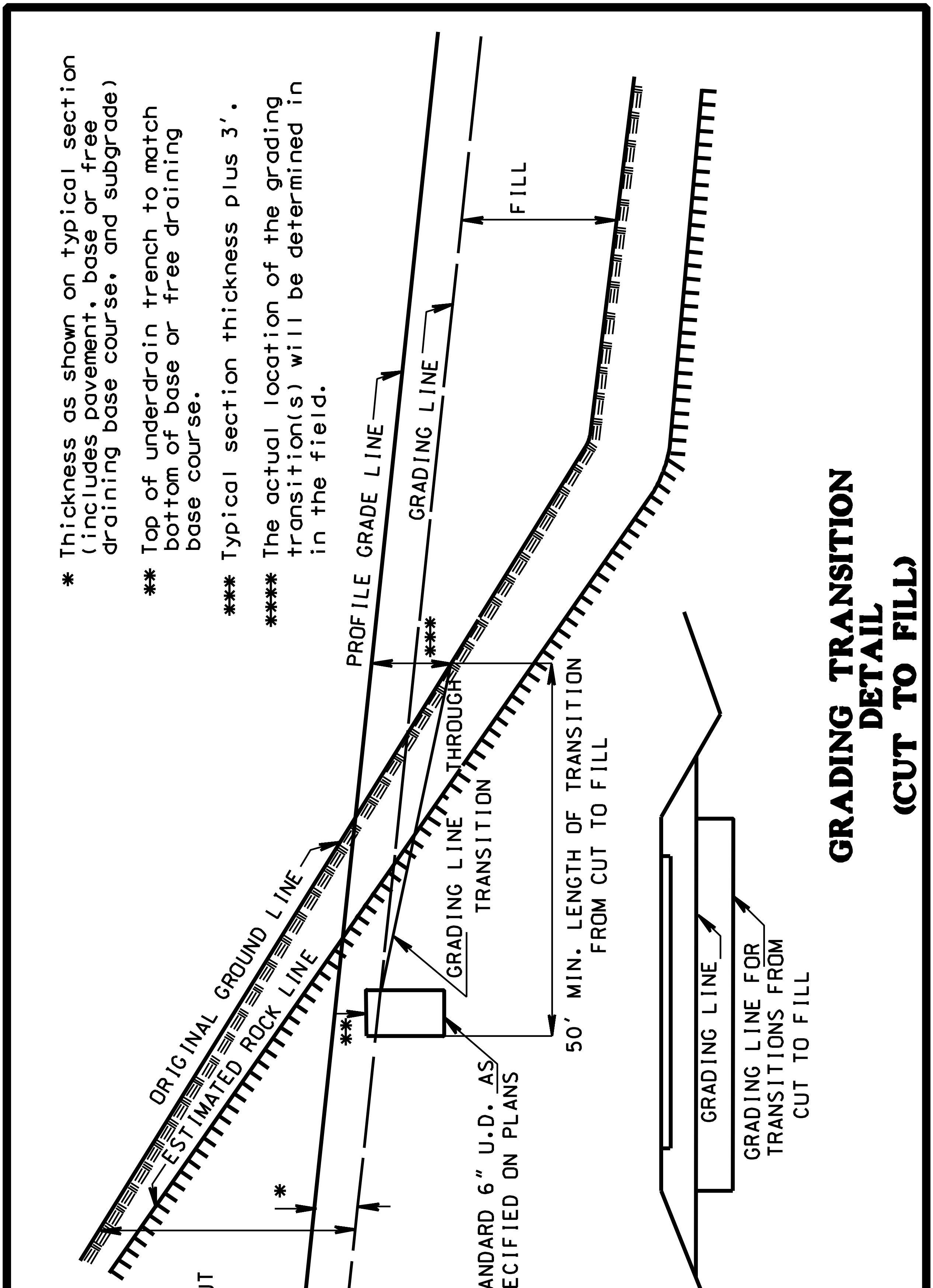
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

405
GRADING TRANSITION DETAIL

February 26, 1998

The detail for transitioning from cut to fill section is attached for your use. It should not be used indiscriminately. Its need is a function of the height of fill as well as the material and foundation conditions encountered. As such, no precise criteria for its use can be set. Engineering judgment of the Designer will be used for this determination.

Attachment


* Thickness as shown on typical section (includes pavement, base or free draining base course, and subgrade)
** Top of underdrain trench to match bottom of base or free draining base course.
*** Typical section thickness plus 3'.
**** The actual location of the grading transition(s) will be determined in in the field.
PROFILE GRADE LINE
GRADING LINE
FILL
ORIGINAL GROUND LINE
ESTIMATED ROCK LINE
GRADING LINE THROUGH TRANSITION
GRADING LINE TRANSITION
50' MIN. LENGTH OF TRANSITION FROM CUT TO FILL
STANDARD 6" U.D. AS SPECIFIED ON PLANS
CUT
*
**
***
GRADING LINE
GRADING LINE FOR TRANSITIONS FROM CUT TO FILL
GRADING TRANSITION DETAIL (CUT TO FILL)
DD-405

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

406
EARTHWORK FACTORS
February 26, 1998

The following values are to be used as a guide in computing earthwork volumes for a project:

Soil	15% shrinkage
Shale	5% swell
Limestone or Sandstone	15% swell

The Designer shall use his judgment on intermediate values other than those listed above.

For example, where hard shale is found, possibly 10% swell could be used.

When it is necessary to compute a more accurate earthwork volume and the cost can be justified, the earthwork factors could be determined for soil and bedrock as follows:

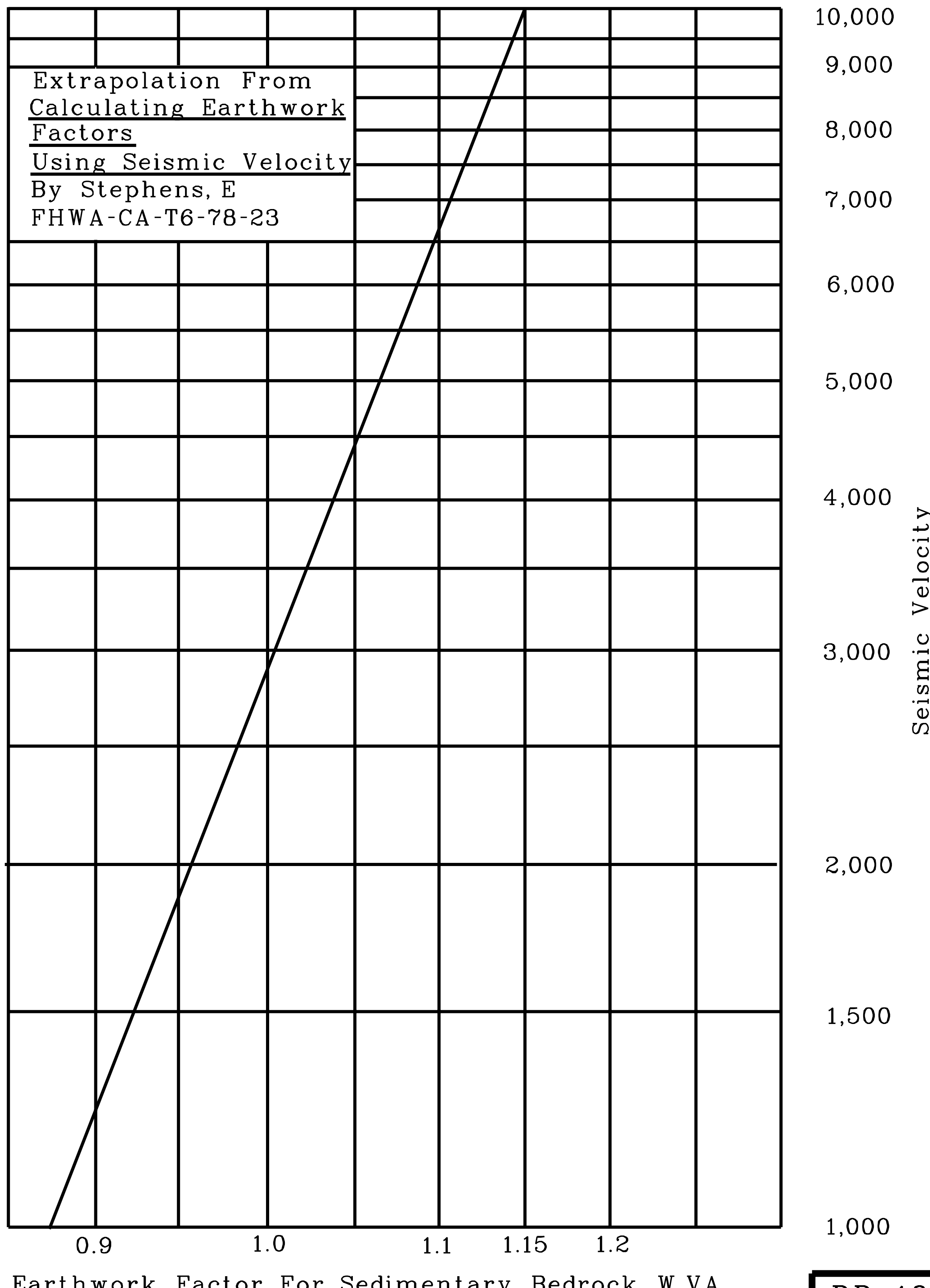
1. Soil - Density tests of the soils could be taken in the field and these results compared to AASHTO T99 test results obtained from laboratory testing.

2. Bedrock - Refractory seismic wave velocities of the bedrock could be obtained and these values used to estimate an earthwork factor from the attached graph.

3. Individual factors for each cut shall be used in lieu of an average value for the entire project if data is available indicating such.

Volumes of the materials with different earthwork factors will be calculated and then adjusted earthwork volumes computed. These adjusted volumes will then be summed to obtain a total earthwork volume for the project.

Attachment


Extrapolation From
Calculating Earthwork
Factors
Using Seismic Velocity
By Stephens, E
FHWA-CA-T6-78-23
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,500
1,000
Seismic Velocity
0.9
1.0
1.1
1.15
1.2
Earthwork Factor For Sedimentary Bedrock W.VA.

DD-406

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-407
GUIDELINES FOR UNSUITABLE MATERIAL
December 23, 2005

All topsoil shall be considered unsuitable material. The volume of topsoil that is to be removed prior to the roadway or drainage structure construction shall be determined from the soil profile.

Areas where the overburden soils have excessive moisture, which would require extensive manipulation by the contractor in order to dry the material to a suitable condition to compact in embankments, shall be identified based on laboratory test data as well as field notes and considered to be unsuitable material. Soils to be excavated from natural drains for channel changes or drainage structure excavation shall be considered unsuitable.

The volume of material excavated for the construction of the first lettered (i.e., lowest) fill bench of embankment shall be considered unsuitable material. This quantity shall include both the soil and rock portions, as well as, the volume of material required to daylight the fill bench. For the purpose of quantity calculations, the backslope of the first lettered bench shall be extended to the existing ground line.

All coal and material having 7.5% or more by weight of organic material shall be designated as unsuitable material.

All areas where existing pavement removal is specified in the plans, and pavement undercut is necessary to construct the new pavement structure, the excavated quantity of the pavement undercut shall be designated as unsuitable material. For small projects where information is available, the quantity of pavement removal shall be based on actual field conditions. For larger projects where information regarding the existing pavement is not available, the pavement undercut quantity shall be based on an average thickness. The average thickness shall be determined by the project review team at preliminary and final field reviews. A total pavement area of 10% may be reliable in most cases for quantity calculation purposes. The payment to remove the pavement undercut shall be included in Item 207001, Unclassified Excavation. The quantity shall be shown on grading summary as a separate line. If rock is not available in the contract, a rock borrow item (select embankment), shall be designated for backfill.

All areas and limits of the unsuitable material, other than topsoil, shall be delineated on the plans or cross sections.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

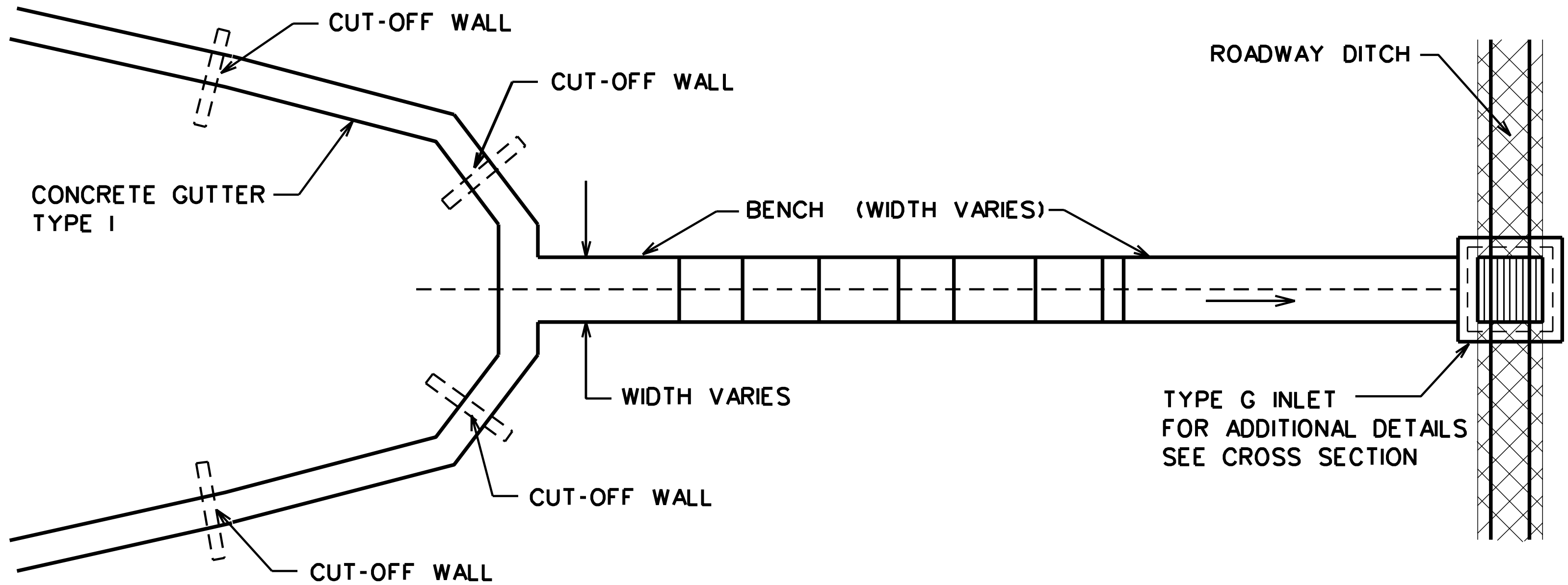
DD-408
CASCADES IN ROCK CUTS
March 4, 1998

Designers are encouraged to investigate and consider cascades in rock cuts in lieu of slope pipes or flumes, in order to reduce maintenance costs.

Cascades in rock cuts shall be used only in areas where the bedrock is medium hard, hard sandstone, limestone, or hard shale. The geological information shall be included in typical details for cascades.

Attachment A is a typical cascade detail, this detail is provided as a guide and should be modified if necessary on a project-by-project basis.

Attachment

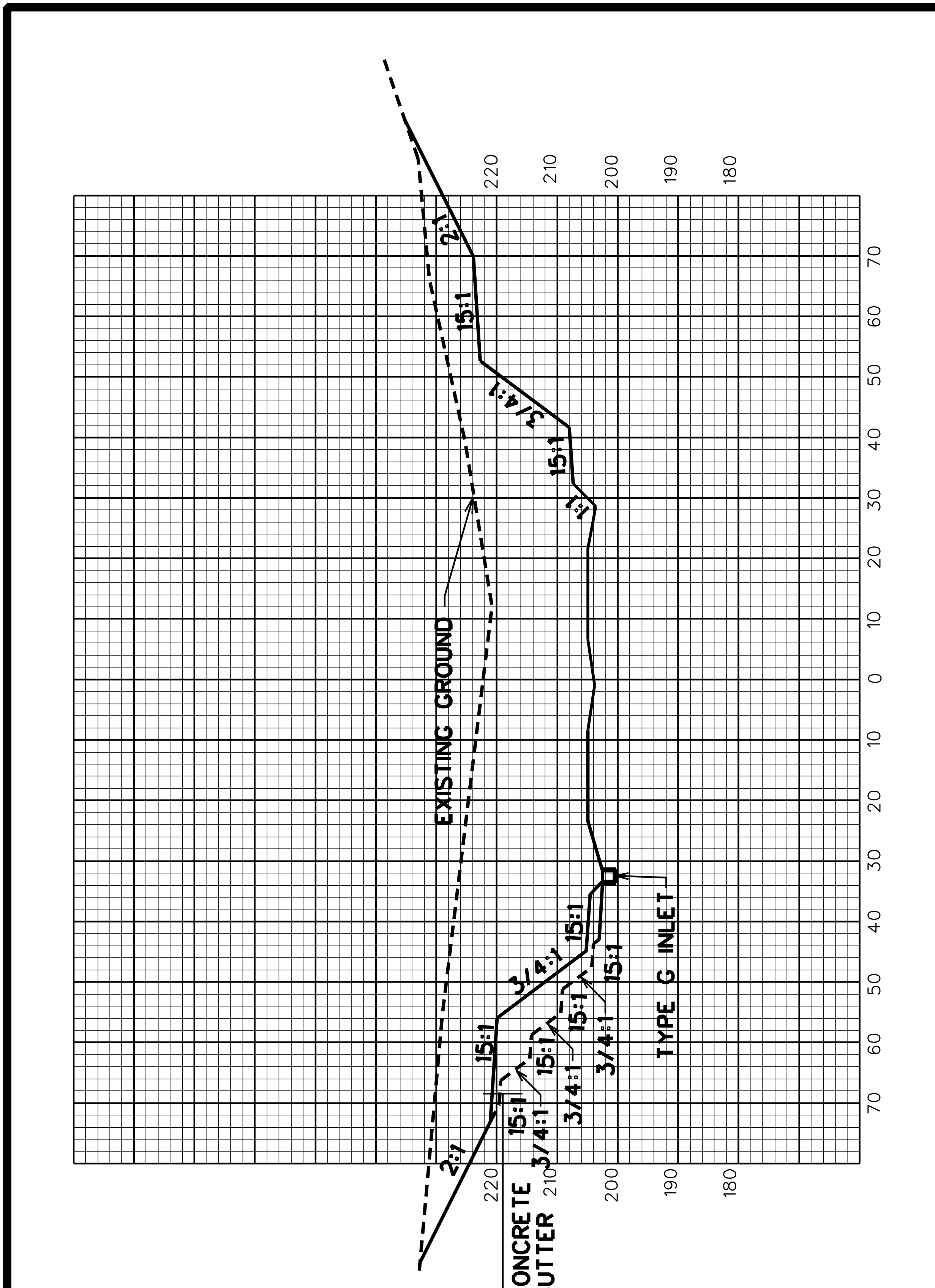


1. REFER TO THE CROSS SECTIONS FOR THE LENGTH OF CONCRETE GUTTER AND BENCH WIDTHS.
2. THE DIMENSIONS FOR THE CASCADE SHOWN ON THE CROSS SECTIONS ARE TO BE CONSIDERED AS APPROXIMATE AND MAY BE VARIED DURING CONSTRUCTION TO COMFORM WITH NATURAL PLANES OF STRATIFICATION ENCOUNTERED IN THE ROCK.
3. FOR ELEVATIONS VIEW SEE CROSS SECTION.

TYPICAL CASCADE DETAIL

DD-408

SHEET 1 OF 2



TYPICAL CASCADE CROSS-SECTION

DD-408

SHEET 2 OF 2

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-409
GEOTECHNICAL INSPECTOR
November 28, 2006

This Design Directive will give guidance and instruction on the duties of the Geotechnical Inspector who is assigned to oversee the work of the Core Boring Contractor. For the purposes of this Design Directive, the Geotechnical Inspector will be considered an employee of or a subcontractor to a Consultant Designer, who has awarded and is administering the Core Boring Contract for any design project. However, these provisions apply equally well to core boring projects performed by the Division of Highways' drilling crews. In addition, these provisions apply to firms providing Geotechnical Analyses and Reports under the Statewide Drilling Contract to either the Division's In-House designers or any District designer.

Attachment

10. General

The Geotechnical Inspector should be an employee of the firm that a Consultant Designer has contracted with to do the Geotechnical Analyses and Report for a particular design project; or an employee of a firm that the Division of Highways has requested to develop a Geotechnical Report for either its In-House or District designers. In the case where bids for drilling services are solicited, the firm producing the Geotechnical Analyses and Report cannot be the same firm that has been awarded and is performing the actual Core Boring Contract, as has been stipulated in Design Directive (DD) 401 "Procedure for Core Boring Contracts". This will not be the case where drilling services are provided under the Statewide Drilling Contract. Furthermore, there are situations where the Consultant Designer produces the Geotechnical Analyses and Report itself for a project, so this DD will apply to that person employed by the Consultant Designer who has been assigned as the Geotechnical Inspector.

In Section 101 "Definition of Terms" of the Core Boring Contract Documents, the "Engineer" is defined as "…the Consulting Engineer awarding the Contract or his duly authorized representative; or the West Virginia Division of Highways (WVDOH) when the Division awards the Contract." The Geotechnical Inspector is usually the Engineer's field representative. Hereinafter in this document, the term "Engineer" will refer to the entity administering the Core Boring Contract, whether it is a Consultant Designer or the WVDOH.

20. Qualifications of the Geotechnical Inspector

For Consultant-designed projects, the name(s), qualifications, and resume(s) of the Engineer's proposed Geotechnical Inspector(s) are to be provided in the Consultant's proposal to the WVDOH for approval before Notice to Proceed for the design work is given. Approval will be given by the Division's Geotechnical Project Manager assigned to the project.

The Geotechnical Inspector must demonstrate experience in soils and rock description, Rock Hardness and Compressive Strength Index (HCSI), Rock Quality Designation (RQD), and methods for obtaining and testing field samples. These qualifications shall be described in the proposed Geotechnical Inspector's resume to be submitted with the Consultant's proposal as given in the above paragraph.

30. Duties of the Geotechnical Inspector

In Section 101 "Definition of Terms", of the Core Boring Contract Documents, the "Engineer" is defined as "the Consulting Engineer awarding the Contract or his duly authorized representative; or the WVDOH when the Division awards the Contract." The Geotechnical Inspector is the Engineer's field representative, and therefore has authority to enforce all of the Core Boring Contract Document's provisions concerning the work being performed.

The Geotechnical Inspector shall communicate with the Geotechnical Engineer, the WVDOH roadway and/or structural Project Managers, and the WVDOH geotechnical Project Managers as the conditions encountered require.

In addition to enforcing the provisions of the Core Boring Contract, with particular attention being paid to but not limited to Section 105.1 "Authority of the Engineer", and Section 200 "Operational Details", the Geotechnical Inspector has other duties, hereinafter described:

A. Photograph all structure borings. Color photographs of the structure borings will be required in the Geotechnical Reports designated by the Division's Project Manager. The remaining Reports may have black-and-white photographs. Photographs of roadway borings are not required unless otherwise stipulated.

B. Geotechnical Inspectors are responsible for obtaining representative samples in adequate numbers to comply with LRFD and roadway design specifications, or as stipulated in the Core Boring Contract Documents. As a guide a minimum of three (3) unconfined compressive strength samples should be obtained within the influence of the foundation for each substructure unit.

C. For all bridges over waterways, a scour analysis will be required. The D_{50} and D_{84} sizes of the stream bed material are to be determined. For streams with gravel or a finer bed material a bag sample as specified in the Core Boring Contract Documents of the stream bed material shall be obtained for a sieve analysis. For boulder and cobble bed streams, the D_{50} and D_{84} sizes may be determined by performing a "riffle pebble count". See the "Definitions" in Section 40 below.

40. Definitions

A. D_{50} size – the diameter at which 50% of the particles are at that size or smaller. This value is used as an indicator for livebed or clearwater scour, and channel classification.

B. D_{84} size – The diameter at which 84% of the particles are at that size or smaller. This value is for determining roughness coefficients and calculating sediment competence.

C. Riffle pebble count – a method of characterizing the stream bed material at the project location. Measure the **intermediate axis** of 100 particles at evenly spaced intervals across the wetted width of the stream cross section. For small streams, particles may be taken along more than one cross section as long as the values represent the area of interest for the project. Percent finer is determined by number of particles rather than by weight. The intermediate axis of a particle is defined as the middle dimension of the three measured axes of a particle. The intermediate axis is measured because it represents the maximum sieve size that a particle would pass.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-501
DRAINAGE MANUAL
December 15, 2008

The December 2007 issue of the West Virginia Department of Highways Drainage Manual (3rd Edition) with approved Addendums is to be used for design of facilities for the Division of Highways. Any exceptions are to be approved by the Deputy State Highway Engineer - Development.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 502
MAXIMUM AND MINIMUM FILL HEIGHT TABLES
FOR DRAINAGE PIPE
August 4, 2020
Supersedes October 1, 2003

The purpose of this Design Directive is to provide the designer with a quick reference to maximum fill heights and minimum cover depths for various types of pipe. Both cover depths are provided for reinforced concrete, which is considered rigid pipe; and for polypropylene, high density polyethylene, and corrugated metal, which are considered flexible pipe.

REINFORCED CONCRETE PIPES

Maximum and minimum cover heights are listed for Class III through Class V concrete pipe for backfilling with CLSM, crushed aggregate, and granular material, as listed in the WVDOH Specifications. Each of the three tables are titled by the backfill material and the corresponding backfill designation Type (1, 2, or 3) in accordance with the American Concrete Pipe Association. For fill heights that exceed those given for Class V pipe, contact a supplier for a special design. Values listed are from *American Concrete Pipe Association Fill Height Tables,* which are based on Section 12.10.4.3 of the *AASHTO LRFD Bridge Design Specifications, 8th Edition, 2017*. See WVDOH Specifications and Standard Details for further information on installation.

For Railroad installation, hydraulic and structural requirements for culverts are governed by the "Public Projects Manual" for each railroad, which can be found online.

http://www.nscorp.com/nscorphtml/pdf/Customers/public_projects_manual.pdf

https://www.csx.com/index.cfm/library/files/about-us/property/public-project-manual/

MAXIMUM FILL HEIGHT

TYPE 1 – CLSM INSTALLATION

CIRCULAR RCP				
	Diameter (Inches)	Maximum Fill Heights (Feet)		
		Class III	Class IV	Class V
Circular pipes are also available in diameters of 21, 27, 30, 33, 42, 54, 66, 78, 90 and 102.	18	23	35	52
	24	23	35	53
	36	23	34	52
	48	23	34	52
	60	22	34	51
	72	22	33	51
	84	21	33	50
	96	21	32	50
	108	21	32	49
	120	20	31	49
	132	20	31	48
	144	19	30	47

TYPE 2 - CRUSHED AGGREGATE INSTALLATION

MAXIMUM COVER FOR EMBANKMENT OR TRENCH INSTALLATION:

<table>
<tr><th colspan="5">CIRCULAR RCP</th></tr>
<tr><td rowspan="14">Circular pipes are also available in diameters of 21, 27, 30, 33,42, 54, 66, 78, 90 and 102.</td><th rowspan="2">Diameter (Inches)</th><th colspan="3">Maximum Fill Heights (Feet)</th></tr>
<tr><th>Class III</th><th>Class IV</th><th>Class V</th></tr>
<tr><td>18</td><td>17</td><td>26</td><td>40</td></tr>
<tr><td>24</td><td>17</td><td>26</td><td>40</td></tr>
<tr><td>36</td><td>17</td><td>26</td><td>40</td></tr>
<tr><td>48</td><td>17</td><td>26</td><td>40</td></tr>
<tr><td>60</td><td>17</td><td>26</td><td>40</td></tr>
<tr><td>72</td><td>17</td><td>25</td><td>39</td></tr>
<tr><td>84</td><td>16</td><td>25</td><td>39</td></tr>
<tr><td>96</td><td>16</td><td>25</td><td>39</td></tr>
<tr><td>108</td><td>16</td><td>25</td><td>39</td></tr>
<tr><td>120</td><td>16</td><td>25</td><td>39</td></tr>
<tr><td>132</td><td>16</td><td>25</td><td>39</td></tr>
<tr><td>144</td><td>15</td><td>25</td><td>39</td></tr>
</table>

TYPE 3 – GRANULAR MATERIAL

MAXIMUM COVER FOR EMBANKMENT OR TRENCH INSTALLATION:

CIRCULAR RCP				
	Diameter (Inches)	Maximum Fill Heights (Feet)		
		Class III	Class IV	Class V
Circular pipes are also available in diameters of 21, 27, 30, 33,42, 54, 66, 78, 90 and 102.	18	14	21	31
	24	14	21	32
	36	13	20	31
	48	13	20	31
	60	13	20	31
	72	13	20	30
	84	12	19	30
	96	12	19	30
	108	12	19	30
	120	12	19	30
	132	11	19	30
	144	11	19	30

MINIMUM FILL HEIGHTS (FEET) – FOR ALL TYPES OF INSTALLATIONS Measured from the top of flexible pavement and from the bottom of rigid pavement.			
DIAMETER (INCHES)	CLASS III	CLASS IV	CLASS V
18	2	1	1
24	1	1	1
30	2	1	1
36	1	1	1
48	1	1	1
54 <	1	1	1

HORIZONTAL ELLIPTICAL CONCRETE PIPE

These shapes are most applicable for low cover situations where maximum fill heights are not an issue. Therefore, maximum fill height tables are not included. When the fill height exceeds 5 feet see the American Concrete Pipe Association (*ACPA) LFRD Fill Height Tables for Horizontal Elliptical and Arch Concrete Pipe* for further information. Minimum cover heights are measured from the top of rigid pavement and from the bottom of flexible pavement.

MINIMUM FILL HEIGHTS (FEET) – TYPE 2: CRUSHED AGGREGGATE INSTALLATION			
SIZE (INCHES)	**HE- II**	**HE-III**	**HE-IV**
14 x 23	2.5	0.5	0.5
19 x 30	2.5	1.5	0.5
22 x 34	2.5	0.5	0.5
24 x 38	2.5	0.5	0.5
27 x 42	2.5	0.5	0.5
29 x 45	2	0.5	0.5
32 x 49 & LARGER	0.5	0.5	0.5

MINIMUM FILL HEIGHTS (FEET) – TYPE 3: GRANULAR MATERIAL INSTALLATION			
SIZE (INCHES)	**HE- II**	**HE-III**	**HE-IV**
14 x 23	3	0.5	0.5
19 x 30	2.5	2	0.5
22 x 34	2.5	2	0.5
24 x 38	2.5	0.5	0.5
27 x 42	2.5	0.5	0.5
29 x 45	2.5	0.5	0.5
32 x 49 & LARGER	0.5	0.5	0.5

PLASTIC PIPES

Maximum and minimum cover heights are listed for high density polyethylene and polypropylene pipe for backfilling with CLSM, and crushed aggregate, as listed in the WVDOH Specifications. Values listed are calculated by WVDOH in accordance with Section 12.12 of the *AASHTO LRFD Bridge Design Specifications, 8th Edition, 2017*, and were compared to values provided by the Plastic Pipe Institute (Drainage Handbook, Chapter 7, tables 7.17 and 7.18) and other industry sources. See WVDOH Specifications and Standard Details for further information on installation. “Crushed aggregate” is Class 1 or Class 3 in accordance with Table 704.6.2A, compacted in accordance with 604.8.1 of the Specifications.

Minimum fill height is 24 inches for pipes up to 48-inch diameter, and 30 inches for 54-inch and 60-inch pipes, measured from the top of rigid pavement and from the bottom of flexible pavement.

MAXIMUM FILL HEIGHT		
Polypropylene		
Maximum Fill Heights for Different Backfill Materials (Feet)		
Diameter (Inches)	**CLSM**	**Crushed Aggregate**
18	30	25
24	31	26
30	31	26
36	25	20
42	26	20
48	26	20
54	--	--
60	25	20
High Density Polyethylene		
Maximum Fill Heights for Different Backfill Materials (Feet)		
Diameter (Inches)	**CLSM**	**Crushed Aggregate**
18	29	24
24	25	19
30	25	19
36	23	18
42	21	16
48	22	17
54	20	15
60	22	17

METAL PIPE

The use of metal pipe under highways or within fills that support highways is limited to low volume roads (ADT < 400) with less than 5 feet of cover. Round pipes up to 24-inch diameter and pipe-arches up to 128 inches by 83 inches are allowed. Aluminum Structural Plate Box Culverts may also be used. Minimum cover is 12 inches, measured to the top of rigid pavement or to the bottom of flexible pavement.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

503
SELECTION OF PIPE MATERIALS
April 4, 2018
Supersedes March 10, 2003

Attached is the West Virginia Department of Transportation, Division of Highways, Design Directive for the “Selection of Pipe Materials” to be used on all projects.

SELECTION OF PIPE MATERIALS

This design directive is to provide guidance on the selection of appropriate pipe materials in terms of service life, hydraulic efficiency, and structural capacity. The design process includes consideration of the factors shown in Section 1 through Section 5 below. Life cycle cost and safety shall take priority over initial cost. Small Corrugated metal pipe and pipe-arches may only be used for low volume roads with shallow cover heights. Galvanized structural plate pipe or pipe-arches installed with concrete paved inverts may only be used with the approval of the Director of the Engineering Division and the State Highway Engineer.

SECTION 1: ROADWAY CLASSIFICATION

The following table summarizes acceptable conduit materials based on the design classification, fill height, and service life requirement of the roadway that the pipe is to be placed under. Design classification is site specific rather than project specific and refers to the roadway that is directly over or supported by fill over the culvert. WVDOH items numbers are listed in parenthesis.

Table 503-1
Allowable Pipe Materials

DESIGN CRITERIA	ALLOWABLE CONDUIT MATERIALS
Highways with an ADT ≥ 3000 or Height of cover ≥ 10 ft. 75 year design life	• Cast in Place or Precast Reinforced Concrete Box (604070) • Cast in Place (620003) or Precast Reinforced Concrete Arch (620001) • Reinforced Concrete Pipe (604037) and Elliptical Reinforced Concrete Pipe (604041) • High Density Polyethylene Pipe (solid wall (604056), profile wall (604050), or steel-reinforced (604051), installed in Type F trench • Polyvinyl Chloride Pipe (profile wall), installed in type F trench (604052) • Polypropylene Pipe (604045), installed in type F trench
Highways with an ADT < 3000 and Height of Cover < 10 ft. 40 year design life	All of the above • High Density Polyethylene Pipe (solid wall (604056), profile wall (604050), or steel-reinforced (604051) • Polyvinyl Chloride Pipe (profile wall) (604052) • Polypropylene Pipe (profile wall) (604045)
Highways with an ADT <400 and Height of Cover < 5 ft. 20 year design life	All of the above • Aluminized Steel, Type 2 Corrugated Metal Pipe, up to 24" (604076) • Aluminized Steel, Type 2 Corrugated Metal Pipe-Arch up to 128" x 83" (604077) • Aluminum Structural Plate Box Culvert (604074)

Unless otherwise specified, all pipes shall be installed in accordance with Standard Specification 604.

SECTION 2: HYDRAULICS

Hydraulic design of culverts is addressed in the WVDOH Drainage Manual.

SECTION 3: STRUCTURE

Refer to DD-502 for maximum cover and minimum cover for all pipes. The maximum values in DD-502 are conservative. The designer may exceed the limits set in DD-502 if the pipe is designed in accordance with AASHTO LRFD Section 12, *BURIED STRUCTURES AND TUNNEL LINERS*.

SECTION 4: CORROSION

Plastic pipe materials are acceptable in most environmental conditions without soil and water testing.

Concrete pipe will require soil and water testing for resistivity and sulfate concentration. A resistivity of less than 1,000 ohm-cm is an indication of the presence of chlorides. Sulfate content data are required for the use of concrete pipe.

Sulfate concentration is also a durability concern for concrete. Type II cement is designed to resist sulfate attack. Therefore, Type II cement shall be used for precast concrete pipe. Reducing the water/cement ratio reduces permeability and is the single most important factor in increasing concrete resistance to sulfate attack. Increasing the cement content also improves sulfate resistance. Precast concrete pipe and box culverts are typically produced using 658 pounds (7 bags) of cement per cubic yard of concrete with a water cement ratio of 0.44 or less. Only a minor adjustment in the water cement ratio is required to meet the severe Sulfate condition. For very severe conditions the water cement ratio shall be reduced to 0.35. The following table illustrates the actions required for a given sulfate concentration. Cement content and water/cement ratio shall be included in the plans when severe and very severe sulfate conditions are encountered.

Table 503-2
Sulfate Concentration For
Reinforced Concrete Pipe

Conditions			Requirements		
Relative Degree of Sulfate Attack	% Water-Soluble Sulfate in Soil Samples	PPM Sulfate in Water Samples	Cement Content (bags/cy)	Cement Content (lbs/cy)	Maximum Water/ Cement Ratio
Negligible	0.00 - <0.10	0 – <150	5	470	0.53
Positive	0.10 - <0.20	150 - <1,500	5	470	0.53
Severe	0.20 - 2.00	1,500 - 10,000	5.5	517	0.4
Very Severe	>2.00	>10,000	7	658	0.35

Metal pipes and structures are allowed as stated in Table 503-1. The pH of the water and soil must be between 5 and 9.

SECTION 5: ABRASION

The designer shall assess the abrasion potential for proposed culvert installations. Consider the slope of the stream and the size of the stream bed material. Determine the size of the streambed material in accordance with DD-409. Calculate the velocity of the flow in the channel upstream of the proposed culvert and in the proposed culvert to determine if the abrasive material in the streambed could be transported at a sufficient velocity to cause damage to the invert of the conduit. A 2-year storm (Q_2) shall be used to determine the velocity for abrasion potential. When flow velocities are greater than 25 feet per second, 6000 psi concrete and abrasion resistant aggregate are required.

There is a potential for higher than normal abrasion during construction due to runoff from disturbed areas that have not yet been vegetated or paved. For new construction projects, sediment traps shall be placed upstream of culverts to prevent large sediment from entering the culvert.

ABRASION Continued

Three sided structures do not require invert protection, however, the potential for scour at the footings shall be addressed and documented. It may be less expensive to provide a concrete slab below the streambed between the footings instead of extending the footings to rock.

The following chart is to be used to select the appropriate invert protection for culverts. Use the velocity of the 2-year storm flow in the pipe or in the channel upstream of the pipe, whichever is greater.

Table 503-3
Invert Protection Chart
For Abrasive Flows

CULVERT MATERIAL	**2-Year (Q_2) Storm Design Velocity**			
	0 to 5 ft/sec	5 to 10 ft/sec	10 to 25 ft/sec	Greater than 25 ft/sec
Aluminized Steel Type 2	None	None	Concrete Paved invert	Concrete Paved invert
Aluminum Alloy	None	None	Add one gage	Add two gages
Plastic (PVC or HDPE or PP)	None	None	None	None
Reinforced Concrete Pipe	None	None	Aggregate with LA Abrasion loss of less than 30%	6000 psi concrete Aggregate with LA Abrasion loss of less than 30%

SECTION 6: ALTERNATE MATERIALS

When using this directive, more than one material may be found to satisfy the project requirements. The designer should include economical designs that meet the requirements stated above. Allowable alternates should be listed in the pipe quantity table included in the plans.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 504
DESIGN DISCHARGE DETERMINATION
July 10, 2020
Supersedes May 12, 2010

The calculation of design discharges shall be in accordance with the West Virginia Division of Highways Drainage Manual, latest edition, and any addenda.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 505
DITCH LININGS
July 10, 2020
Supersedes June 13, 1996

Designer shall use the sheer stress analysis method to design ditch linings. The sheer stress analysis method is found in the West Virginia Division of Highways Drainage Manual (Latest Edition) with approved Addendums. This method shall be used for selection of ditch linings for new and rebuilt ditches designed for the West Virginia Division of Highways. Any exceptions shall be approved by the Deputy State Highway Engineer - Development.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Design Directive 506
POST-CONSTRUCTION STORM WATER MANAGEMENT
March 10, 2020
Supersedes February 19, 2016

10. INTRODUCTION

This Directive is for Post-construction Storm Water Management (PCSWM) on new highways and improvement or renovation of existing highway systems and shall be used on all applicable projects. The West Virginia Department of Environmental Protection (DEP) has regulations and issues National Pollutant Discharge Elimination System (NPDES or Clean Water Act Section 402) Permits to address this issue. Much of the language contained herein comes directly from those regulations

This directive applies to all increases in impervious area greater than **5,000** square feet within the West Virginia Division of Highways (DOH) Municipal Separate Storm Sewer System (MS4) areas. MS4 areas are defined as urbanized areas by the US Census and the USEPA or the current MS4 area mandated by the USEPA. The following link shows the MS4 boundaries https://gis.transportation.wv.gov/ms4/.

The DOH does not have the legal authority to regulate PCSWM beyond State Right-of-Way. A sub-government or political subdivision cannot regulate a higher level/division of government. Therefore, as a state agency, the DOH is not subject to city or county storm water regulations. The DOH or its agent will coordinate new project development and substantial improvement projects with local authorities; and may provide an opportunity for public comment, when appropriate, through a mechanism such as the National Environmental Policy Act (NEPA). The DOH will make a good faith effort to address or incorporate comments submitted by an adjacent MS4.

State regulations prohibit encroachment onto DOH right-of-way without authorization from the DOH. Since the regulatory agencies have made it clear that the owner of the discharge outlet will be held responsible for any and all pollutants discharged at that point, the DOH will prohibit all connections to the DOH storm water systems within Urbanized Areas as defined in Section 20, unless the discharger can ensure that only non-polluted storm water will enter the system. Any such connection to any Division of Highways' drainage system shall be by permit only.

20. GUIDANCE

The drainage system for the project shall be designed in accordance with the current DOH Drainage Manual. In addition, pollution prevention and discharge reduction methods are mandatory within MS4 boundaries.

MS4 boundaries can be found at this link https://gis.transportation.wv.gov/ms4/. The boundaries to be used are the "Urbanized Area" boundaries. Note: there are boundaries shown on other WVDOT Urban maps as "Urbanized Cluster"; these areas SHALL NOT be used for MS4 determination. The designer is to exercise caution when identifying "Urbanized Area" boundaries.

Site design standards for all new development and redevelopment will require, in combination or alone, management measures that retain and manage on-site the first one inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation for the increased impervious surface area. For design purposes, the West Virginia Division of Highways has determined that it is nearly impossible to manage the first inch of rainfall from all storm events; therefore, the first inch of rainfall management shall be designed for the 90th percentile rainfall event.
Note: Redevelopment is defined as construction requiring land disturbance that alters the footprint of an existing developed site, such as lane/roadway widening, two-way turn lanes, left turn lanes, intersection improvements that add turning lanes, sidewalks, etc.

Runoff volume reduction can be achieved by canopy interception, soil amendments, evaporation, rainfall harvesting, engineered infiltration, extended filtration and/or evapotranspiration and any combination of these practices.

This first one inch of rainfall from the 90th percentile rainfall event must be 100% managed with no discharge to surface waters. n Various alternative approaches are described below:

1. Storm Water Treatment

1. Storm water is treated before release to surface waters via extended or engineered infiltration. Extended filtration practices that are designed to capture and manage up to one inch of rainfall may discharge through an underdrain system.
2. The permittee develops and implements a program to collect payment in-lieu of on-site retention, provided such funds are used for Storm water projects only.
3. The permittee develops and implements an off-site mitigation program.
4. The permittee develops and obtains approval of an alternative method of managing the first 1" of rainfall. The method must be equally protective of water quality as the methods detailed in the permit.

2. Run-off volume reduction can be achieved by:

1. Canopy interception,
2. Soil amendments,
3. Evaporation,
4. Evapotranspiration,
5. Rainfall harvesting such as rain tanks and cisterns,

6. Grass channels and swales,
7. Reforestation,
8. Rooftop disconnections, such as gutter drains,
9. Permeable pavers/pavement,
10. Porous concrete,
11. Engineered infiltration including extended infiltration via bioretention cells,
12. Release to groundwater may require an Underground Injection Control (UIC) Permit and permittees are required to list projects using this practice in the annual report, or
13. Any combination of these methods.

3. Storm Water Management

In instances where alternatives to complete on-site retention of the first inch of rainfall are necessary, technical justification as to the infeasibility of on-site retention is required. Such technical justification must be documented, transmitted to the District Environmental Coordinator, and archived with the project files.

Pollution prevention and discharge reduction shall apply to increases in impervious surfaces and redevelopment. Conversion of previously impervious areas to pervious areas shall reduce the increased impervious areas total. When there are projects in urbanized areas that are not required to provide additional pollution prevention and rainfall reduction beyond normal DOH practices, it is advisable to implement additional pollution prevention and discharge reduction methods on projects in order to offset impacts for other projects where it may not be possible to achieve the minimum pollution prevention and rainfall reduction requirements.

Exclusions to the discharge reduction requirement for the first one-inch of rainfall from the 90th percentile rainfall event preceded by 48-hours of no measurable precipitation are:

1. Milling,
2. Resurfacing of existing roadways
3. Increases in impervious surfaces area less than 5000 square feet
4. Structures bridging waterways, roadways, railways, or impervious surfaces if, the finished structure includes measures that prevent erosion from any and all storm water discharges from the structure.

Water quality impacts shall be considered from the beginning stages of a project. New development and redevelopment provide more opportunities for water quality protection. Post-construction discharge shall not exceed predevelopment discharge. The design of the project shall minimize water quality impacts. A few very basic example calculations for simple situations are given at the end of this Directive.

Project development shall give great consideration to protecting sensitive areas such as wetlands and riparian areas, maintaining or increasing open space, providing buffers along sensitive water bodies, minimizing impervious surfaces, and minimizing disturbance of soils and vegetation.

Post-construction storm water Best Management Practices (BMP) structures include: storage practices such as ponds, sumps, underdrains, and extended-detention structures; filtration/infiltration practices such as grassed swales, stream restoration, and bio-retention structures.

Storm water technologies are constantly being improved, and the evaluation and implementation of new technologies shall be considered. It is mandatory that all permanent BMPs are accessible and maintainable by DOH Maintenance Forces. This may require building access roads to remote features, installing fences with locked gates around such items, or the use of moveable vehicle barriers, etc. Access to these storm water management features must be considered early in the design process, so additional right-of-way, if needed, is acquired as part of the project.

Utilization of practices for pollution prevention and discharge reduction may include dry swales, bio-retention, rain tanks and cisterns (outside of the travelled surfaces), soil amendments, rooftop disconnections, permeable pavement (parking lots and sidewalks only), porous concrete (parking lots and sidewalks only), permeable pavers (parking lots and sidewalks only), reforestation, grass channels, and other practices that alone or combined will capture the first one inch of rainfall runoff volume. Extended filtration practices that are designed to capture and retain up to one inch of rainfall may discharge volume in excess of the first inch through an underdrain system. An UIC permit may be required under certain criteria. UIC requirements may be found on the DEP web site: https://dep.wv.gov/WWE/Programs/gw/Pages/gwhome.aspx .

The designer shall insert the Special Provision 107.21.4 *Increasing Impervious Areas and MS4 Requirements* into the project's PS&E package. This special provision can be obtained from Contract Administration Division.

4. Mitigation

4.1 Off-site Mitigation

Reduction of post-construction storm water runoff within the same watershed (prior to or at the same time that the construction impacts occur) shall receive 100% credit towards the management of the first one inch of rainfall from the 90th percentile rainfall event preceded by 48 hours of no measurable precipitation. A ratio of 1 on-site for 1.5 off-site shall apply to mitigation outside the project's 8-digit Hydrologic Unit Code (HUC 8) watershed area.

For example, if the designer can achieve all but 1,000 c.f. of mitigation on-site then 1,500 c.f. of off-site mitigation would be required as compensation.

4.2 Payment In-lieu of Physical Mitigation

The DOH project may also fund a storm water improvement project for the local MS4 agency. The in-lieu fee method is another method of mitigation wherein the DOH pays another MS4 agency to perform the actual physical mitigation. In order to utilize the in-lieu fee method to offset unmanaged pollution prevention and discharge reduction, the local MS4 agency must be willing to accept the funds and apply the funds to pollution prevention and discharge reduction within the agency's MS4 area.

An in-lieu fee matrix shall be developed for each project in an MS4 area. The fee matrix is based on the percentage of rainfall not managed, the proportional cost of all items of constructed rainfall management, and/or the volume of discharge. For example, if the designer has managed 0.75 inches of rainfall discharge at an estimated cost of $75,000. The designer may assume that if the full one-inch of rainfall discharge management would cost $100,000. This would equate to $25,000 in unmanaged discharge. The accepted mitigation multiplier of 2 is applied to offset the temporal loss of the storm water management. The in-lieu fee would be $25,000 multiplied by 2 or $50,000.

Note: The DEP regulations also apply to design-build contracts; therefore, design-build contractors shall be responsible for meeting the MS4 requirements in this Design Directive. The Design-build Contractor shall be responsible for the cost of mitigation for failure to manage on-site the first one inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation for the increased impervious surface area.

30. Best Management Practices

For more information concerning storm water pollution prevention Best Management Practices the National Menu of Storm water BMPs: Post-Construction Storm water Management in New Development and Redevelopment is available through the EPA at: http://water.epa.gov/polwaste/npdes/swbmp/PostConstruction-Stormwater-Management-in-New-Development-and-Redevelopment.cfm

Topics on this website include:

Structural BMPs	**Nonstructural BMPs**
Ponds Dry extended detention ponds Wet ponds **Infiltration practices** Infiltration basin Infiltration trench	**Experimental practices** Alum injection **On-lot Treatment** **Better site design** Buffer zones Open space design Urban forestry
Filtration practices Bioretention Sand and organic filters **Vegetative practices** Storm water wetland Grassed swales Grassed filter strip	Conservation easements Infrastructure planning Narrower residential streets Eliminating curbs and gutters Green parking Alternative turnarounds Alternative pavers BMP inspection and maintenance
Runoff pretreatment practices Catch basins/Catch basin insert In-line storage Manufactured products for storm water inlets	

Note: It is normal that multiple methods of mitigation may be needed on a single project.

40. References

Underground Injection Control (UIC)

https://dep.wv.gov/WWE/Programs/gw/Pages/gwhome.aspx

Municipal Separate Storm Sewer System (MS4)

https://dep.wv.gov/WWE/Programs/stormwater/MS4/permits/Pages/default.aspx

Construction Storm Water (National Pollutant Discharge Elimination System or NPDES)

https://dep.wv.gov/WWE/Programs/stormwater/csw/Pages/home.aspx

Best Management Practices

http://water.epa.gov/polwaste/npdes/swbmp/PostConstruction-Stormwater-Management-in-New-Development-and-Redevelopment.cfm

Sample Calculations

Example

1 mile of 24' wide roadway with 4-foot stone shoulders

	Length (ft)	Width (ft)	1" Precip. (ft)	% impervious		ft ^{3}	
roadway	5280	24	0.083333333	100%	=	10560	
shoulder	5280	8	0.083333333	90%	=	3168	
						13728	Total new impervious volume to be managed

4" underdrain along one side of the road

Length (ft)	Diam. Cross-sectional Area of Pipe (ft^2)		ft ^{3}	
5280	0.087	=	461	volume managed

Note: The DOH may be able to claim more management credit depending on the material used in the trench fill. This example uses the nominal diameter to calculate the cross-sectional area. However, it is also acceptable to use industry standard tables to look-up the actual cross-sectional area or the actual diameter to calculate the actual area.

2 ponds that are 40' long x 40' wide x 4' deep

Length (ft)	Width (ft)	Depth (ft)			ft ^{3}	
40	40	4		=	6400	
40	40	4		=	6400	
					12800	discharge managed

Grass Swale 1000 feet long x 4 feet wide x 6" deep
(less than 4% slope)

Length (ft)	Width (ft)	Depth (ft)	% infiltration		ft ^{3}	
1000	4	0.5	70%	=	1400	discharge managed

In-lieu Fee Calculation Matrix						
A	**B**	**C**	**D**	**E**	**F**	
Increased Impervious Area (Ft^2)	**% of 1st inch of rainfall managed**	**Estimated cost for the management achieved in Column B**	**Estimated cost for 100% Management**	**Fee for remainder not managed**	**Temporal Loss Penalty**	**In-Lieu Fee**
A	**B**	**C**	**C/(B/100)**	**(100-B)/100*D**	**2**	**E*2**
*If there is not a reasonable means to determine a cost estimate to manage the first inch of rainfall, the alternative in-lieu fee will be $20,000 for the projects first mile or portion of a mile, plus an additional $20,000 for every mile or portion of a mile thereafter. Example: the in-lieu fee for a 2.4mile long project would be $60,000.						
**** Column A is for record keeping purposes only**						

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 601
GEOMETRIC DESIGN CRITERIA FOR RURAL HIGHWAYS
June 17, 2020
Supersedes June 1, 2017

FUNCTIONAL CLASSIFICATION OF HIGHWAYS

The AASHTO functional classification system is to be used as the highway type for design purposes. This system consists of arterials, collectors, and local roads. Upon determining the functional classification of the highway, the criteria as established in this directive which has been derived from the 2018 AASHTO publication *"A Policy on Geometric Design of Highways and Streets"* and the 2016 AASHTO publication *"A Policy on Design Standards – Interstate System"* as applicable is to be used in all design unless otherwise directed. As required, the AASHTO publication, *"Guidelines for Geometric Design of Very Low–Volume Local Roads (ADT≤ 400) 2001"*, shall be referenced. The Designer should refer to the above referenced AASHTO publications for other geometric design criteria not established in this directive.

DEFINITIONS

Tables

Unless otherwise noted, all referenced tables are from the 2018 AASHTO Publication, "*A Policy on Geometric Design of Highways and Streets*" using the U.S. Customary portion thereof with all applicable footnotes.

Traveled Way

The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

Roadway

The portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways.

Graded Shoulder

The width of shoulder from the edge of the traveled way to the intersection of the shoulder slope and foreslope.

Usable Shoulder

The width of shoulder that can be used when a driver parks or makes an emergency stop. If the sideslope is 4:1 or flatter, the usable shoulder width is the same as the graded shoulder width.

If the sideslope is steeper than 4:1 and a roadside barrier is not present, the limit of the usable shoulder is the beginning of the rounding of the shoulder and foreslope. If a roadside barrier is present, the usable shoulder is limited to two feet from the face of the barrier.

National Highway System (NHS)

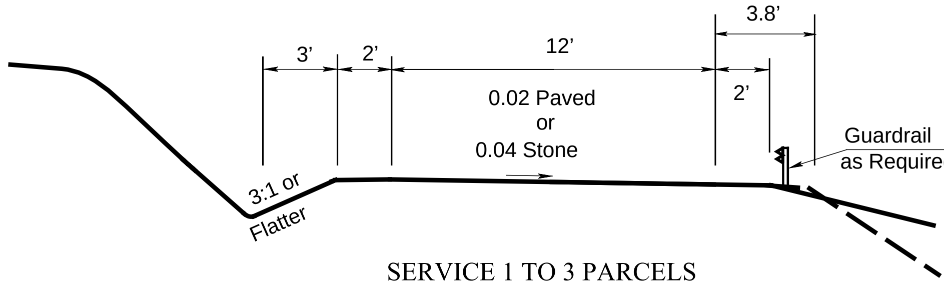
The National Highway System (NHS) includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs). For verification of a N.H.S. roadway designation, contact Intermodal and Special Project Section of the Program Planning and Administration Division.

Very Low-Volume Local Road

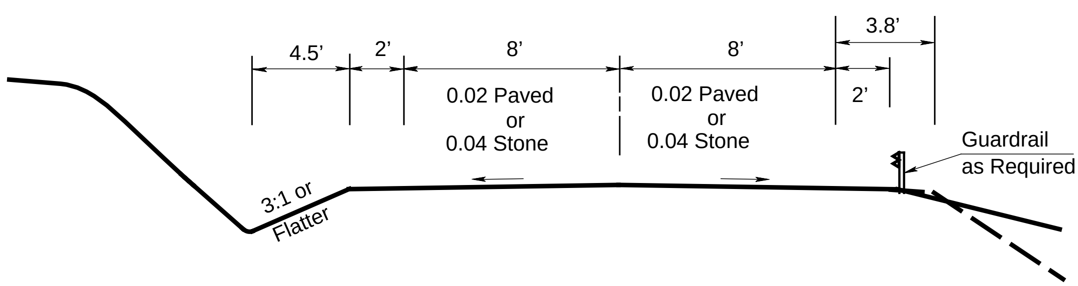
A road that is functionally classified as a local road and has a design average daily traffic volume of 400 vehicles per day or less. Collectors with volumes of 400 vehicles per day or less and that serve primarily local or repeat drivers may also use very low-volume design criteria.

Access Roads

A road that is designed to restore service to ten (10) or fewer parcels where access was affected by the design of a project. The roadway section will be replaced in-kind or in accordance with the typical section for Access Roads shown in Figure 1 of this DD, whichever is greater.



SERVICE 1 TO 3 PARCELS



SERVICE 4 TO 10 PARCELS

ACCESS ROADS

Fig. 1

RURAL ARTERIALS

The highest classification of highways is the arterial. Arterials are expected to provide a high degree of mobility for the longer trip length. They should have a high operating speed and level of service. Since access to abutting property is not their function, access control to enhance mobility is desired. Arterials may be two-lane or multilane, divided or undivided.

A special class of arterial is the freeway. Freeways require full access control. The Interstate System is an example of a freeway. The Appalachian Development Highway (APD) System is not a freeway as it allows at-grade intersections.

Criteria is therefore established for three different sections for arterials: (1) Freeway; (2) Other Divided Arterials; and (3) Two-Lane Arterials.

1. FREEWAY CRITERIA

CRITERIA	DESIGN SPEED (MPH)						
	50	**55**	**60**	**65**	**70**	**75**	**80**
Min. Radius (feet)	758	960	1200	1483	1815	2206	2670
Min. Stopping Sight Distance (ft) for Arterials & Two Lane Highways	425	495	570	645	730	820	910
Maximum Grade (Percent)Type Terrain*							
Level	4	4	3	3	3	3	3
Rolling	5	5	4	4	4	4	4
Mountainous	6	6	6	5	5	-	-

*Grades 1 percent steeper than the value shown may be used for extreme cases in urban areas where development precludes the use of flatter grades and for one-way downgrades except in mountainous terrain.

See Tables 3-7, 7-1, and 8-1

Number of Lanes

The number of lanes should be sufficient to accommodate the selected DHV of an acceptable level of service, determined on the basis of service volumes for applicable conditions. Four will be the minimum number. The most recent approved and adopted edition of the “Highway Capacity Manual” and level of service will help determine the number of lanes. See Tables 2-2 and 2-3 of the 2018 AASHTO ***A Policy on Geometric Design of Highways and Streets*** for levels of service.

Lane Width

Lane width shall be 12 feet.

RURAL ARTERIALS (Continued)

1. FREEWAY CRITERIA (Continued)

Paved Shoulder Width

Useable shoulders to the right of traffic will be 10 feet minimum. Twelve feet should be considered if truck traffic exceeds 250 DDHV. The minimum may be reduced to 8 feet in mountainous terrain.

Useable shoulders to the left of traffic and along auxiliary lanes will be 4 feet minimum. For six or more lanes, 10 feet should be provided and if truck traffic exceeds 250 DDHV, 12 feet should be considered.

Paving of the useable shoulder with concrete or asphalt is required.

Clear Width of Bridge

The clear width on a bridge will be the same as the clear roadway width of approach. This may be reduced for bridges longer than 200 feet in length which will be analyzed individually. The offset from the edge of pavement to the barrier face both left and right of traffic will be 4 feet minimum.

Existing bridges may remain in place as long as the bridge cross section consists of 12-foot lanes, a 10-foot shoulder on the right and a 3.5-foot shoulder on the left. For bridges longer than 200 feet, the offset to the face of parapet or bridge railing shall be a minimum of 3.5 feet from the edge of the nearest traveled lane. Bridge railing shall meet or be upgraded to current standards.

Horizontal Clearance to Obstructions

The width of the clear recovery area will be as per the most recent approved and adopted edition of the AASHTO Roadside Design Guide.

Bridge Design Loading

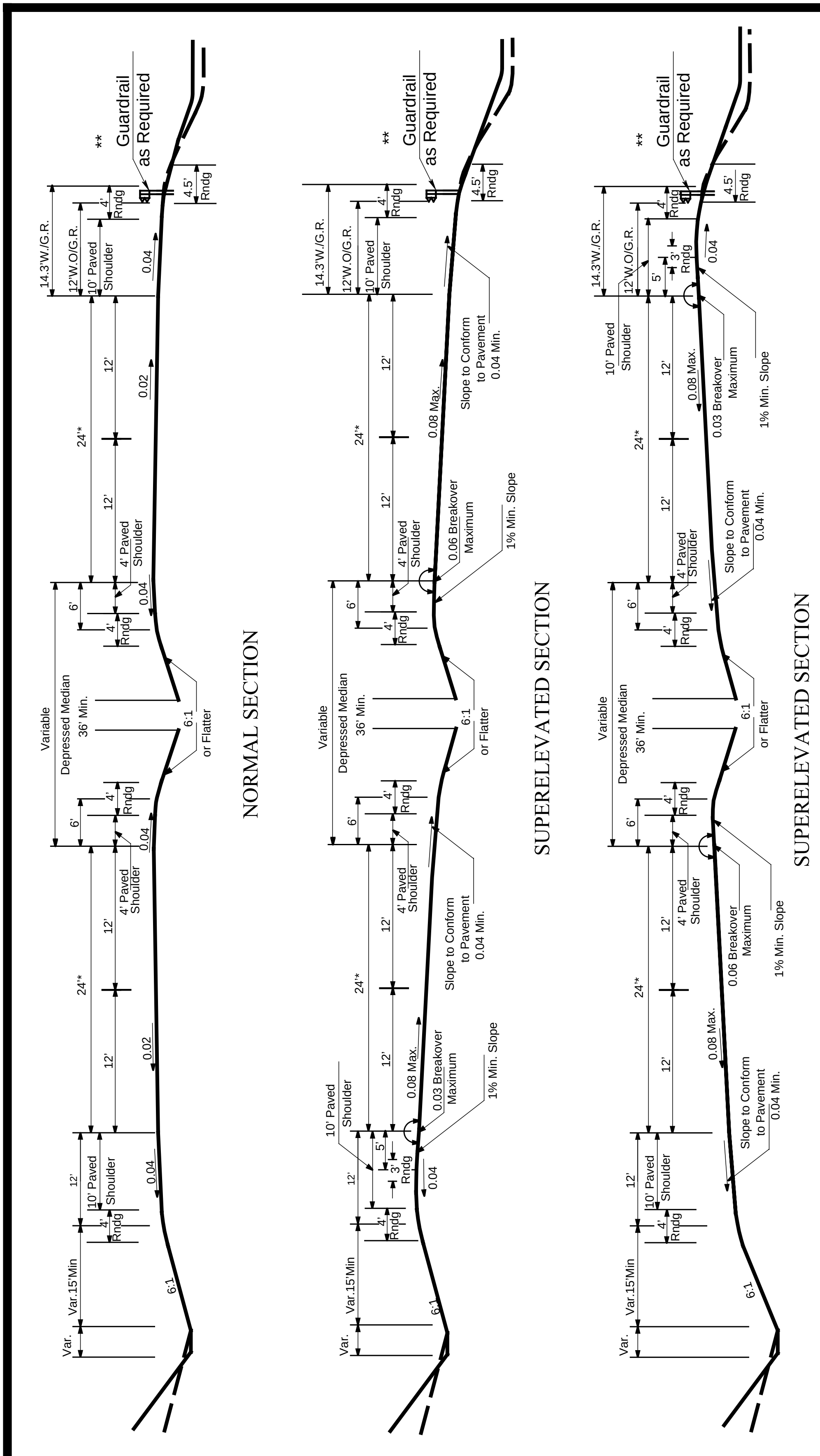
Bridge Design Loading will be HL 93 using LRFD Bridge Design Specifications.

Minimum Vertical Clearance

Clear height of structures shall not be less than 16 feet over the entire roadway and usable shoulder width. There shall be an additional 6 inch allowance for future resurfacing on new structures. The vertical clearance to pedestrian overpasses and sign trusses shall be minimum 17 feet. The vertical clearance from the bridge deck to cross bracing on through trusses shall also be minimum 17 feet.

Typical Section

A sample typical section is shown in Figure 2 of this DD.



* This is the min. width for freeway. Additional lanes (12') may be specified if warranted.

** Guardrail to be located such that the back of the guardrail post is 1 foot from the shoulder P. I.

FREEWAY

Fig. 2

RURAL ARTERIALS (Continued)

2. DIVIDED ARTERIAL CRITERIA

CRITERIA Max. Grade (Percent) Type Terrain	**DESIGN SPEED (MPH)**						
	30	**35**	**40**	**45**	**50**	**55**	**60**
Level	8	7	7	6	6	5	5
Rolling	9	8	8	7	7	6	6
Mountainous	11	10	10	9	9	8	8

Table 7-4 Maximum Grades for Urban Arterials

CRITERIA Max. Grade (Percent) Type Terrain	**DESIGN SPEED (MPH)**								
	40	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**
Level	5	5	4	4	3	3	3	3	3
Rolling	6	6	5	5	4	4	4	4	4
Mountainous	8	7	7	6	6	5	5	5	5

Table 7-2 Maximum Grades for Rural Arterials

Access Control

At-grade intersections with public roads are permitted. Direct access to abutting property will be permitted when: (1) Total intersections do not generally exceed two per side of the road per mile; and (2) sufficient additional corner right of way at each intersection at-grade is acquired to ensure that access connections on the crossroad or driveway are sufficiently removed to minimize interference with the arterial.

Number of Lanes

The number of lanes should be sufficient to accommodate the selected DHV of an acceptable level of service, determined on the basis of service volumes for applicable conditions. Four will be the minimum number. See Tables 2-2 and 2-3 of the 2018 AASHTO Design of Highway and Streets for levels of service.

RURAL ARTERIALS (Continued)

2. DIVIDED ARTERIAL CRITERIA (Continued)

Lane Width

Lane width shall be 12 feet.

Usable Shoulder Width

Usable shoulders to the right of traffic will be 8 feet minimum. Usable shoulders to the left of traffic will be 4 feet minimum. For six or more lanes, full width shoulders of 8 feet should be provided. Paving of the usable shoulder is preferred.

Clear Width of Bridge

The clear width on a bridge will be the same as the clear roadway width of approach. This may be reduced for bridges longer than 200 feet in length, which will be analyzed individually. The offset from the edge of pavement to the barrier face both left and right of traffic will be 4 feet minimum.

Horizontal Clearance to Obstructions

The horizontal clearance to obstructions will be as per the most recent approved and adopted edition of the AASHTO Roadside Design Guide.

Bridge Design Loading

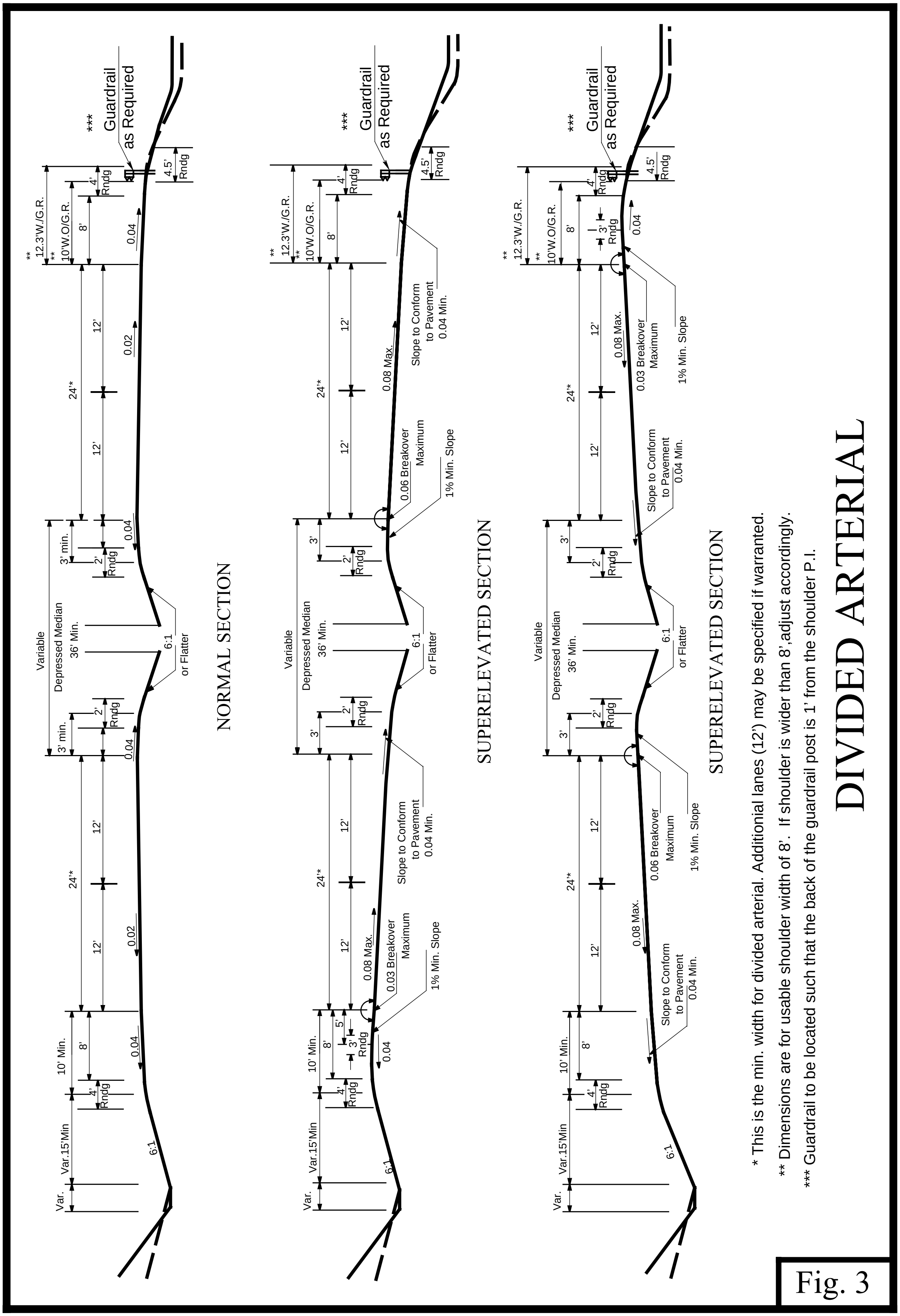
Bridge Design Loading will be HL 93 using AASHTO LRFD Bridge Design Specifications.

Minimum Vertical Clearance

Clear height of structures shall not be less than 16 feet over the entire roadway and usable shoulder width. There shall be an additional 6 inch allowance for future resurfacing on new structures. The vertical clearance to pedestrian overpasses and sign trusses shall be minimum 17 feet. The vertical clearance from the bridge deck to cross bracing on through trusses shall also be minimum 17 feet.

Typical Section

A sample typical section is shown in Figure 3 of this DD.


DIVIDED ARTERIAL
NORMAL SECTION
SUPERELEVATED SECTION
SUPERELEVATED SECTION
Guardrail as Required
***
12.3'W./G.R.
10'W.O/G.R.
Variable Depressed Median 36' Min.
6:1 or Flatter
24'*
12'
8'
3' min.
Var.15'Min
Var.
10' Min.
Slope to Conform to Pavement 0.04 Min.
0.08 Max.
0.06 Breakover Maximum
0.03 Breakover Maximum
1% Min. Slope
* This is the min. width for divided arterial. Additional lanes (12') may be specified if warranted.
** Dimensions are for usable shoulder width of 8'. If shoulder is wider than 8',adjust accordingly.
*** Guardrail to be located such that the back of the guardrail post is 1' from the shoulder P.I.
Fig. 3

RURAL ARTERIALS (Continued)

3. TWO-LANE ARTERIAL CRITERIA

CRITERIA	DESIGN SPEED (MPH)			
	40	**50**	**60**	**70**
Min. Radius (feet)	See Table 3-7 *			
Min. Stopping Sight Distance (ft)	See Table 7-1 *			
Min. Passing Sight Distance (ft)	See Table 7-1 *			
Max. Grade (Percent) Type Terrain	See Table 7-2 *			

* 2018 AASHTO "*A Policy on Geometric Design of Highways and Streets*"

Minimum width of traveled way(ft)[a] for specified design volume (veh/day)				
Design Speed (mph)	**Under 400**	**400-1500**	**1500-2000**	**Over 2000**
40	22	22	22	24
45	22	22	22	24
50	22	22	24	24
55	22	22	24	24
60	24	24	24	24
65	24	24	24	24
70	24	24	24	24
75	24	24	24	24
All speeds	**Width of usable shoulder (ft)[b]**			
	4	6	6	8

[a] On roadways to be reconstructed, an existing 22-ft traveled way may be retained where alignment is satisfactory and there is no crash pattern suggesting the need for widening.
[b] Preferably, usable shoulders on arterials should be paved; however, where volumes are low or a narrow section is needed to reduce construction impacts, the paved shoulder may be a minimum of 2 ft. provided that bicycle use is not intended to be accommodated on the shoulder.

Table 7-3 Minimum Width Traveled Way and Usable Shoulder for Rural Arterials

Clear Width of Bridge

The clear width on a bridge will be the same as the clear roadway width of approach. This may be reduced for bridges longer than 200 feet in length which will be analyzed individually. The offset from the edge of pavement to the barrier face both left and right of traffic will be 4 feet minimum.

RURAL ARTERIALS (Continued)

3. TWO-LANE ARTERIAL CRITERIA (Continued)

Horizontal Clearance to Obstructions

The horizontal clearance to obstructions will be as per the most current and adopted edition of the AASHTO Roadside Design Guide.

Bridge Design Loading

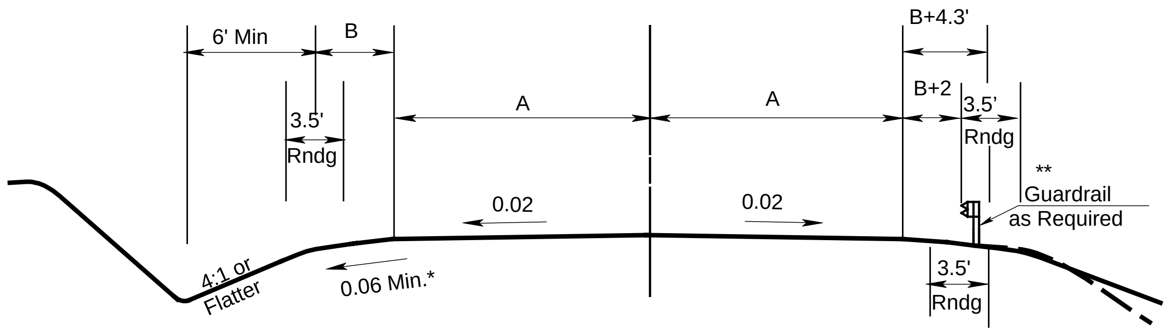
Bridge Design Loading will be HL 93 using AASHTO LRFD Bridge Design Specifications.

Minimum Vertical Clearance

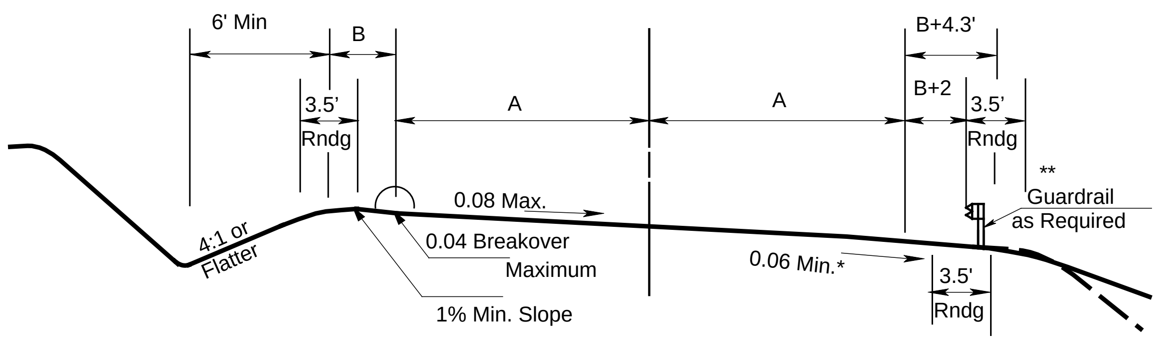
Clear height of structures shall not be less than 16 feet over the entire roadway and usable shoulder width. There shall be an additional 6 inch allowance for future resurfacing on new structures. The vertical clearance to pedestrian overpasses and sign trusses shall be minimum 17 feet. The vertical clearance from the bridge deck to cross bracing on through trusses shall also be minimum 17 feet.

Typical Section

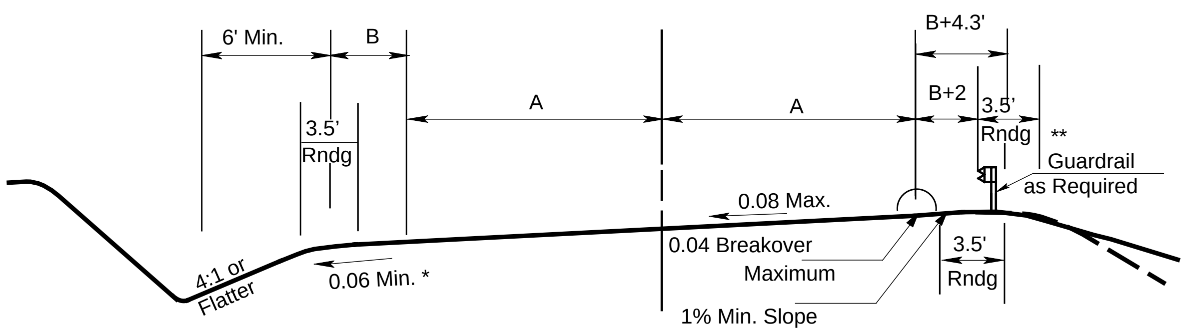
A sample typical section is shown in Figure 4 of this DD.



NORMAL SECTION



SUPERELEVATED SECTION



SUPERELEVATED SECTION

Notes

A = traveled way width
B = graded shoulder width } See page 7 of text

* This is for stone shoulder. If paved, use 0.04.

** Guardrail to be located such that the back of the guardrail post is 1' from the shoulder P.I.

TWO-LANE ARTERIAL

Fig. 4

RURAL COLLECTORS

Collectors serve dual purposes as they feed the arterials as well as service abutting property. Collector roads that serve primarily local or repeat drivers, with very low-volume (ADT ≤ 400) may use the AASHTO publication, “Guidelines for Geometric Design of Very Low–Volume Local Roads (ADT ≤ 400) 2001” (VLVLR) in lieu of Guidelines in the latest edition of the Green Book. See below section titled VERY LOW-VOLUME LOCAL OR COLLECTOR ROADS (≤ 400 ADT) for more information.

Minimum Design Speed

Minimum design speeds (MPH) as a function of traffic demand and terrain type are as follows:

Type Terrain	Design Speed (mph) for specified design volume (veh/day)		
	0-400	400-2000	Over 2000
Level	40	50	60
Rolling	30	40	50
Mountainous	20	30	40

Table 6-1 Minimum Design Speeds for Rural Collectors

Minimum Radius

Minimum Radius is a function of design speed and maximum superelevation (e max=0.08). See: AASHTO 2018 ***A Policy on Geometric Design of Highways and Streets*** Tables 3-8 through 3-10.

Sight Distance

Minimum sight distances (stopping and passing) and K values as a function of design speed are as follows:

Design Speed (MPH)	Stopping			Passing (See Note)	
	Feet	K for Crest [a]	K for Sag [a]	Feet	K for Crest [a]
15	80	3	10		
20	115	7	17	400	57
25	155	12	26	450	72
30	200	19	37	500	89
35	250	29	49	550	108
40	305	44	64	600	129
45	360	61	79	700	175
50	425	84	96	800	229
55	495	114	115	900	289
60	570	151	136	1000	357
65	645	193	157	1100	432

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades; i.e., K=L/A.

Table 6-3 Design Controls for Stopping Sight Distance and for Crest and Sag Vertical Curves

Table 6-4 Design Controls for Crest Vertical Curves Based on Passing Sight Distance

RURAL COLLECTORS (Continued)

Maximum Grades

Type Terrain	Maximum grade (%) for specifications Design Speed (MPH)								
	20	25	30	35	40	45	50	55	60
Level	7	7	7	7	7	7	6	6	5
Rolling	10	10	9	9	8	8	7	7	6
Mountainous	12	11	10	10	10	10	9	9	8

Note: Short lengths of grade in rural areas, such as grades less than 500 ft in length, one-way downgrades, and grades on low-volume rural collectors may be up to 2 percent steeper than the grades shown above.

Table 6-2 Maximum Grades for Rural Collectors

Number of Lanes

Two lanes are appropriate.

Width of Traveled Way and Graded Shoulder

The minimum widths (feet) of traveled way and graded shoulder as a function of design speed and traffic demand are as follows:

Minimum width of traveled way (ft) for specific design volume (veh/day)[a]				
Design speed (MPH)	**Under 400**	**400-1500**	**1500-2000**	**Over 2000**
20	20[b]	20	22	24
25	20[b]	20	22	24
30	20[b]	20	22	24
35	20[b]	22	22	24
40	20[b]	22	22	24
45	20	22	22	24
50	20	22	22	24
55	22	22	24	24
60	22	22	24	24
65	22	22	24	24
All speeds	**Width of shoulder on each side of road (ft)**			
	2.0	5.0[c]	6.0	8.0

[a] On roadways to be reconstructed, a 22 ft traveled way may be retained where the alignment is satisfactory and there is no crash pattern suggesting the need for widening.

[b] An 18 ft minimum width may be used for roadways with design volumes under 250 veh/day.

[c] Shoulder width may be reduced for design speeds greater than 30 mph provided that a minimum roadway width of 30 ft is maintained.

Table 6-5 Minimum Width of Traveled Way and Shoulders

RURAL COLLECTORS (Continued)

Design volume (veh/day)	Minimum clear roadway width for bridges [a]	Design loading structural capacity
400 and under	Traveled way + 2 ft (each side)	HL-93
400-1500	Traveled way + 3 ft (each side)	HL-93
1500-2000	Traveled way + 4 ft (each side) [b]	HL-93
Over 2000	Approach roadway (width) [b]	HL-93

[a] Where the approach roadway width (traveled way plus shoulders) is surfaced, that surface width should be carried across the structures.
[b] For bridges in excess of 100 ft in length, the minimum width of traveled way plus 3 ft on each side is acceptable.

Table 6-6 Minimum Roadway Widths and Design Loadings for New and Reconstructed Bridges

Horizontal Clearances to Obstructions

Design Speed ≤ 45 mph — Clearance: 10 feet from edge of traveled way

Design Speed ≥ 50 mph — Clearance: Refer to the most current adopted edition of the AASHTO Roadside Design Guide

Bridge Design Loading

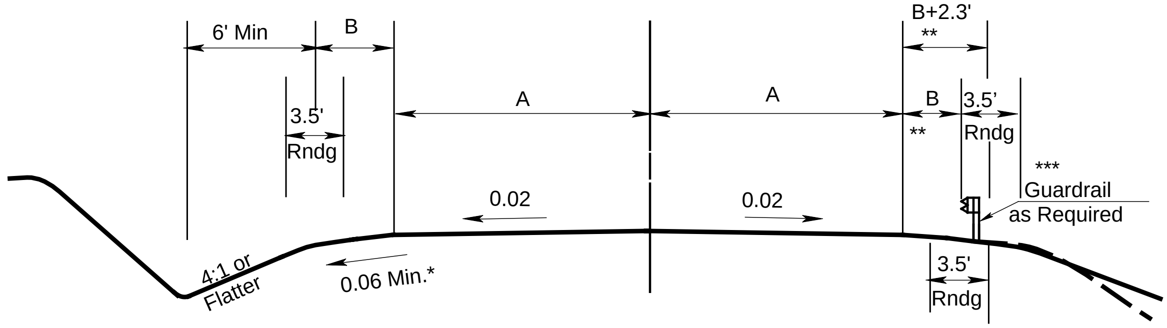
The minimum design loading for bridges on collector roads should be HL 93 LRFD. The minimum roadway widths for new and reconstructed bridges should be as shown in Table 6-6.

Minimum Vertical Clearance

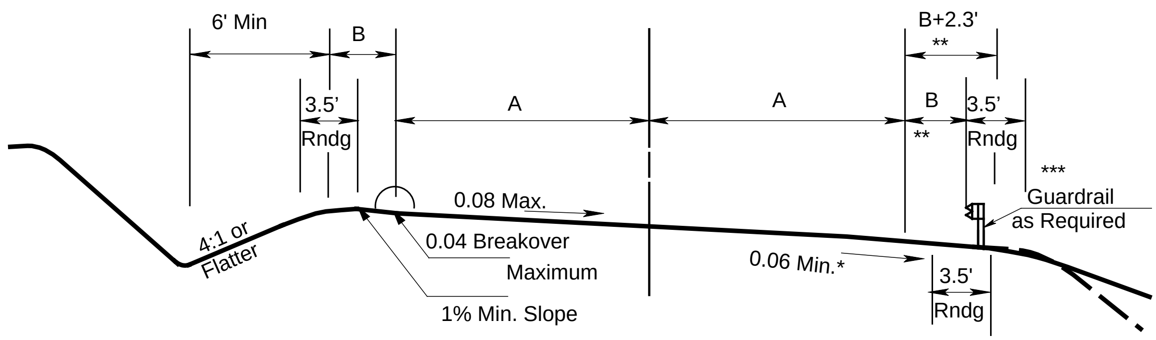
Minimum vertical clearance should be 14’–6” over the entire roadway width. There shall be an additional 6 inch allowance for future resurfacing on new structures.

Typical Section

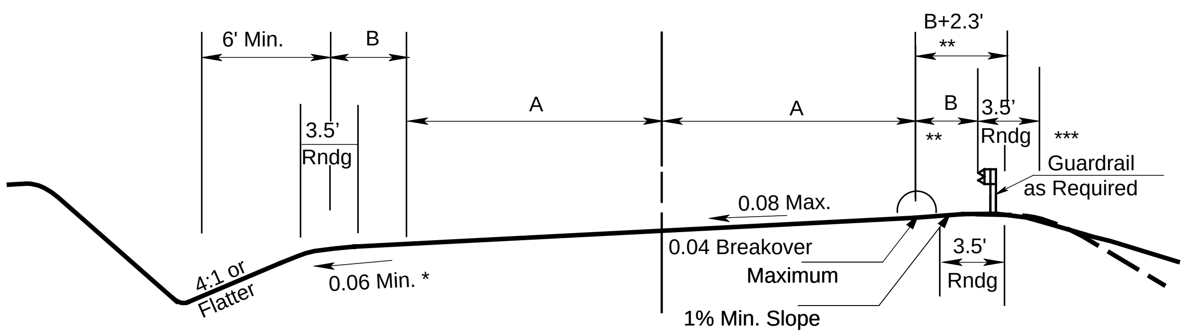
A sample typical section is shown in Figure 5 of this DD.



NORMAL SECTION



SUPERELEVATED SECTION



SUPERELEVATED SECTION

Notes

A = traveled way width
B = graded shoulder width
} See page 10 of text

* This is for stone shoulder. If paved, use 0.04.

** It is desirable but not mandatory to add 2' to these dimensions when guardrail is present. This dimension to be 4' min. when guardail is present.

*** Guardrail to be located such that the back of the guardrail post is 1' from the shoulder P.I.

COLLECTOR ROADS

Fig. 5

LOCAL ROADS (> 400 ADT)

Local roads have relative short trip lengths and their main function is property access. This section pertains to local roads with an ADT > 400.

Design speed (mph) for specified design volume (veh/day)			
Type of Terrain	400-1500	1500-2000	2000 and over
Level	50	50	50
Rolling	40	40	40
Mountainous	30	30	30

Minimum Design Speeds for Local Rural Roads (> 400 ADT) – Adapted from Table 5-1

Minimum Radius

Minimum Radius is a function of design speed and maximum superelevation (emax=0.08) (See AASHTO 2018 ***A Policy on Geometric Design of Highways and Streets*** Tables 3-8 through 3-10.)

Initial speed (mph)	Design stopping sight distance (ft)	Rate of vertical curvature, K[a] (ft/%)	
		Crest	Sag
15	80	3	10
20	115	7	17
25	155	12	26
30	200	19	37
35	250	29	49
40	305	44	64
45	360	61	79
50	425	84	96
55	495	114	115
60	570	151	136
65	645	493	157

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades (i.e., K=L/A).

Table 5-3 Design Controls for Stopping Sight Distance and for Crest and Sag Vertical Curves

LOCAL ROADS (>400 ADT) (Continued)

Design speed (mph)	Design passing sight distance (ft) (See Note)	Rate of vertical curvature, K[a] (ft/%) (See Note)
20	400	57
25	450	72
30	500	89
35	550	108
40	600	129
45	700	175
50	800	229
55	900	289
60	1000	357

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades (i.e., K=L/A).

Table 5-4 Design Controls for Crest Vertical Curves Based on Passing Sight Distance
Note – See NCHRP Report 605 for rationale behind new Passing Sight Distance Criteria

Maximum Grade – is a function of design speed and terrain Maximum grade (%) for specified design speed (mph)									
Type of terrain	**15**	**20**	**25**	**30**	**40**	**45**	**50**	**55**	**60**
Level	9	8	7	7	7	7	6	6	5
Rolling	12	11	11	10	10	9	8	7	6
Mountainous	17	16	15	14	13	12	10	10	-

Table 5-2 Maximum Grades for Local Rural Roads

Minimum width of traveled way (ft) for specific design volume (veh/day)			
Design speed (mph)	**400-1500**	**1500-2000**	**Over 2000**
15	20[a]	20	22
20	20[a]	22	24[b]
25	20[a]	22	24[b]
30	20[a]	22	24[b]
40	20[a]	22	24[b]
45	22	22	24[b]
50	22	22	24[b]
55	22	24[b]	24[b]
60	22	24[b]	24[b]
65	22	24[b]	24[b]
All speeds	**Width of shoulder on each side of road (ft)**		
	5 [a, c]	6	8

[a] For roads in mountainous terrain with design volume of 400 to 600 veh/day, use 18ft traveled way width and 2ft shoulder width.
[b] Where the width of the traveled way is shown as 24ft, the width may remain at 22ft on reconstructed highways where there is no crash pattern suggesting the need for widening.
[c] May be adjusted to achieve a minimum roadway width of 30ft for design speeds greater than 40 mph.

Adapted from Table 5-5 Minimum Width of Traveled Way and Shoulders

LOCAL ROADS (>400 ADT) (Continued)

Clear Width of Bridge		
Design volume (veh/day)	**Minimum clear roadway width for bridges [a]**	**Design loading structural capacity**
400-2000	Traveled way + 3 ft (each side)	HL-93
Over 2000	Approach roadway (width) [b]	HL-93

[a] Where the approach roadway width (traveled way plus shoulders) is surfaced, that surface width should be carried across the structures.
[b] For bridges in excess of 100 ft in length, the minimum width of traveled way plus 3 ft on each side is acceptable.

Adapted from Table 5-6 Minimum Clear Roadway Widths and Design Loadings for New and Reconstructed Bridges

Horizontal Clearance to Obstructions

Clearance shall be 7 feet to 10 feet minimum.

Minimum Vertical Clearance

Minimum vertical clearance should be 14 feet over the entire roadway. There shall be an additional 6 inch allowance for future resurfacing on new structures.

Typical Section

A sample typical section for local roads is shown in Figure 6 of this DD.

VERY LOW-VOLUME LOCAL OR COLLECTOR ROADS (≤ 400 ADT)

Very low-volume local or collector roads have relatively short trip lengths and their main function is property access. This section pertains to very low-volume local or collector roads. Very low-volume roads shall be defined as a road classified as a local road or collector road with an ADT ≤ 400.

Design guidelines for very low-volume local or collector roads are the incorporation of substantial design flexibility based on the exercise of judgment by qualified engineering professionals who are familiar with site conditions and local experiences.

The design criteria and guidance in the AASHTO publication, "Guidelines for Geometric Design of Very Low–Volume Local Roads (ADT ≤ 400) 2001" (VLVLR) will be used as minimum criteria for very low-volume local or collector roads. The guidelines in this DD are intended for application in the design of suitable very low-volume roads including applications in both improvements and new construction of existing roads; and new construction of new roads, including both rural and urban areas.

Minimum Vertical Clearance

Minimum vertical clearance should be 14 feet over the entire roadway width. There shall be an additional 6 inch allowance for future resurfacing on new structures.

Existing Very Low-Volume Roads

Rehabilitation and Reconstruction

These projects may include reconstruction, resurfacing, rehabilitation, restoration, relocation, bridge replacement and other improvements. The criteria for "improvements of existing roads" and "existing bridges" from the VLVLR shall be used on these projects

The design speed to be used for improvement and new construction of existing very low-volume roads will be the existing posted speed limit.

Safety

For replacement of an existing bridge only on a very low-volume road the previous accident history of that segment of roadway shall be examined. An analysis of several years of accident data is to be made by the designer. If no accident data is available, the segment of roadway is to be visually inspected for signs of crashes, such as scarred trees; damage to guardrail, bridge parapet ends, or other roadside features; recent skid marks; etc. Also, the District Maintenance Engineer should be consulted to determine if there have been any past repair

VERY LOW-VOLUME LOCAL OR COLLECTOR ROADS (≤ 400 ADT) (Continued)

issues with roadside features due to crashes in that segment. Severity of crashes will be considered in this analysis also. If any of these analyses reveal the segment has ongoing safety problems, or for any bridge of less than 12' clear width, then approval from the Deputy State Highway Engineer/Development is required for a bridge width less than that given in the Desirable Minimum Clear Width of Bridge table below.

These issues must be a part of the Location and Design (L & D) Approval request (See Design Directive 206, Guidance for Location and Design Approvals for more guidance concerning L & D Approval).

New Construction of New Roads

These projects include new construction where no road existed before, or when the character of the traffic has changed. The criteria for "new construction" from the VLVLR shall be used on these projects. Bridge width shall be less than 16' or greater than 18'.

Typical Section (New Construction of New Roads)

A sample typical section for new construction of new roads is shown in Figure 6 of this DD. A 2 foot preferred minimum shoulder (Dimension "B" in Figure 6) should be utilized for new construction of new roads that are very low-volume roads.

Design Speeds (mph)			
Type of Terrain	Specified Design Volume (veh/day)		
	Under 50	50-250	250-400
Level	30	30	40
Rolling	20	30	30
Mountainous	20	20	20

VERY LOW-VOLUME LOCAL OR COLLECTOR ROADS (≤ 400 ADT) (Continued)

Clear Width of Bridges for New Construction of New Low-Volume Local or Collector Roads

Desirable Minimum Clear Width (ft) of Bridge [a, b]				
Design Speed (mph)	Specified Design Volume (veh/day)			
	Under 25	26-100	100-250	250-400
20	12	15	22	24
30	12	15	22	24
40	22	22	24	24

[a] Bridge width shall not be less than the total roadway width. (roadway width = travel way width + shoulder widths)
[b] Bridge width shall be less than 16’ or greater than 18’.

Conditions for one lane 15’ clear bridge widths on new construction of new roads :

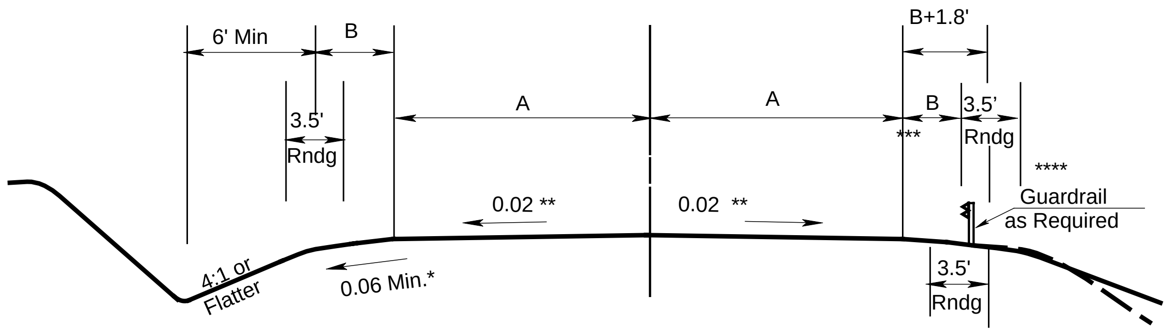
a. ADT < 100. See VLVLR Page 21.
b. Speed ≤ 30 mph.
c. Recommended that bridge length is less than 100’.
d. Intervisible pull-offs should be provided at each end of bridge. See VLVLR Page 21.
e. There should be low potential for commercial or residential development. Property owners and other users of the existing bridge should be consulted with before the bridge width is set to ascertain whether any major development is proposed. Also, for a bridge on a VLVLR leading to only one parcel, as in the case of a US Forest Service road for example, that property owner should be consulted with to determine the type of facility desired. The character of traffic expected to use the facility must be considered. For example, if the bridge is on a VLVLR which serves a commercial enterprise, large trucks may be the majority of the traffic using the bridge, and could impact the choice of the bridge width.
f. Total sight distance should be double the distance shown in Exhibit 12, on Page 39 of VLVLR.
g. Roadway shall meet the requirements for a two-way single-lane road as shown on Page 52 of VLVLR.

Conditions for one lane 12’ clear bridge widths on new construction of new roads:

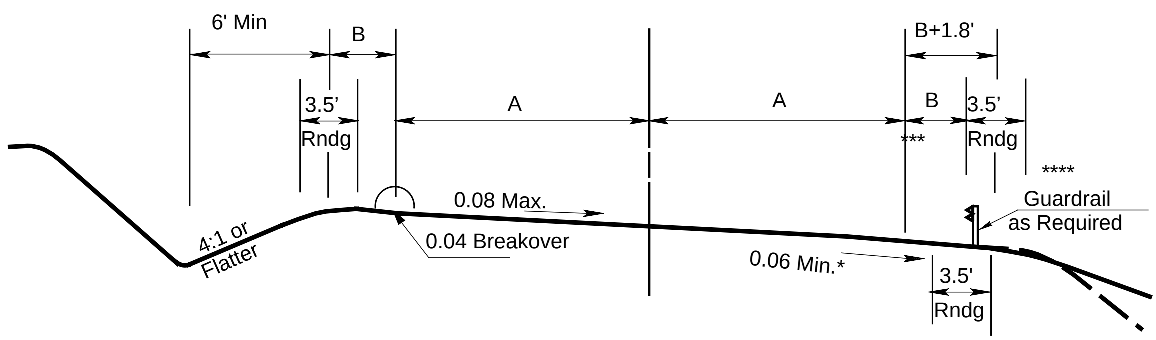
Although structures with a minimum clear width of 15’ wide are strongly encouraged, 12’ clear width one lane bridges may be used in locations with exceptionally low traffic volumes.

One lane bridges with 12’ clear widths may be used when:

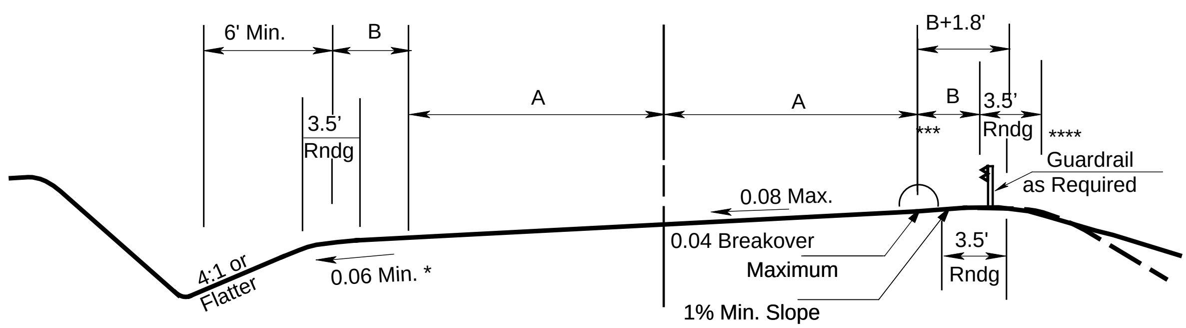
a. ADT ≤ 25
b. Speed ≤ 30 mph.
c. The bridge is not on the National Highway System and is not a concrete-slab or deck-girder type, a TL1 approved barrier according to the Manual for Assessing Safety Hardware (MASH) (latest edition) may be used, with consideration being given to the entire section of roadway, not just the bridge location. (Note – All bridge railings shall conform to the latest edition of MASH.)
d. All other conditions for a 15’ wide structure are met.



NORMAL SECTION



SUPERELEVATED SECTION



SUPERELEVATED SECTION

Notes

A = traveled way width

B = graded shoulder width

* This is for stone shoulder. If paved, use 0.04.

** This is for paved roadway. If stone (permissible only for ADT < 50) use 0.04.

*** It is desirable but not mandatory to add 2' to this dimension when guardrail is present.

**** Guardrail to be located such that the back of the guardrail post is 1' from the shoulder P.I.

LOCAL ROADS

Fig. 6

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-602
INTERCHANGE RAMP WIDTHS
August 1, 2003

The pavement width for ramps is to be 16 feet for tangents and where radii is 200 feet or greater. In cases where the ramp is "two lane operations one way", the minimum width of pavement shall be 30 feet allowing for two fifteen feet lanes and the minimum radii shall be 200 feet. Any radius less than 200 feet is undesirable and must be approved as a special case. In all cases, provisions are to be provided to allow for passing of stalled vehicle/trucks.

The right shoulder will be 8 feet to the face of guardrail or to the intersection of the slopes without guardrail. A 5 feet paved shoulder will be provided on the right in either case.

The left shoulder will be 4 feet to the face of guardrail or to the intersection of slopes without guardrail. A 3 feet paved shoulder will be provided on the left.

The full shoulders shall be carried onto ramp structures. The width of ramp structures will, therefore, be 28 feet measured between the intersections of the parapet wall and the deck. In cases of the ramp being "two lane operation – one way" the width of the ramp structure will be 42 feet between the intersection of the parapet wall and the deck. Ramp bridges with long spans (200 feet or greater) shall be considered special cases and the width for such structures is to be analyzed individually.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-603
SPIRAL CURVES AND SUPERELEVATION
October 3, 2012

Attached for your use is the Division of Highways policy on special curves and superelevation.

The policy is based on the AASHTO publication "*A Policy on Geometric Design of Highways and Streets, 2011*."

Attachments

SPIRAL CURVES AND SUPERELEVATION

DEFINITIONS

Relative Gradient

- the grade difference between the edge of a two-lane road and its centerline, expressed as a percent (%) and/or ratio.

Maximum Relative Gradient

- maximum acceptable difference between the longitudinal grade of the axis of rotation and the edge of pavement. See Table 3-15 of the AASHTO Publication "*A Policy on Geometric Design of Highways and Streets, 2011*" (hereinafter referred to as the 2011 AASHTO Green Book.

1. Use of Spiral Curves

Spiral curves are to be used on all multi-lane highways classified as an arterial. They shall also be used on multi-lane higher type collector and local roads which have relatively good horizontal and vertical alignment. Spiral curves are not required on two lane roads, however, spiral curves are preferred on high-speed two-lane roads (design speeds over 45 mph). Under the 2011 AASHTO Green Book, the radius (R), superelevation (e max), and design speeds are the controlling factors, not the degree of curvature.

The use of spiral curves on spot improvement projects shall be determined based on the individual characteristics of the proposed construction.

The minimum length of spiral for four-lane highways, divided or undivided, shall be the length of runoff as shown under the "2-Lanes Rotated" columns for the chosen superelevation rate in Table 3-17b from the 2011 AASHTO Green Book.

2. Superelevation Attainment

Four methods are used to transition the pavement to a superelevation cross section: (1) revolving a traveled way with normal cross slopes about the centerline profile, (2) revolving a traveled way with normal cross slopes about the inside-edge profile, (3) revolving a traveled way with normal cross slopes about the outside-edge profile, and (4) revolving a straight cross slope traveled way about the outside-edge profile. Minimum tangent runout lengths will vary as per Table 3-23, and Table 3-16 will give the increase in runoff transition according to which method is used. Four lane undivided highway runoffs are 1.5 times the two lane distance and are 2.0 times the two lane distance for six lanes. A transition detail showing the rate of superelevation along with tables giving the profile grade and lane edge elevations at 25 foot intervals and at other selected points as may be necessary is to be made a part of the plans. The elevation tables should be included with the other tables required in the plans. It may be desirable to show the lane edge elevations in the plan view rather than in the table. Either method is acceptable.

Only preliminary data such as proposed radii and superelevation should be shown until the line and grade is approved. When transitioning into existing roads, relative gradients should be used. The 8% superelevation table shall be used, except as described below. On Urban streets the maximum superelevation rate can be 4%; however, on tie-ins to an existing road the 6% table may be used, but caution must be exercised.

3. Tangent Runout

The tangent minimum runout length should be attained at the same rate as the superelevation is attained and a minimum length shown in Adapted Table 3-23 below.

Design speed (mph)	Tangent runout length (ft) Superelevation rate			
	2	**4**	**6**	**8**
15	44	-	-	-
20	59	30	-	-
25	74	37	25	-
30	88	44	29	-
35	103	52	34	26
40	117	59	39	29
45	132	66	44	33
50	147	74	49	37
55	161	81	54	40
60	176	88	59	44
65	191	96	64	48
70	205	103	68	51
75	220	110	73	55
80	235	118	78	59

Notes: 1. Based on 2.0% normal cross slope.
2. Superelevation rates above 8% and cells with "-" coincide with a pavement edge grade that exceeds the maximum relative gradient in Table 3-15 by 50% or more. These limits apply to roads where one lane is rotated; lower limits apply when more lanes are rotated (see Table 3-16).

Adapted from Table 3-23 Tangent Runout Length for Spiral Curve Transition Design

4. Unspiraled Curves

On unspiraled circular curves the transition from normal crown to the fully superelevated section shall be accomplished in the runoff distance "L" shown in Table 3-17b from the above referenced 2011 AASHTO Green Book, plus the tangent runout distance as required for spiral curves. The runoff distance should be so applied that two-thirds of the length is on the tangent and one-third is on the curve.

DESIGN SPEED (MPH)	MAXIMUM RELATIVE GRADIENT (%)	EQUIVALENT MAXIMUM RELATIVE SLOPE
15	0.78	1:128
20	0.74	1:135
25	0.70	1:143
30	0.66	1:152
35	0.62	1:161
40	0.58	1:172
45	0.54	1:185
50	0.50	1:200
55	0.47	1:213
60	0.45	1:222
65	0.43	1:233
70	0.40	1:250
75	0.38	1:263
80	0.35	1:286

Table 3-15 Maximum Relative Gradients

Number of Lanes Rotated, n_l	Adjustment Factor, b_w^a	Length Increase Relative to One-lane Rotated ($=n_l b_w$)
1	1.00	1.0
1.5	0.83	1.25
2	0.75	1.5
2.5	0.70	1.75
3	0.67	2.0
3.5	0.64	2.25

Table 3-16 Adjustment Factor for Number of Lanes Rotated

n_l = number of lanes rotated

b_w^a = adjustment factor for number of lanes (The equation for the adjustment factor b_w is: $b_w = [1+0.5(n_i-1)]/n_i$

Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 4%

(Reference: Adapted from 2011 Green Book, Table 3-8, Page 3-44.)

U.S. Customary Units										
e (%)	V_d=**15 mph**	V_d=**20 mph**	V_d=**25 mph**	V_d=**30 mph**	V_d=**35 mph**	V_d=**40 mph**	V_d=**45 mph**	V_d=**50 mph**	V_d=**55 mph**	V_d=**60 mph**
	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**	R **(ft)**
NC	796	1410	2050	2830	3730	4770	5930	7320	8650	10300
RC	506	902	1340	1880	2490	3220	4040	4940	5950	7080
2.2	399	723	1110	1580	2120	2760	3480	4280	5180	6190
2.4	271	513	838	1270	1760	2340	2980	3690	4500	5410
2.6	201	388	650	1000	1420	1930	2490	3130	3870	4700
2.8	157	308	524	817	1170	1620	2100	2660	3310	4060
3.0	127	251	433	681	982	1370	1800	2290	2860	3530
3.2	105	209	363	576	835	1180	1550	1980	2490	3090
3.4	88	175	307	490	714	1010	1340	1720	2170	2700
3.6	73	147	259	416	610	865	1150	1480	1880	2350
3.8	61	122	215	348	512	730	970	1260	1600	2010
4.0	42	86	154	250	371	533	711	926	1190	1500

Note: use of e_{max} = 4% should be limited to urban conditions.

Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 6%
(Reference: Adapted from 2011 Green Book, Table 3-9, Page 3-45.)

U.S. Customary Units														
e (%)	V_d=15 mph	V_d=20 mph	V_d=25 mph	V_d=30 mph	V_d=35 mph	V_d=40 mph	V_d=45 mph	V_d=50 mph	V_d=55 mph	V_d=60 mph	V_d=65 mph	V_d=70 mph	V_d=75 mph	V_d=80 mph
	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)
NC	868	1580	2290	3130	4100	5230	6480	7870	9410	11100	12600	14100	15700	17400
RC	614	1120	1630	2240	2950	3770	4680	5700	6820	8060	9130	10300	11500	12900
2.2	543	991	1450	2000	2630	3370	4190	5100	6110	7230	8200	9240	10400	11600
2.4	482	884	1300	1790	2360	3030	3770	4600	5520	6540	7430	8380	9420	10600
2.6	430	791	1170	1610	2130	2740	3420	4170	5020	5950	6770	7660	8620	9670
2.8	384	709	1050	1460	1930	2490	3110	3800	4580	5440	6200	7030	7930	8910
3.0	341	635	944	1320	1760	2270	2840	3480	4200	4990	5710	6490	7330	8260
3.2	300	566	850	1200	1600	2080	2600	3200	3860	4600	5280	6010	6810	7680
3.4	256	498	761	1080	1460	1900	2390	2940	3560	4250	4890	5580	6340	7180
3.6	209	422	673	972	1320	1740	2190	2710	3290	3940	4540	5210	5930	6720
3.8	176	358	583	864	1190	1590	2010	2490	3040	3650	4230	4860	5560	6320
4.0	151	309	511	766	1070	1440	1840	2300	2810	3390	3950	4550	5220	5950
4.2	131	270	452	684	960	1310	1680	2110	2590	3140	3680	4270	4910	5620
4.4	116	238	402	615	868	1190	1540	1940	2400	2920	3440	4010	4630	5320
4.6	102	212	360	555	788	1090	1410	1780	2210	2710	3220	3770	4380	5040
4.8	91	189	324	502	718	995	1300	1640	2050	2510	3000	3550	4140	4790
5.0	82	169	292	456	654	911	1190	1510	1890	2330	2800	3330	3910	4550
5.2	73	152	264	413	595	833	1090	1390	1750	2160	2610	3120	3690	4320
5.4	65	136	237	373	540	759	995	1280	1610	1990	2420	2910	3460	4090
5.6	58	121	212	335	487	687	903	1160	1470	1830	2230	2700	3230	3840
5.8	51	106	186	296	431	611	806	1040	1320	1650	2020	2460	2970	3560
6.0	39	81	144	231	340	485	643	833	1060	1330	1660	2040	2500	3050

Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 8%
(Reference: Adapted from 2011 Green Book, Table 3-10b, Page 3-47.)

U.S. Customary Units														
e (%)	V_d=15 mph	V_d=20 mph	V_d=25 mph	V_d=30 mph	V_d=35 mph	V_d=40 mph	V_d=45 mph	V_d=50 mph	V_d=55 mph	V_d=60 mph	V_d=65 mph	V_d=70 mph	V_d=75 mph	V_d=80 mph
	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)
NC	932	1640	2370	3240	4260	5410	6710	8150	9720	11500	12900	14500	16100	17800
RC	676	1190	1720	2370	3120	3970	4930	5990	7150	8440	9510	10700	12000	13300
2.2	605	1070	1550	2130	2800	3570	4440	5400	6450	7620	8600	9660	10800	12000
2.4	546	959	1400	1930	2540	3240	4030	4910	5870	6930	7830	8810	9850	11000
2.6	496	872	1280	1760	2320	2960	3690	4490	5370	6350	7180	8090	9050	10100
2.8	453	796	1170	1610	2130	2720	3390	4130	4950	5850	6630	7470	8370	9340
3.0	415	730	1070	1480	1960	2510	3130	3820	4580	5420	6140	6930	7780	8700
3.2	382	672	985	1370	1820	2330	2900	3550	4250	5040	5720	6460	7260	8130
3.4	352	620	911	1270	1690	2170	2700	3300	3970	4700	5350	6050	6800	7620
3.6	324	572	845	1180	1570	2020	2520	3090	3710	4400	5010	5680	6400	7180
3.8	300	530	784	1100	1470	1890	2360	2890	3480	4140	4710	5350	6030	6780
4.0	277	490	729	1030	1370	1770	2220	2720	3270	3890	4450	5050	5710	6420
4.2	255	453	678	955	1280	1660	2080	2560	3080	3670	4200	4780	5410	6090
4.4	235	418	630	893	1200	1560	1960	2410	2910	3470	3980	4540	5140	5800
4.6	215	384	585	834	1130	1470	1850	2280	2750	3290	3770	4310	4890	5530
4.8	193	349	542	779	1060	1390	1750	2160	2610	3120	3590	4100	4670	5280
5.0	172	314	499	727	991	1310	1650	2040	2470	2960	3410	3910	4460	5050
5.2	154	284	457	676	929	1230	1560	1930	2350	2820	3250	3740	4260	4840
5.4	139	258	420	627	870	1160	1480	1830	2230	2680	3110	3570	4090	4640
5.6	126	236	387	582	813	1090	1390	1740	2120	2550	2970	3420	3920	4460
5.8	115	216	358	542	761	1030	1320	1650	2010	2430	2840	3280	3760	4290
6.0	105	199	332	506	713	965	1250	1560	1920	2320	2710	3150	3620	4140

Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 8% (continued from previous page)
(Reference: Adapted from 2011 Green Book, Table 3-10b, Page 3-47.)

U.S. Customary Units														
e (%)	V_d=15 mph	V_d=20 mph	V_d=25 mph	V_d=30 mph	V_d=35 mph	V_d=40 mph	V_d=45 mph	V_d=50 mph	V_d=55 mph	V_d=60 mph	V_d=65 mph	V_d=70 mph	V_d=75 mph	V_d=80 mph
	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)	R (ft)
6.2	97	184	308	472	669	909	1180	1480	1820	2210	2600	3020	3480	3990
6.4	89	170	287	442	628	857	1110	1400	1730	2110	2490	2910	3360	3850
6.6	82	157	267	413	590	808	1050	1330	1650	2010	2380	2790	3240	3720
6.8	76	146	248	386	553	761	990	1260	1560	1910	2280	2690	3120	3600
7.0	70	135	231	360	518	716	933	1190	1480	1820	2180	2580	3010	3480
7.2	64	125	214	336	485	672	878	1120	1400	1720	2070	2470	2900	3370
7.4	59	115	198	312	451	628	822	1060	1320	1630	1970	2350	2780	3250
7.6	54	105	182	287	417	583	765	980	1230	1530	1850	2230	2650	3120
7.8	48	94	164	261	380	533	701	901	1140	1410	1720	2080	2500	2970
8.0	38	76	134	214	314	444	587	758	960	1200	1480	1810	2210	2670

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-604
NON-FREEWAY NHS RRR POLICY
October 26, 2012

Attached for your use is the Division of Highways Non-Freeway NHS RRR Policy dated October 26, 2012 which was approved by the Federal Highway Administration on March 18, 2013. It shall be used on all applicable projects.

Attachment

NON-FREEWAY NHS RRR POLICY

INTRODUCTION

These criteria have been developed to assure that maximum benefits can be derived from available funds for restoration, rehabilitation, and resurfacing (RRR) of non-freeway highways on the National Highway System (NHS) in a manner which will preserve and extend the service life and enhance safety. Because the priority and scope of such projects are based primarily on needs and economic considerations, emphasis is placed on implementation of cost-effective improvements, where practical, while considering and including appropriate safety improvements.

Non-Freeway NHS Route RRR projects, are basically an attempt to extend the service life of an existing highway and enhance safety by use of pavement resurfacing, shoulder restoration, traffic control devices, safety improvements, and drainage improvements as required. Projects may also include minor adjustments to superelevation, improvements to lane widths, radii, or other modifications to eliminate spot safety hazards. Reference is hereby made to National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, for further use by the designer in considering safety improvements. This Report can be found at the following web address: http://safety.transportation.org/guides.aspx.

RRR projects are defined as restoration or rehabilitation of existing pavement, substructure, superstructure or other significant parts of the existing system. Specifically, pavement overlay projects shall be designed using the criteria contained herein, when the project scope consists of an overlay greater in thickness than a one and one-half inch wearing course and either a patching and leveling course or a scratch course as defined in DD-644. Additionally, bridge deck overlays and projects repairing structural members shall require the application of this criteria. Generally the level of service is not increased.

Special circumstances such as extraordinary costs, significant environmental impacts, route continuity, etc., may require consideration of exceptions to these criteria. Any exceptions to these criteria will be documented as required by DD-605 "Design Exception Policy". FHWA approval must be obtained on non-exempt Federal-aid projects. On any project designated for concurrence review by FHWA, any required design exceptions shall also be concurrently reviewed by FHWA.

When costs due to upgrading geometric features or the structural section for RRR projects exceed the original proposed expenditure by a substantial amount, the designer will evaluate the benefits received from a RRR project versus a reconstruction project.

APPLICABILITY

These criteria shall apply to all RRR non-freeway projects on the National Highway System regardless of funding source. All design elements not meeting the criteria set forth in this directive will require the preparation and approval of a design exception.

FUNCTIONAL CLASSIFICATION

The highway system in West Virginia has been functionally classified into the following areas: Arterial, Collector and Local Roads and Streets.

Arterial highways generally provide direct service between cities and larger towns and are high speed, high volume facilities. Arterial routes may be freeways, other divided highways or two-lane highways. All NHS routes are by definition Principal Arterials.

PHYSICAL CHARACTERISTICS, POTENTIAL IMPACTS, AND PROJECT SELECTION

The physical characteristics of a highway and its general location often determine what improvements are necessary, desirable, possible, practical, or cost-effective. Topography, climate, adjacent development, existing alignment (horizontal and vertical), cross section (traveled way width, shoulder width, cross slope, side slopes, etc.), and similar characteristics will be considered in determining the scope of geometric or safety improvements to be made.

Quite often, the scope of geometric improvements made by RRR projects is influenced by potential impacts on the surrounding land development. Typically, social, environmental and economic impacts severely limit the scope of RRR projects, particularly where the existing right of way is narrow and there is considerable adjacent development. The need for additional right of way frequently determines the upper limit of practical geometric improvements.

Projects are identified and selected based on a variety of factors with the pavement or bridge condition being of utmost importance. The pavement condition itself will not affect the extent of geometric improvements included in the project. Geometric improvements will be initiated to fulfill traffic service/safety needs.

TRAFFIC VOLUMES

Traffic data is needed in the design of all highway improvements. For RRR Projects the need for a formal forecast of future traffic is greatest when the current traffic is approaching the capacity of the highway, and decisions must be made regarding the timing of major improvements such as additional lanes. Studies to determine future traffic are not normally necessary on low volume roads where even high percentage increases in traffic do not significantly affect design decisions. The current average daily traffic will be used for design purposes except in specific cases of capacity-related problems.

DESIGN SPEED

The minimum design speed shall be the existing posted speed limit.

HORIZONTAL CURVATURE/SUPERELEVATION

Within the limits of the RRR Project the existing horizontal curvature and superelevation will not be determined for each curve. All curves will be investigated during field reviews and available crash data for the locations reviewed. Reconstruction of the curve, modification of the superelevation, and/or special signing/delineation will be considered as appropriate; however, reconstruction would only be considered cost-effective at higher ADT levels. Advisory curve signs with speed plates will be erected for all curves with safe driving speed less than the posted speed limit or regulatory speed limit, or if possible, the superelevation will be adjusted. The designer is also encouraged to consider the following strategies on curves identified to have a high crash rate: widening of the roadway or shoulder throughout the curve, installation of shoulder rumble strips (this would require the shoulder to be paved to a minimum width of 3 feet), enhancement of delineation along the curve by use of post-mounted delineators outside the roadway, and the mitigation of pavement-edge drop-offs by use of the “Safety Edge” in accordance to DD-650, to which reference is hereby made. “Safety Edge” will also be used on all tangent sections of roadway.

The above information is taken from Volume 7 of the National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, to which reference in hereby made to the designer for more information concerning other strategies for increasing the safety of horizontal curves.

VERTICAL ALIGNMENT

Design speeds of existing crest vertical curves will not be determined within the RRR project limits. During the design process all vertical curves will be reviewed for possible reconstruction if the curve significantly reduces stopping sight distances, or the curve hides major potential hazards such as intersections, sharp horizontal curves or narrow bridges. If reconstruction of the curve, to include flattening of the vertical curve (if a crest curve) or widening of the shoulders, or relocation of the intersection(s) is determined not to be cost-effective, warning signs or advisory signing modification for the potential hazard will be considered. Also, enhancement of visibility by use of delineators will be considered, as well as removal of roadside fixed-object hazards.

PAVEMENT THICKNESS FOR OVERLAY

A pavement design will be executed in accordance with DD-646 "Pavement Design Selection Guide." Pavement designs are to be approved by the Deputy State Highway Engineer/ Operations. Exceptions to Pavement Thickness Design will be documented and approval requested from the Deputy State Highway Engineer/Development. A brief history of the existing pavement shall be included with the request for exception to the design thickness, along with a report of the existing pavement conditions obtained from field inspections. The straight-line diagrams maintained by the Program Planning and Administration Division can be utilized as a source of information regarding the history of the existing pavement.

Special Skid Resistant Pavement (bid Item 402001-*) is to be used for the final wearing course on all routes where the ADT is 3,000 or more. Pavement per Section 401 may be utilized as the final course when the ADT is less than 3,000 and there is no evidence of a high wet-pavement crash rate at that particular location. Special Skid Resistant Pavement will be specified on routes that have a reported high wet-pavement crash rate.

LANE AND SHOULDER WIDTHS

A. DIVIDED ARTERIAL CRITERIA

Lane Width: Lane width shall be 12 feet minimum.

Usable Shoulder Width:

1. Usable shoulders to the right of traffic will be 8 feet minimum.

2. Usable shoulders to the left of traffic will be 3 feet minimum. For six or more lanes, 8 feet should be provided.

   Paving of the usable shoulder is preferred. Rumble strips will be required on all paved shoulders 3 feet or greater in width.

B. UNDIVIDED ARTERIAL CRITERIA

Lane and Shoulder Widths in feet				
Current Design Volume ADT	**Design Speed mph**	**Shoulder Width Feet**	**Lane Width in feet <10% Trucks**	**≥10% Trucks**
< 2000	< 50	4	10	11
	≥ 50	4	11	12*
≥ 2000	All	6	11	12*

*11 feet lanes may remain where alignment and safety records are satisfactory.

NOTE: Shoulder widths noted are minimums from a design criteria standpoint. Actual constructed widths should be in accordance with the existing, available shoulder width up to a maximum of 10 feet. The designer shall maintain, as much as possible, a consistent paved shoulder width through the project. This width should match that width which can be obtained predominantly along the roadway in question. For urban roadway segments with a curb/curb and gutter section, lane and shoulder widths are to match the existing section unless traffic service/safety needs dictate the need for widening, assuming existing lane widths meet or exceed the minimums listed in this table.

PAVEMENT CROSS SLOPE AND SUPERELEVATION

Pavement resurfacing under the RRR program will be accomplished such that the finished pavement is center crowned on tangent sections and the cross slope is a minimum of 1.6%. When warranted by the crash history, the existing superelevation shall be evaluated per the AASHTO criteria. On four-lane, high speed, divided highways the designer shall require the Contractor to submit the existing superelevation data for review. If the existing superelevation does not meet AASHTO standards, the designer shall either require the Contractor to upgrade the superelevation or shall prepare a design exception for approval.

VERTICAL CLEARANCE

Vertical clearance shall be at least 14'-6" over the entire roadway, including usable shoulder. If a design exception is approved, signing, in conformance with the Manual on Uniform Traffic Control Devices, is to be used to delineate the low clearance.

SAFETY

Because safety enhancement is an essential consideration, RRR projects will be developed and accomplished in a manner which considers and includes appropriate roadside safety improvements. Once RRR project route segments are selected, an analysis of several years of accident data will be made for each. Evaluation of crash records often reveals problems requiring special attention. Relative crash rates can be an additional important factor in establishing both the priority and scope of RRR Projects. The crash history for the project area will be compiled and compared to the statewide average accident rate for the same type of road. This data review is an integral part of the RRR Project development process to determine feasible safety modifications for incorporation into the project as necessary. Route segment crash rates, critical crash rate segments, spot locations having potential for safety improvements, and hazardous segments identified through the highway safety improvement program will be identified, documented, and made available for each RRR Project developed. Also, the Designer will coordinate with the District Traffic Engineer for the District in which the project is located for a determination if the project includes locations with known safety issues, based on the Division of Highway's tracking system prioritized safety improvements list. These safety issues will be evaluated and addressed in the project, if feasible. The design will incorporate spot improvements as well as general safety feature upgrading as appropriate. These determinations will be made considering the accident rate for each RRR segment, ADT, design speed, geometry, and other pertinent factors.

The designer is hereby directed to the National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan for guidance concerning strategies for safety enhancements related to the various types of dangers faced by drivers described in the report's Volumes, which can be found at the following web address: http://safety.transportation.org/guides.aspx.

The Volumes are referenced as follows:

1. Volume 1: A Guide for Addressing Aggressive-Driving Collisions
2. Volume 2: A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses
3. Volume 3: A Guide for Addressing Collisions with Trees in Hazardous Locations
4. Volume 4: A Guide for Addressing Head-On Collisions
5. Volume 5: A Guide for Addressing Unsignalized Intersection Collisions
6. Volume 6: A Guide for Addressing Run-Off-Road Collisions
7. Volume 7: A Guide for Reducing Collisions on Horizontal Curves
8. Volume 8: A Guide for Reducing Collisions Involving Utility Poles
9. Volume 9: A Guide for Reducing Collisions Involving Older Drivers
10. Volume 10: A Guide for Reducing Collisions Involving Pedestrians
11. Volume 11: A Guide for Increasing Seat Belt Use
12. Volume 12: A Guide for Reducing Collisions at Signalized Intersections
13. Volume 13: A Guide for Reducing Collisions Involving Heavy Trucks

Interactive Highway Safety Design Model

The Interactive Highway Safety Design Model (IHDSM) is road safety evaluation software that evaluates the safety impact of specific geometric designs for roadways. This software, available free on this web site: www.ihsdm.org/ihsdm_public/index.html, estimates current or future safety performance based on crash predictions. This software can be used to analyze the predicted safety performance of a roadway segment before a RRR project, and then be used to predict the safety performance of the proposed improvement in the project. Comparisons can then be made, using the predicted reduction in crashes, of the cost-effectiveness of an improvement.

It is recommended that this analysis be used for 2-lane RRR projects only.

Road Safety Audits

A Road Safety Audit (RSA) is the formal safety performance examination of an existing or future road or intersection by an independent audit team. Its main objective is to address the safe operation of intersections and roadways to ensure a high level of safety for all road users. More information concerning RSA’s can be found at the following web sites: safety.fhwa.dot.gov/state_program/rsa/ and www.roadwaysafetyaudits.org.

An RSA team assesses the crash potential and safety performance of a roadway or intersection and prepares a report that identifies potential safety issues. Project officials or managers can then evaluate and determine appropriate changes. An RSA can be used in any phase of project development from planning to construction. An RSA done during the planning and design stages can identify potential safety issues before they are built into the project.

It is recommended that Road Safety Audits be conducted on multilane RRR projects. This determination will be made by the Traffic Engineering Division in conjunction with the District Traffic Engineer for the District in which the project is located. If it is decided a Road Safety Audit is not necessary, then at minimum the crash data must be obtained and analyzed to identify any existing safety problems.

Clear Zone

The term "clear zone", for this design policy, shall be used to designate the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles. The disposition of existing obstacles within the clear zone shall be treated in the following order of preference:

1. Remove or relocate obstacle.

2. Redesign obstacle to reduce hazard (e.g. frangible mountings, etc.)

3. Shield obstacle with approved traffic barrier.

4. Leave obstacle in place with or without treatment (e.g. delineation). This will require the designer to prepare documentation to the project file of the reasons for leaving the obstacle in place and the choice of delineation, if any.

Cut slopes within the "clear zone" require special attention by the designer. Smooth cut faces, free of jagged projections, may be left in place. Cut faces that are rough can be graded to a smooth face in the contract or shielded by an approved traffic barrier. If no corrective action is taken on rough cut faces inside the "clear zone", a design exception must be written.

The minimum clear zone for non-freeway NHS routes shall be as follows:

A. **MULTILANE HIGHWAYS (RURAL AND URBAN)**

The minimum clear zone shall be determined in accordance with the latest edition of the AASHTO Roadside Design Guide.

B. **TWO LANE HIGHWAYS**

Rural Highways:

Minimum Clear Zone in feet		
Current Design	**Design Speed**	
Volume (ADT)	**≤ 40 mph**	**> 40 mph**
≤ 750	6	8
751 to 2000	8	10
2001 to 4500	10	12
> 4500	12	14

Urban Highways (Without curb and gutter):

Minimum Clear Zone in feet		
Current Design	**Design Speed**	
Volume (ADT)	**≤ 30 mph**	**> 30 mph**
≤ 2000	4	6
> 2000	6	8

Urban Highways (With curb and gutter):

The minimum clear zone shall be one and one-half feet behind the curb.

EXISTING GUARDRAIL

See DD-662 Guardrail for more information on the treatment of existing guardrail and end treatments on 3R Projects.

SIGNING, SIGNALS AND PAVEMENT MARKINGS

All traffic signs, pavement markings and traffic signals will be in conformance with the "Manual on Uniform Traffic Control Devices." Traffic control during construction shall be maintained in accordance with a traffic control plan included in the plans. The traffic control plan shall be reviewed by the Traffic Engineering Division in accordance with DD-202 and conform to the latest edition of the Division's "Manual on Temporary Traffic Control for Streets and Highways".

BRIDGE LOADING

All bridges encountered within or immediately adjacent to RRR Project limits will be investigated to determine their load carrying capacity. The designer shall request and examine the Bridge Inspection Report for each bridge within or adjacent to the project limits for any deficiencies previously identified by inspections. For each bridge, the rating will be determined from the state highway bridge inventory. If the rating equals or exceeds an HS-20 loading, the bridge will be considered to meet the RRR program design criteria for bridge loading. For bridges with a rating below an HS-20 loading, a design exception shall be required for the bridge to remain in its existing condition.

BRIDGE RAILING

Bridge railings will be evaluated according to criteria established in the most current edition of the Division's "Bridge Design Manual", Section 3.2.2 – Barriers, on all bridges within or immediately adjacent to RRR Project limits. The evaluation will determine if the existing railing is acceptable or must be modified. All bridge railings shall be continuous and have a surface with no protrusions that could snag vehicles. Also, considering the ADT and speeds served, the railings shall have uniform and adequate overall strength.

A. If the railing is determined not to be structurally adequate, a structurally adequate bridge railing is to be provided as part of the project. If a determination of adequacy cannot be made by the project designer, Engineering Division should be consulted to make this determination.

B. If the railing is determined not to be crash worthy, a crash worthy railing is to be provided as a part of the project.

BRIDGE APPROACH GUARDRAIL

Approach guardrail, in accordance with current Division of Highways' Standards, will be installed at all bridge locations. This will include an appropriate attachment to the bridge railing, a transition section and an end treatment. Only approved crash tested approach guardrail installations will be used. See DD-662 for more information.

BRIDGE WIDTH

A. DIVIDED ARTERIALS

Bridges < 200 feet should have the full width of roadway.
Bridges ≥ 200 feet, traveled way plus 4 feet offset (inside and outside) to the face of parapet. APD bridges that were originally constructed with a travel way plus three foot offsets (inside and outside) may also remain in place.

B. **UNDIVIDED ARTERIALS**

Current Design Volume ADT	Usable Bridge Widths
≤ 2000	Width of Approach Travel Way + 2 feet
2001 to 4000	Width of Approach Travel Way + 4 feet
> 4000	Width of Approach Travel Way + 6 feet*

*Bridges ≥ 200 feet, traveled way plus 4 feet offset (inside and outside) to the face of parapet. APD bridges where the original constructed bridge width was equal to the travel way plus three foot offsets (inside and outside) may also remain in place. Appropriate warning signs and delineation will be provided for all bridges with widths less than the finished approach roadway (lanes + shoulders) width.

NON-FREEWAY NHS RRR DESIGN CHECKLIST

The attached design checklist shall be submitted with all Non-Freeway NHS RRR Project PS&E submittals to Program Administration Division. The Design Exception report per DD-605 is only required on those projects where exceptions are included in the design.

Sheet _____ of _____

NON-FREEWAY NHS RRR DESIGN CHECKLIST

State Project Number ________________________

Federal Project Number ______________________

County ____________________________________

Project Name ______________________________

Date ______________________________________

Current ADT: _______________ vpd

Design Speed: _______________ mph (km/h)

Pavement Thickness for Overlay (if applicable): _______________ inches (mm)

Lane Width: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Shoulder Width: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Vertical Clearance: **_______________________ feet (meters)**

Clear Zone: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Bridge Width: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Bridge Railing (if applicable):

Structurally Adequate Yes No

Crash Worthy Yes No

Bridge Rating: **HS - ___________________**

Safety Improvements Considered (add additional sheets as necessary):

____

____

____

____

Safety Improvements Incorporated: Yes No

Design Exceptions Required & Attached: Yes No

Completed by: ____

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-605
DESIGN EXCEPTION POLICY
February 9, 2017
Supersedes January 25, 2013

Attached for your use is the Division of Highways (DOH) Design Exception Policy. It shall be used on all applicable projects.

Attachment

DESIGN EXCEPTION POLICY

INTRODUCTION

All new construction or reconstruction projects on the National Highway System (NHS) shall be designed in accordance with the AASHTO criteria, such as criteria found in the most current approved editions of the AASHTO Green Book and the Roadside Design Guide. All RRR projects shall be designed in accordance with the current FHWA approved State RRR criteria. Those criteria related to design speed, lane and shoulder widths, design loading structural capacity, horizontal curve radius, maximum grade, stopping sight distance, cross slope, superelevation rate, and vertical clearance are the controlling criteria that require formal design exceptions when not met. Stopping sight distance (SSD) applies to horizontal alignments and vertical alignments except for sag vertical curves.

Of the 10 controlling criteria, only design loading structural capacity and design speed apply to all NHS facility types. The remaining eight criteria are applicable only to "high-speed" NHS roadways, defined as Interstate highways, other freeways, and roadways with a design speed greater than or equal to 50 mph (80 km/h). However, any of the remaining eight criteria that are not met on projects that do not require a formal design exception for these criteria shall be documented to the project file, with any mitigation strategies indicated in the report. The following chart is included for clarity.

Application of Controlling Criteria

All NHS Roadways:	**Interstate highways, other freeways, and roadways with design speed ≥ 50 mph:**
Design Speed	Design Speed
Design Loading Structural Capacity	Design Loading Structural Capacity
	Lane Width
	Shoulder Width
	Horizontal Curve Radius
	Superelevation Rate
	Maximum Grade
	Stopping Sight Distance
	Cross Slope
	Vertical Clearance

According to the Stewardship & Oversight Agreement, the WVDOH is responsible for preparation and approval of all design exceptions, including those on the NHS. For Full Oversight and PoDI (Projects of Division Interest) Projects, a copy of the design exception should be forwarded to the FHWA.

The criteria are included in the attached flowcharts and "Design Exception Justification Report". These criteria will be referred to throughout this document as the **"10 Controlling Criteria"**. A formal design exception is not required and should not be submitted unless the existing/proposed value for any of the “10 Controlling Criteria” fails when compared to the design values for any of these criteria. The designer should follow “Step 1” of the attached flowchart when determining which design directive to use in establishing design values.

All efforts should be made to adhere to the specified criteria. However, under unusual conditions, it may be necessary to use values that are less than the minimum values that have been established. If lesser values are proposed for use, a Design Exception Justification Report shall be developed and approved. The approved Design Exception Report shall be submitted to Planning Division at PS&E for filing and inclusion on the straight-line diagrams. A copy of the approved design exception shall be included in the project file.

As stated previously, design exceptions shall only be submitted when one or more of the “10 Controlling Criteria” design values is violated by the existing/proposed values. Design exceptions are not required and shall not be submitted on projects defined as “Maintenance Projects” as shown in the attached flowcharts. The designer should refer to DD-817 “Resurfacing Project Categories” for guidance in determining which project types are classified as maintenance projects in this regard.

Design criteria that are not satisfied and are not one of the “10 Controlling Criteria” shall not be documented and submitted as a formal design exception. These criteria exceptions shall be documented in the project files only.

DESIGN EXCEPTION JUSTIFICATION REPORT

The following information, which affects the design values selected, must be considered and documented as a part of the design exception request: (1) the existing roadway characteristics, the minimum design criteria values, specific design criteria that will not be met, the proposed design values, and the criteria source (controlling design directive or AASHTO section) must be identified; and (2) a narrative documenting that the acceptance of the design exceptions is prudent, cost-effective and will not compromise the safety of the traveling public. This narrative will discuss the following items:

1. The effect of the variance from the design criteria on the safety and operation of the facility and other impacts such as right-of-way, community, environmental, cost, and usability by all modes of transportation; and safety mitigating measures considered and provided;

2. The compatibility of the design and operation with adjacent sections of roadway;

3. Amount and character of traffic using the facility;

4. Accident history (type, location, severity, etc.);

5. Alternatives considered;

6. Comparative cost of full design criteria versus lower design criteria being proposed, or other practical alternatives;

7. The long term effect of the reduced design criteria versus full design criteria (effect of capacity reduction);

8. Difficulty in obtaining full design criteria (cost, right of way involvement, delay, environmental impacts, etc.);

9. Level of Service for full design criteria versus reduced design criteria; and,

10. Any other design criteria that is not being met, i.e., cumulative effect of more than one standard that is being reduced.

This documentation is <u>essential</u> for each design exception requested.

The level of analysis should be commensurate with the complexity of the project.

Design Speed and Design Loading Structural Capacity are fundamental criteria in the design
of a project. Exceptions to these criteria should be extremely rare and the documentation will provide the following additional information;

1. Design Speed exceptions:
   a. Length of section with reduced design speed compared to overall length of project
   b. Measures used in transitions to adjacent sections with higher or lower design or operating speeds.

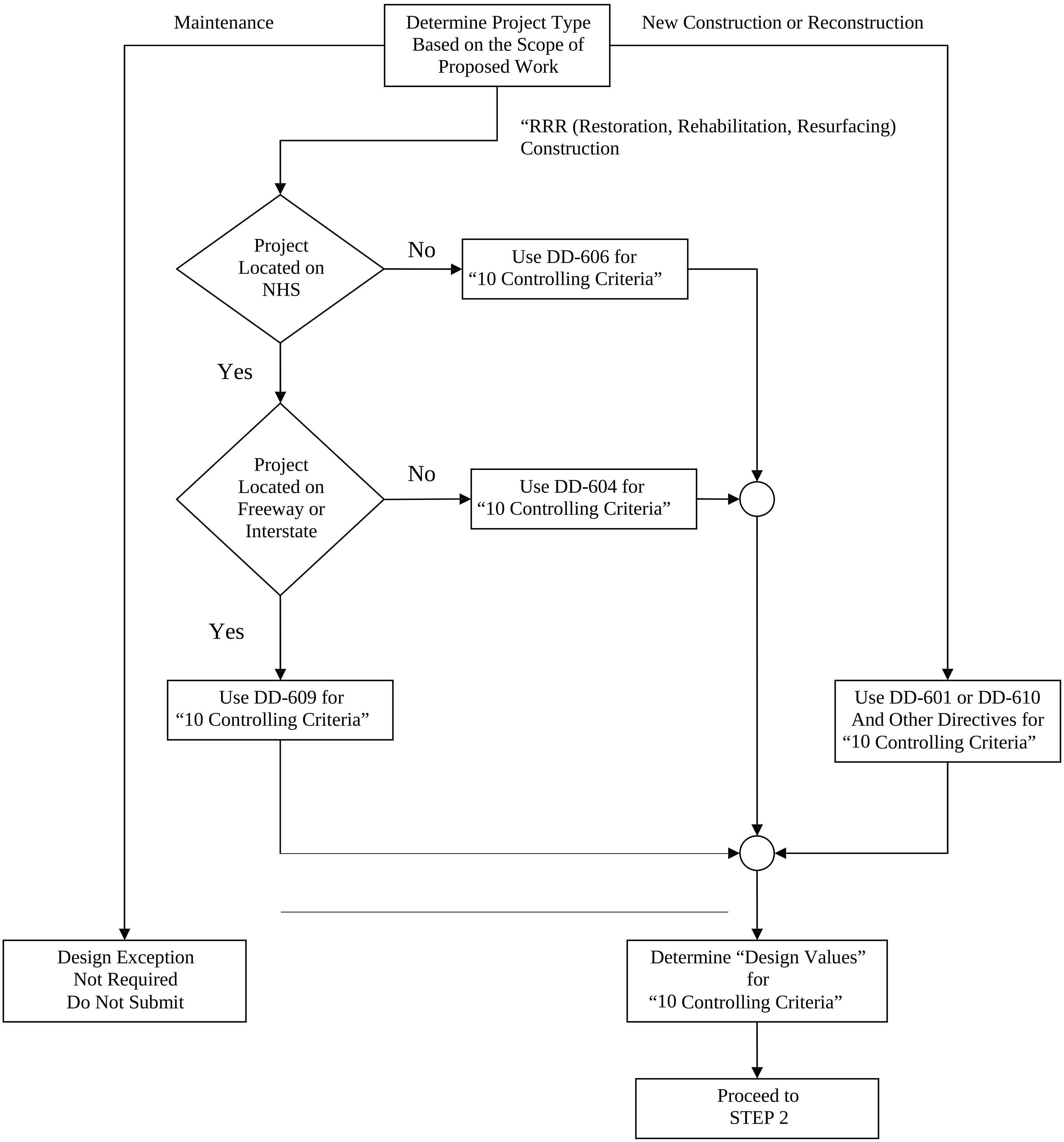
2. Design Loading Structural Capacity exceptions:
   a. Verification of safe load-carrying capacity (load rating) for all State unrestricted legal loads or routine permit loads, and in the case of bridges and tunnels on the Interstate, all Federal legal loads.

Design values chosen or being considered, which are exceptions to the appropriate minimum design criteria values, shall be approved as early as possible in the design process prior to considerable detailed design work being accomplished. The Deputy State Highway Engineer - Operations will approve those exceptions necessary on projects that are District "Design Responsibility". The Deputy State Highway Engineer - Development will approve those exceptions necessary on projects that are a Central Office Division "Design Responsibility". The DOH is responsible for the preparation and approval of <u>all</u> design exceptions.

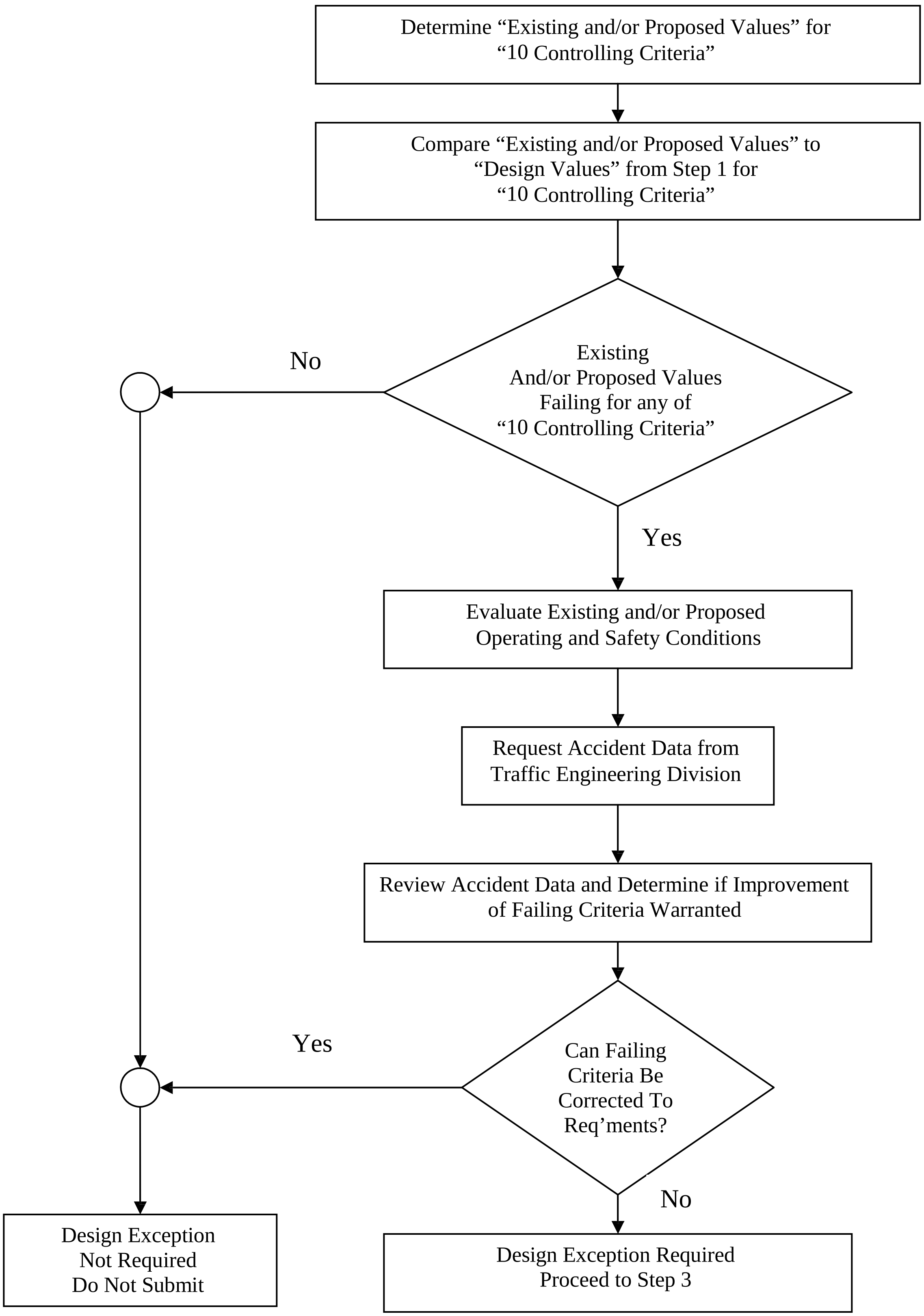
During the design process, a continuing review of exceptions shall be made and any additions or modifications documented and placed in the project files.

Design exceptions on all other projects must be approved prior to submission of the PS&E package to Contract Administration Division.

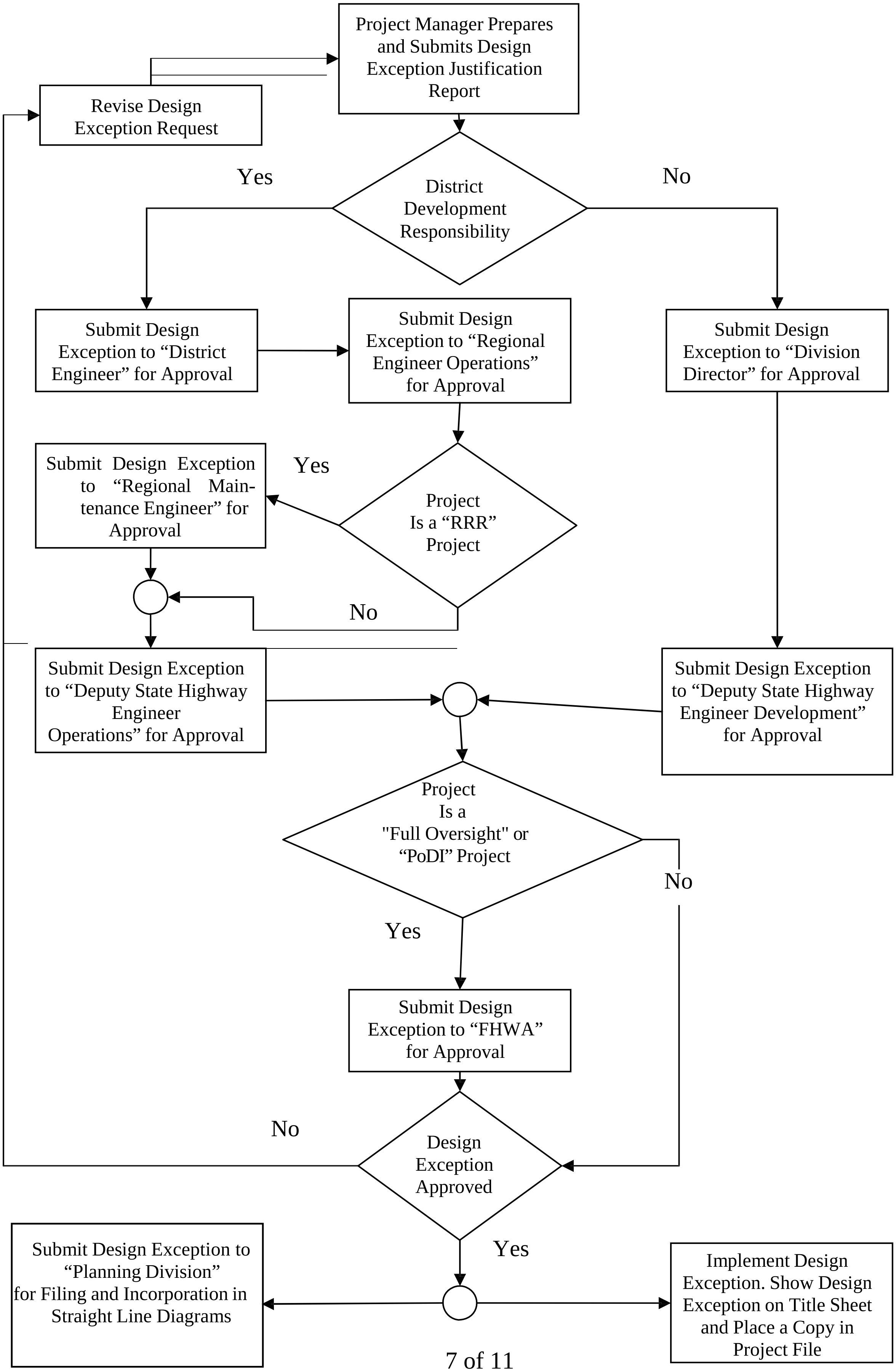
STEP 1: DETERMINE PROJECT "DESIGN VALUES"



STEP 2: DETERMINE IF DESIGN EXCEPTION IS REQUIRED



STEP 3: PREPARE AND SUBMIT DESIGN EXCEPTION FOR APPROVAL



DESIGN EXCEPTION JUSTIFICATION REPORT

PROJECT DATA

State Project No. ______________________ **Date:** ______________________

Federal Project No: ______________________ **County:** ______________________

Project Name: ______________________

Project Description: ______________________

WVDOH Representative: ______________________

FHWA Representative: ______________________

HIGHWAY ROUTE DATA

AASHTO Functional Classification

1. ☐ Urban ☐ Rural
2. ☐ Arterial ☐ Collector ☐ Local Road
3. ☐ Freeway ☐ Divided/Arterial ☐ Two-Lane Arterial
4. ☐ Interstate

TERRAIN TYPE ☐ Level ☐ Rolling ☐ Mountainous

TRAFFIC DATA

Current Year: ______________	**Design Year:** ______________
ADT: ______________	**ADT:** ______________
DHV: ______________	**DHV:** ______________

SPEED LIMIT: ______________ ☐ **POSTED/** ☐ **REGULATORY**

ACCIDENT DATA

Accident Rate: ______________________

Base Accident Rate (Statewide Average): ______________________

Nature of Area: ______________________

DISTRICT DESIGN PROJECTS

DESIGN CRITERIA DATA (Document Only Exceptions)

10 Controlling Criteria	Existing Condition	Minimum Design Criteria	Proposed Value	Criteria Source
1. Design Speed	________	________	________	________
2. Lane Width	________	________	________	________
3. Shoulder Width	________	________	________	________
4. Stopping Sight Distance	________	________	________	________
5. Horizontal Curve Radius	________	________	________	________
6. Maximum Grade	________	________	________	________
7. Cross-Slope	________	________	________	________
8. Superelevation	________	________	________	________
9. Vertical Clearance	________	________	________	________
10. Design Loading Structural Capacity	________	________	________	________

APPROVAL SIGNATURES

RECOMMENDED:

1. ______________________________
   Responsible Charge Engineer

2. ______________________________
   District Engineer or Maintenance Engineer

APPROVED:

____
Deputy State Highway Engineer – Operations

____
Federal Highway Administration
(Full Oversight and PoDI Projects Only)

CENTRAL OFFICE DESIGN PROJECTS

DESIGN CRITERIA DATA (Document Only Exceptions)

10 Controlling Criteria	Existing Condition	Minimum Design Criteria	Proposed Value	Criteria Source
1. Design Speed				
2. Lane Width				
3. Shoulder Width				
4. Stopping Sight Distance				
5. Horizontal Curve Radius				
6. Maximum Grade				
7. Cross-Slope				
8. Superelevation				
9. Vertical Clearance				
10. Design Loading Structural Capacity				

APPROVAL SIGNATURES

RECOMMENDED:

1. ______________________________
Responsible Charge Engineer

2. ______________________________
Division Director

APPROVED:

____
Deputy State Highway Engineer – Development

____
Federal Highway Administration
(Full Oversight and PoDi Projects Only)

DD-605

SHEET ____ OF _____

NARRATIVE DISCUSSION OF DESIGN EXCEPTION(S):

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-606
NON-NHS RRR POLICY
October 26, 2012

Attached for your use is the Division of Highways' Non-NHS RRR Policy dated October 26, 2012 which was approved by the Division of Highways on March 18, 2013. It shall be used on all applicable projects.

Attachment

RRR POLICY

ROUTES NOT ON THE

NATIONAL HIGHWAY SYSTEM

2012

INTRODUCTION

These criteria have been developed to assure that maximum benefits can be derived from available funds for restoration, rehabilitation, and resurfacing (RRR) of highways other than freeways in a manner which will preserve and extend the service life and enhance safety. Because the priority and scope of such projects are based primarily on economic considerations, emphasis is placed on implementation of cost-effective improvements where practical while considering and including appropriate safety improvements.

Non-freeway resurfacing, restoration, and rehabilitation projects, referred to as "RRR Projects," are basically an attempt to reestablish the original project by improving the riding characteristics and include pavement resurfacing, shoulder restoration, traffic control devices, safety improvements, and drainage improvements as required. Projects may also include minor adjustments to superelevation, improvements to lane widths, radii, and other significant efforts to eliminate spot safety hazards. Projects are most commonly bituminous concrete resurfacing with shoulder restoration and spot safety improvements. Generally the level of service is not increased. Reference is hereby made to National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, for further use by the designer in considering safety improvements. This Report can be found at the following web address: http://safety.transportation.org/guides.aspx.

Special circumstances such as extraordinary costs, significant environmental impacts, route continuity, etc., may require consideration of exceptions to these criteria. Any exceptions to these criteria will be documented as required by DD-605 "Design Exception Policy"**.**

When costs due to upgrading geometric features or the structural section for RRR projects exceed the original proposed expenditure by a substantial amount, the designer will evaluate the benefits received from an RRR project versus a reconstruction project. When a reconstruction project is selected instead of a RRR project, the Division of Highways' latest Design Standards and Design Directives will be utilized in redesign.

APPLICABILITY

These criteria shall apply to all RRR non-freeway projects not on the National Highway System regardless of funding source. All design elements not meeting the criteria set forth in this directive will require the preparation and approval of a design exception.

FUNCTIONAL CLASSIFICATION

The highway system in West Virginia has been functionally classified by legislation into the following areas: Expressway, Trunkline, Feeder and Local Service. The American Association of State Highway and Transportation Officials (AASHTO) utilizes, as presented in the publication; "The AASHTO Green Book," a similar functional classification system. The designations used are; Freeway, Arterial, Collector and Local Roads and Streets. Therefore, state highways have been assigned these classifications also.

Arterial highways generally provide direct service between cities and larger towns and are high speed, high volume facilities. Collector highways serve small towns directly, connecting them and local roads to the arterial system. Local Roads and Streets primarily provide access to farms, businesses, residences, and other abutting properties from either Arterial or Collector highways.

PHYSICAL CHARACTERISTICS, POTENTIAL IMPACTS, AND PROJECT SELECTION

The physical characteristics of a highway and its general location often determine what improvements are necessary, desirable, possible, practical, or cost-effective. Topography, climate, adjacent development, existing alignment (horizontal and vertical), cross section (pavement width, shoulder width, cross slope, side slopes, etc.), and similar characteristics will be considered in determining the scope of geometric or safety improvements to be made.

Quite often, the scope of geometric improvements made by RRR projects is influenced by potential impacts on the surrounding land development. Typically, social, environmental and economic impacts severely limit the scope of RRR projects, particularly where the existing right of way is narrow and there is considerable adjacent development. The need for additional right of way frequently determines the upper limit of practical geometric improvements.

Projects are identified and selected based on a variety of factors with the pavement condition being of utmost importance. The pavement condition itself will not affect the extent of geometric improvements included in the project. Geometric improvements will be initiated to fulfill traffic service/safety needs.

TRAFFIC VOLUMES

Traffic data is needed in the design of all highway improvements. For RRR Projects the need for a formal forecast of future traffic is greatest when the current traffic is approaching the capacity of the highway, and decisions must be made regarding the timing of major improvements such as additional lanes. Studies to determine future traffic are not normally necessary on low volume roads where even high percentage increases in traffic do not significantly affect design decisions. The current average daily traffic will be used for design purposes except in specific cases of capacity-related problems.

DESIGN SPEED

A reasonable and logical average running speed on each arterial, collector, and local road/street RRR Project will be established for use as the design speed. This speed shall be determined by review of posted speeds and curve advisory speed signs, and assessing the roadside development, curvature, and other roadway features such as pavement width, shoulder width, and horizontal and vertical alignments. A speed study may be required, due to the fact that the posted speed limit may not represent the actual running speed of that segment of roadway. Projects may contain segments with different design speeds.

HORIZONTAL CURVATURE/SUPERELEVATION

Within the limits of the RRR Project the existing horizontal curvature and superelevation will not be determined for each curve. All curves will be investigated during field reviews and available crash data for the locations reviewed. Reconstruction of the curve, modification of the superelevation, and/or special signing/delineation will be considered as appropriate; however, reconstruction would only be considered cost-effective at higher ADT levels. Advisory curve signs with speed plates will be erected for all curves with safe driving speed less than the posted speed limit or regulatory speed limit, or if possible, the superelevation will be adjusted. The designer is also encouraged to consider the following strategies on curves identified to have a high crash rate: widening of the roadway or shoulder throughout the curve, installation of shoulder rumble strips (this would require the shoulder to be paved to a minimum width of 3 feet), enhancement of delineation along the curve by use of post-mounted delineators outside the roadway, and the mitigation of pavement-edge drop-offs by use of the “Safety Edge” in accordance to DD-650, to which reference is hereby made. “Safety Edge” will also be used on all tangent sections of roadway.

The above information is taken from Volume 7 of the National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, to which reference in hereby made to the designer for more information concerning other strategies for increasing the safety of horizontal curves. The web link for this report is: http://safety.transportation.org/guides.aspx.

VERTICAL ALIGNMENT/STOPPING SIGHT DISTANCE

Design speeds based on stopping sight distances of existing crest vertical curves will not be determined within the RRR project limits. During the design process all vertical curves will be reviewed for possible reconstruction if (1) the ADT is greater than 2000, (2) the curve significantly reduces stopping sight distances, or (3) the curve hides major potential hazards such as intersections, sharp horizontal curves or narrow bridges. If reconstruction of the curve, to include flattening of the vertical curve (if a crest curve), widening of the shoulders, or relocation of the intersection(s) is determined not to be cost-effective, warning signs or advisory signing modification for the potential hazard will be considered. Also, enhancement of visibility by use of delineators will be considered, as well as removal of roadside fixed-object hazards.

PAVEMENT THICKNESS FOR OVERLAY

A pavement design will be executed for a performance period as described in Section 140, DD-646, Pavement Design Selection Guide on all Non-NHS Routes. The designer shall use sound engineering judgment when choosing the performance period. Pavement thickness designs are to be approved by the Director of the Engineering Division. Exceptions to Pavement Thickness Design will be documented and approval requested from the Divisions' Deputy State Highway Engineer/Development. A brief history of the existing pavement shall be included with the request for exception to the design thickness, along with a report of the existing pavement conditions obtained from field inspections. The straight-line diagrams maintained by the Program Planning and Administration Division can be utilized as a source of information regarding the history of the existing pavement.

Special Skid Resistant Pavement (bid Item 402001-*) is to be used for the final wearing course on all routes where the ADT is 3,000 or more. Pavement per Section 401 may be utilized as the final course when the ADT is less than 3,000 and there is no evidence of a high wet-pavement accident rate at that particular location. Special Skid Resistant Pavement will also be specified on routes that have a reported high wet-pavement accident rate.

LANE AND SHOULDER WIDTHS

Lane and shoulder width studies have been completed for the Transportation Research Board. The report entitled "Roadway Widths for Low-Traffic-Volume Roads" has been prepared as the National Cooperative Highway Report 362.

The research studies show that for roads with less than 2000 ADT, there is no apparent accident reduction above a total roadway width, including travel lane and usable shoulder width, of 30 feet. Widening a lane from 8 feet or 9 feet to 10 feet produces no apparent benefit of accident reduction.

The research studies show that the accident rate is not improved by widening a lane from 9 feet to 10 feet unless a shoulder width of 5 feet is provided. Widening a lane from 10 feet with little or no shoulder width to 11 feet plus greater than 3 foot shoulders appears effective in terms of expected reduction of accident rates. The study shows that accident rates are lower on 11 and 12 foot lanes than on 10 foot or 9 feet lanes; however, the accident rate appears to be essentially the same for 12 foot lanes as on 11 foot lanes.

Shoulder widths were not studied in regards to reduction of accident rates independently as indicated above. Each project shall be evaluated on pavement and shoulder widening for cost effectiveness. Widening should only be conceded if the accident rate can be significantly reduced. The remainder of the route, of which a project may be only a short segment, should be reviewed for continuity of lane and shoulder widths.

The following Pavement/Shoulder Width Table is to be used to determine the minimum values for cross section elements of the facilities on Non-Freeway Non-NHS RRR Projects:

PAVEMENT/SHOULDER TABLE			
ARTERIAL			
ADT	PAVEMENT(MINIMUM)		SHOULDER MINIMUM**
	> (40 MPH)*	≤ (40 MPH)	
>2000	(22')	(20')	(4')
≤2000	(20')	(18')	(2')
COLLECTOR			
ADT	PAVEMENT(MINIMUM)		SHOULDER MINIMUM**
	> (40 MPH)*	≤ (40 MPH)	
>2000	(20')	(18')	(2')
≤2000	(18')	(18')	(1')

* MPH Designations Are Design Speeds
** Widths noted are minimums from a State approved design criteria standpoint. Actual constructed widths should be in accordance with the existing, available shoulder width up to a maximum of 8 feet.

Exceptions to the Division's minimum widths in the Pavement/Shoulder Width Table for pavement and shoulders must be documented and approved by the Division of Highways Deputy State Highway Engineer/Development or other designated official.

For urban roadway segments with a curb/curb and gutter section, pavement and shoulder widths are to match the existing section unless traffic service/safety needs dictate the need for widening.

PAVEMENT CROSS SLOPE AND SUPERELEVATION

Pavement resurfacing under the RRR program will be accomplished such that the finished pavement is center crowned on tangent sections and the cross slope is a minimum of 1.6%. When warranted by the crash history, the existing superelevation shall be evaluated per the AASHTO criteria. In the situation that this evaluation results in an crash rate that is determined to be excessive, the designer shall require the Contractor to submit the existing elevation data for review. If the existing superelevation does not meet AASHTO standards, the designer shall either require the Contractor to upgrade the superelevation or shall prepare a design exception for approval.

VERTICAL CLEARANCE

Vertical clearance on all state highways shall be at least 14’-6” over the entire roadway width. If this clearance cannot be provided, a design exception shall be prepared according to DD-605 and submitted for approval, and appropriate signing will be erected.

SAFETY

Because safety enhancement is an essential consideration, RRR projects will be developed and accomplished in a manner which considers and includes appropriate roadside safety improvements. Once RRR Project route segments are selected, an analysis of several years' accident data will be made for each. Evaluation of crash records often reveals problems requiring special attention. Relative crash rates can be an additional important factor in establishing both the priority and scope of RRR Projects. The crash history for the project area will be compiled and compared to the statewide average crash rate for the same type of road. This data review is an integral part of the RRR Project development process to determine feasible safety modifications for incorporation into the project as necessary. Route segment crash rates, critical crash rate segments, spot locations having potential for safety improvements, and hazardous segments identified though the highway safety improvement program will be identified, documented, and made available for each RRR Project developed. Also, the Designer will coordinate with the District Traffic Engineer for the District in which the project is located for a determination if the project includes locations with known safety issues, based on the Division of Highway's tracking system prioritized safety improvements list. These safety issues will be evaluated and addressed in the project, if feasible. The design will incorporate spot improvements as well as general safety feature upgrading as appropriate. These determinations will be made considering the accident rate for each RRR segment, ADT, design speed, geometry, and other pertinent factors.

The designer is hereby directed to the National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan for guidance concerning strategies for safety enhancements related to the various types of dangers faced by drivers described in the report's Volumes, which can be found at the following web link: http://safety.transportation.org/guides.aspx.

The Volumes are referenced as follows:

1. Volume 1: A Guide for Addressing Aggressive-Driving Collisions
2. Volume 2: A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses
3. Volume 3: A Guide for Addressing Collisions with Trees in Hazardous Locations
4. Volume 4: A Guide for Addressing Head-On Collisions
5. Volume 5: A Guide for Addressing Unsignalized Intersection Collisions
6. Volume 6: A Guide for Addressing Run-Off-Road Collisions
7. Volume 7: A Guide for Reducing Collisions on Horizontal Curves
8. Volume 8: A Guide for Reducing Collisions Involving Utility Poles
9. Volume 9: A Guide for Reducing Collisions Involving Older Drivers
10. Volume 10: A Guide for Reducing Collisions Involving Pedestrians
11. Volume 11: A Guide for Increasing Seat Belt Use
12. Volume 12: A Guide for Reducing Collisions at Signalized Intersections
13. Volume 13: A Guide for Reducing Collisions Involving Heavy Trucks

<u>Clear Zone</u>

The roadside recovery area is commonly referred to as the clear zone and is defined as that area available for use by errant vehicles, starting at the edge of the traveled way and terminating at the closest obstruction. The primary purpose of a clear zone is the safety of the traveling public. The maximum width of any clear zone which the Division of Highways can control is limited by its right of way; however, moving all existing obstacles from the right of way may not be necessitated by the clear zone policy.

While it may be ideal to remove all obstacles, in many cases such removals may be impractical and ineffective. For example, it is less effective to move those obstacles near the outer limits of the clear zone than those near the traveled way. Moving a pole one foot so that it lies on the right of way line or off the right of way is not always prudent nor cost-effective and adds little to the safety intent of the zone. Once a decision is made to move an obstruction from the clear zone, it should be moved as far from the traveled way as practical.

Although the basic concept seems simple, there are a number of factors which make for the development and implementation of an effective clear zone difficult. One of the biggest factors influencing the establishment of a clear zone in West Virginia is terrain. Many of our roadways are constructed along hillsides with steep slopes, which may have natural obstacles (such as rock cliffs, streams, hillsides, etc.) within the desirable clear zone width. Development of a policy which requires a statewide uniform clear zone distance within such areas would be neither practical nor effective.

It will be the responsibility of the Engineering, Traffic (along with the District traffic Engineer), and Right of Way Divisions to work together, to establish a consistent clear zone for each project. The width of this zone should be based on the type of highway, operating speed and accident history of the highway section with consideration given to existing features within the highway right of way. Obstacles within the established zone shall either be removed, given adequate protection, or identified by proper warning devices. All obstacles outside the consistent clear zone should be evaluated on an individual basis to determine whether greater distances could be attainted for short distances.

The design speed is one of the primary controls for establishing a consistent clear zone, since it generally correlates with the severity of the accident and the distance an errant vehicle is likely to stray from the traveled way.

Design speeds can be divided into two classes:

<u>40 MPH or Less:</u> This design speed is typical for rural local service routes, collector routes, and urban roads and streets. Collisions with fixed objects at these speeds are less likely to be severe. In most cases within this class, it will be of little benefit to move obstructions unless there is a documented accident history.

<u>Greater than 40 MPH:</u> This design speed is found on many rural arterial and collector highways and is common on urban arterials. These highways are generally

characterized by the absence of parking or other impediments to smooth traffic flows. High speed operations characterize most rural arterials and a few urban arterials. In these situations, a collision with a fixed object will almost certainly result in major property damage and/or medical trauma. Given these operating speeds, the keys to establishing a consistent clear zone are the features of the roadside and the potential for accidents. When the Division of Highways determines that existing objects are likely to be involved in accidents and/or cause injuries to the highway user, corrective measures will be initiated to provide a safer environment via an appropriate clear zone. Decisions on each project should be made based on documented accident history and existing obstacles along the road or street.

While this policy has not set a defined clear zone width, it has established some very fundamental guidelines. These guidelines are to be used by those individuals responsible for determining how much clear zone can be reasonably obtained in any given highway section. This clear zone should never be less than the designated shoulder width. The ultimate goal is to provide the maximum usable clear zone available in any given section of highway.

EXISTING GUARDRAIL

See DD-662 Guardrail for more information on the treatment of existing guardrail and end treatments on 3R Projects.

ENCROACHMENTS AND UTILITIES (GUARDRAIL ONLY PROJECTS)

Projects for replacement guardrail to be placed at designated locations and which are not continuous shall have the non-work areas identified on the plans by the words "Project Omission." Encroachments existing within the non-work areas will not be shown on the Encroachment Report. All other Encroachments will be shown by Station and Offset on the straight line plan and listed in the Encroachment Report.

The designer will list utilities that are in conflict and/or may be involved in the limits of work. This determination shall be made by contacting the affected utilities. A "Plan Note" will be included in the plans stating that the Contractor will be responsible for contacting the utility companies before entering the area of potential conflict. The note shall include the names of utilities and the location by station or mile post as determined. The note shall also include the name and telephone number for the contact person for each utility company involved.

SIGNING, SIGNALS AND PAVEMENT MARKINGS

All traffic control signs, pavement markings and traffic signals will be in conformance with the "Manual on Uniform Traffic Control Devices." Traffic control during construction shall be maintained in accordance with a traffic control plan included in the plans. The traffic control plan shall be as specified in the latest edition of the Division’s “Manual on Temporary Traffic Control for Streets and Highways”.

BRIDGE LOADING

All bridges encountered within or immediately adjacent to RRR Project limits will be investigated to determine their load carrying capacity. For each bridge the operating rating will be determined from the state highway bridge inventory. If the operating rating equals or exceeds an HS-15 loading, the bridge will be considered to meet the RRR program design criteria for bridge loading. For bridges with an operating rating below an HS-15 loading, a design exception shall be required for the bridge to remain in its existing condition.

BRIDGE RAILING

Bridge railings will be evaluated according to criteria established in the Division's "Bridge Design Manual", dated March 1, 2004, Section 3.2.2 – Barriers, on all bridges within or immediately adjacent to RRR Project limits. The evaluation will determine if the existing railing is acceptable or must be modified. All bridge railings shall be continuous and have a surface with no protrusions that could snag vehicles. Also, considering the ADT and speeds served, the railings shall have uniform and adequate overall strength.

A. If the railing is determined not to be structurally adequate, a structurally adequate bridge railing is to be provided as part of the project. If a determination of adequacy cannot be made by the project designer, Engineering Division should be consulted to make this determination.

B. If the railing is determined not to be crash worthy, a crash worthy railing is to be provided as a part of the project.

BRIDGE APPROACH GUARDRAIL

Approach guardrail, in accordance with current Division of Highways' Standard, will be installed at all bridge locations. This will include an appropriate attachment to the bridge railing, a transition section and an end treatment. When existing roadway physical features prohibits placement to full standards, the design will provide the best treatment possible. See DD-662 for more information.

BRIDGE WIDTHS

Bridge widths for bridges to remain in place should be in accordance with the following:

CONDITION	BRIDGE WIDTH
ADT >2000 or Design Speed greater than (40 MPH)	*Approach Pavement + (4')
ADT ≤2000 or Design Speed (40 MPH) less	*Approach Pavement + (2')

*Appropriate warning signs and delineation will be provided for all bridges with width less than the finished approach roadway (pavement + shoulders) width.

NON-FREEWAY NHS RRR DESIGN CHECKLIST

The attached design checklist shall be submitted with all Non-NHS RRR Project PS&E submittals to Contract Administration Division. The Design Exception report per DD-605 is only required on those projects where exceptions are included in the design.

Sheet _____ of _____

NON-NHS RRR DESIGN CHECKLIST

State Project Number ________________________

Federal Project Number ______________________

County ____________________________________

Project Name _______________________________

Date _______________________________________

Current ADT: _______________ vpd

Design Speed: _______________ mph (km/h)

Pavement Thickness for Overlay (if applicable): _______________ inches (mm)

Lane Width: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Shoulder Width: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Vertical Clearance: **_______________________ feet (meters)**

Clear Zone: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Bridge Width: **Criteria ________________ feet (meters)**

Actual _________________ feet (meters)

Bridge Railing (if applicable):

Structurally Adequate **Yes** **No**

Crash Worthy **Yes** **No**

Bridge Rating: **HS - ___________________**

Safety Improvements Considered (add additional sheets as necessary):

____

____

____

____

Safety Improvements Incorporated: **Yes** **No**

Design Exceptions Required & Attached: **Yes** **No**

Completed by: _______________________________________

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

608
MEDIAN AND OUTSIDE SLOPES, OVERLAY PROJECTS
April 1, 2004

Final cross slope to a median or outside ditch on overlay projects will be 4:1 or flatter. This will be shown on the typical sections of the project plans.

During field review the Designer is to check existing slopes, inlet elevations, etc. Proper bid items and quantities will be included in the project plans to bring the completed project into the 4:1 or flatter slope requirements.

If it is determined that the scope of grading required to achieve the 4:1 minimum slope is such that the median or outside ditch must be completely rebuilt, the Designer shall determine the existing roadway departure accident rate at the location in question. The existing roadway departure accident rate for the location in question will then be compared to the statewide average roadway departure accident rate for other similar roadways.

On projects where both the scope of grading to achieve 4:1 slopes requires reconstruction of the median or outside ditch and there exists a high roadway departure accident rate the Designer shall grade the cross slope to a preferred 6:1 slope with 5:1 as the minimum slope. If the above two conditions exist and the improved cross slopes cannot be obtained the Designer shall provide justification to and obtain approval from the Deputy State Highway Engineer Development for utilizing 4:1 cross slopes.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

609
INTERSTATE RRR STANDARDS AND GUIDANCE
October 19, 2006

Attached is the West Virginia Department of Transportation, Division of Highways, Interstate RRR Standards and Guidance. It shall be used on all applicable projects.

Attachment

INTERSTATE RRR STANDARDS AND GUIDANCE

INTRODUCTION

As per the 2005 AASHTO publication "*A Policy on Design Standards-Interstate System*," "the standards used for horizontal alignment, vertical alignment, and widths of median, traveled way, and shoulders for resurfacing, restoration, and rehabilitation (RRR) projects may be the AASHTO interstate standards that were in effect at the time of the original construction or inclusion into the interstate system." Based on this, these issues will not be evaluated on Interstate RRR projects.

Issues to be evaluated are roadside safety, vertical clearance, pavement and shoulder cross slope, and bridges to remain in place. The Designer will coordinate with the District Traffic Engineer for the District in which the project is located for a determination if the project includes locations with known safety issues, based on the Division of Highway's tracking system prioritized safety improvements list. These safety issues will be evaluated and addressed in the project, if feasible.

SAFETY

Safety enhancement is an essential consideration of any RRR project, including Interstate projects. In light of this, the following safety measures are to be considered.

Road Safety Audits

A Road Safety Audit (RSA) is the formal safety performance examination of the existing road or interchange by an independent audit team. Its main objective is to address the safe operation of interchanges and roadways to ensure a high level of safety for all road users. More information concerning RSA's can be found at the following web sites: safety.fhwa.dot.gov/state_program/rsa/ and www.roadwaysafetyaudits.org.

RSA teams assess the crash potential and safety performance of roadways and interchanges and prepare a report that identifies potential safety issues. Project officials or managers can then evaluate and determine appropriate changes. An RSA can be used in any phase of project development from planning to construction. An RSA done during the planning stage and very early in the design stage can identify potential safety issues before they are built into the project.

It is recommended that Road Safety Audits be conducted on freeway RRR projects. This determination will be made by the Traffic Engineering Division in conjunction with the District Traffic Engineer for the District in which the project is located. If it is decided a Road Safety Audit is not necessary, then at minimum the crash data must be obtained and analyzed to identify any existing safety problems.

Clear Zone

The clear zone for Interstate RRR projects shall be determined in accordance with the most current and approved version of the AASHTO Roadside Design Guide, and be consistent with the highway's posted speed limit, projected traffic volumes, and proposed side slopes.

Horizontal Clearance To Obstructions

Design options for the treatment of non-traversable/fixed obstacles within the clear zone as determined above shall be in accordance with the most current and approved version of the AASHTO Roadside Design Guide.

Sideslopes

Reference is made to DD-608 for more information concerning sideslope requirements for Interstate RRR projects. This Design Directive requires the determination of existing roadway departure accident rates in accordance with DD-608.

Also see DD-661 through DD-664 for information concerning roadside safety, guardrail, use of curb, and median barrier.

Rumble Strips

Reference is made to DD-645 concerning placement of Rumble Strips.

VERTICAL CLEARANCE

Clear height of structures shall not be less than 16 feet over the entire roadway and usable shoulder width. The vertical clearance to pedestrian overpasses and the bottom of the lowest portion of a sign installation shall be 17 feet minimum. In urban areas, the 16 feet clearance shall apply to a single routing. All other urban routes shall be 14 feet minimum.

PAVEMENT AND SHOULDER CROSS SLOPE

Reference is made to DD-601 for typical sections for both tangent and superelevated sections.

Tangent Sections

Thru-lane: 1.6% minimum

Shoulder: 2% to 6%

Shoulder cross slope will not be less than the cross slope of the adjacent thru-lane. Shoulder cross slope may be steepened on overlay projects in order to minimize impacts to the project as long as the above referenced criteria is met.

Superelevated Sections

Superelevation will be correlated with design speed in accordance with DD-603. Superelevation will be limited to 8% maximum.

Shoulders on the low side of superelevation will have the same superelevation as the thru-lane, although a minimum of 4% will be required. Shoulders on the high side of superelevation will have a 6% breakover for the inside shoulder (6 feet typical) and a 3% breakover for the outside shoulder (12 feet typical).

BRIDGES TO REMAIN IN PLACE

A bridge may remain in place if the operating rating capacity can safely service the system for an additional 20-year service life.

The bridge cross section shall meet the following criteria:

Thru-lane width:	12 feet
Shoulder right of traffic:	10 feet
Shoulder left of traffic:	3.5 feet

For long bridges (length > 200 feet), 3.5 feet shoulders to the right of traffic are acceptable.

Bridge Railing is to meet or be upgraded to current standards.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-610
GEOMETRIC DESIGN CRITERIA FOR URBAN HIGHWAYS
June 18, 2014

FUNCTIONAL CLASSIFICATION OF HIGHWAYS

The AASHTO functional classification system is to be used to classify highways for design purposes. This system consists of arterials, collectors, and local roads. Upon determining the functional classification of the highway (see the Roadway Inventory File maintained by the Planning Division), the criteria as established in this directive which has been derived from the 2011 AASHTO publication "*A Policy on Geometric Design of Highways and Streets"***,** the 2005 AASHTO publication "*A Policy on Design Standards – Interstate System*", and the 2001 AASHTO publication "*Guideline For Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400)* as applicable is to be used in all designs unless otherwise directed.

The Designer should refer to the above referenced AASHTO publications for other geometric design criteria not established in this directive. In cases of discrepancy between the AASHTO publication and this directive, the AASHTO publication will govern on National Highway System (NHS) projects. This document will govern on non-NHS projects.

Attachment

GEOMETRIC DESIGN CRITERIA FOR URBAN HIGHWAYS

DESIGN SPEED

Freeway – See following Table and Exhibits

CRITERIA	DESIGN SPEED (MPH)
Min. Radii (feet)*	**See Table 3-10b**
Min. Stopping Sight Distance (ft.)	**See Table 3-1**
Max. Grade (Percent)	**See Table 8-1**

*e max used in lieu of minimum degree of curvature

Design speed (mph)	Brake reaction distance (ft)	Braking distance on level (ft)	Stopping site distance	
			Calculated (ft)	Design* (ft)
15	55.1	21.6	76.7	80
20	73.5	38.4	111.9	115
25	91.9	60.0	151.9	155
30	110.3	86.4	196.7	200
35	128.6	117.6	246.2	250
40	147.0	153.6	300.6	305
45	165.4	194.4	359.8	360
50	183.8	240.0	423.8	425
55	202.1	290.3	492.4	495
60	220.5	345.5	566.0	570
65	238.9	405.5	644.4	645
70	257.3	470.3	727.6	730
75	275.6	539.9	815.5	820
80	294.0	614.3	908.3	910

Note: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of [11.2ft/s^2] used to determine calculated site distance.
* Use Design vs. Calculated.

Table 3-1 Stopping Sight Distance

OTHER ARTERIALS – SEE FOLLOWING TABLE & EXHIBITS

DESIGN ELEMENT	CRITERIA
Minimum Curvature (ft)	SEE TABLES 3-8 thru 3-10b
Minimum Stopping Sight Distance (ft)	SEE TABLE 3-1
Minimum Passing Sight Distance (ft)	SEE TABLE 3-4
Maximum Distance Between Passing Opportunities (miles)	1.0
Maximum Grade (percent)	SEE TABLE 7-4

e max = 4% for urban areas SEE TABLE 3-8
e max = up to 8% for other areas
e max used in lieu of minimum degree of curvature

Design speed (mph)	Assumed speeds (mph) (See Note)		Passing sight distance (ft) (See Note)
	Passed vehicle	Passing vehicle	Rounded for design
20	8	20	400
25	13	25	450
30	18	30	500
35	23	35	550
40	28	40	600
45	33	45	700
50	38	50	800
55	43	55	900
60	48	60	1000
65	53	65	1100
70	58	70	1200
75	63	75	1300
80	68	80	1400

Table 3-4 Passing Sight Distance for Design of Two-Lane Highways
Note – See NCHRP Report 605 for rationale behind new Passing Sight Distance Criteria

Type of terrain	Maximum grade (%) for specified design speed (mph)						
	30	35	40	45	50	55	60
Level	8	7	7	6	6	5	5
Rolling	9	8	8	7	7	6	6
Mountainous	11	10	10	9	9	8	8

Table 7-4 Maximum Grades for Urban Arterials

Collectors - 30 mph minimum.

Local Streets - 20 to 30 mph minimum depending upon area controls (i.e. right of way, adjacent development).

SIGHT DISTANCE (Function of Design Speed)

Freeways - See Table 3-1 (above)

Other Arterials - See Tables 3-1 and 3-4 (above)

Collectors - Stopping, See Exhibits below.
Passing - Not applicable.

Design speed (mph)	Stopping sight distance (ft)	Rate of vertical curvature, K[a]	
		Calculated	Design
15	80	9.4	10
20	115	16.5	17
25	155	25.5	26
30	200	36.4	37
35	250	49.0	49
40	305	63.4	64
45	360	78.1	79
50	425	95.7	96
55	495	114.9	115
60	570	135.7	136
65	645	156.5	157
70	730	180.3	181
75	820	205.6	206
80	910	231.0	231

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference intersecting grades (A). K=L/A

Table 3-36 Design Controls for Sag Vertical Curves

Design speed (mph)	**Stopping sight distance (ft)**	**Rate of vertical curvature, K[a]**	
		Calculated	**Design**
15	80	3.0	3
20	115	6.1	7
25	155	11.1	12
30	200	18.5	19
35	250	29.0	29
40	305	43.1	44
45	360	60.1	61
50	425	83.7	84
55	495	113.5	114
60	570	150.6	151
65	645	192.8	193
70	730	246.9	247
75	820	311.6	312
80	910	383.7	384

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference intersecting grades (A). K=L/A

Table 3-34 Design Controls for Stopping Sight Distance and for Crest Vertical Curves

Local Streets - Stopping, DESIGN SPEED, 20 mph, 115'
DESIGN SPEED, 30 mph, 200'
Passing - Not applicable.

GRADE (Function of Design Speed)

Freeway - See above Exhibits.
Other Arterials - See above Exhibits.
Collectors - As level as consistent with surrounding terrain.
Minimum 0.5%, Maximum 14%. To be consistent with design speed.
See Table 6-8 below

Type of terrain	**Maximum grade (%) for specified design speed (mph)**								
	20	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**
Level	9	9	9	9	9	8	7	7	6
Rolling	12	12	11	10	10	9	8	8	7
Mountainous	14	13	12	12	12	11	10	10	9

Note: Short lengths of grade in urban areas, such as grades less than 500 ft in length, one-way downgrades, and grades on low-volume urban collectors may be up to 2 percent steeper than the grades shown above.

Table 6-8 Maximum Grades for Urban Collectors

Local Streets - As level as consistent with surrounding terrain. Minimum 0.5%. Maximum 15%. To be consistent with design speed.

<u>ALIGNMENT</u>

Arterials - See DD-601 (minimum radii - emax).

Collectors - Fit existing topography to minimize cuts and fills as well as not to sacrifice safety. To be consistent with design speed.

Local Streets - Fit existing topography to minimize cuts and fills as well as not to sacrifice safety. To be consistent with design speed.

<u>PAVEMENT CROSS SLOPE (Tangent Sections)</u>

Freeway (Interstate) - Same as rural, see DD-601.

Other Arterials - 2% to 3%. Lower values should be used in center lanes with increases of 0.5 to 1.0% per lane drained to a maximum of 3%.

Collectors - Same as "Other Arterials."

Local Streets - 2% (paved).
2% to 6% (unpaved).

<u>SUPERELEVATION</u>

Freeway (Interstate) - Same as rural, see DD-601.

Other Arterials - On major controlled access arterials and any arterial with design speed of 50 mph and above, see DD-601. For other arterials, generally not used, but if used, 4% maximum. See also Pages 3-52 to 3-57 of the 2011 publication *"A Policy on Geometric Design of Highways and Streets."*

Collectors - Usually impractical or undesirable due to adjacent development, etc.
4% maximum when used.

Local Streets - Usually impractical or undesirable due to adjacent development, etc.
4% maximum when used, 6% may be used where a curve is long enough to provide an adequate superelevation transition length.

<u>NUMBER OF LANES</u>

Freeway (Interstate) - Same as rural, see DD-601.

Other Arterials - Varies, dependent upon capacity analysis and available right of way.

Collectors - Should be based on highway capacity analysis. Usually there are 2 lanes.

Local Streets - Service to 3 or fewer parcels - 1.
Service to more than 3 parcels - 2; which may consist of 2 individual one-way lanes (one-way pair).

LANE WIDTH

Freeway (Interstate) – 12 ft.

Other Arterials - 10 ft to 12 ft. If heavy truck traffic anticipated, desirable to add 1ft, up to a maximum width of 12 ft. If truck traffic restricted, may narrow by 1ft to a minimum width of 10 ft.

Collectors - Same as "Other Arterials."

Local Streets - Service to 3 or fewer parcels (one lane) – 12 ft total.
One-way pairs – 12 ft total.
Service to 10 or fewer parcels (two lanes) – 8 ft each.
Industrial areas – 12 ft minimum.
All others – 10 ft minimum.
If right of way width controls, the width for industrial areas and all others may be reduced to 11 ft.

PARKING LANES

Freeway (Interstate) - Not applicable.

Other Arterials - Should only be considered when provision is required due to existing conditions. When a parking lane is provided, the width should meet lane width criteria if future traffic volumes warrant additional capacity. This lane can be used as an additional traffic lane during peak traffic hours by prohibiting parking at these times in addition to possibly being used as a storage lane. If there is no future demand for an additional traffic lane, 8 ft width may be used. Gutter pan width may be included in this width.

Collectors - 8 ft to 11ft wide on one or both sides if sufficient width is available. When a parking lane is provided, the width should meet lane width criteria if future traffic volumes warrant additional capacity. Gutter pan width may be included in this width.

Local Streets - 7 ft in residential areas and 8 ft in commercial and industrial areas. When a parking lane is provided, the width should meet lane width criteria if future traffic volumes warrant additional capacity. If there is no future demand for an additional traffic lane, 6 ft width may be used. Gutter pan width may be included in this width.

CURBS

See DD-663.

CURB RAMPS AND SIDEWALKS

See DD-811.

DRIVEWAYS

See DD-308.

ROADWAY WIDTHS FOR BRIDGES

Arterials - Principal - Same as rural, see DD-601.
Minor – 30 ft minimum.

Collectors - Roadway width 18 ft to 22 ft, match roadway width, minimum 18 ft.
Roadway width greater than 22 ft, ADT less than 1000, minimum 22 ft.
Roadway width greater than 30 ft, ADT greater than 1000, minimum 30 ft.

Local Streets - One-lane streets – 18 ft minimum, 16 ft may be used if mobile home movement is not anticipated or another route exists for mobile home movement.
Two-lane streets – 20 ft minimum.

NOTE The minimum clear width for new bridges on arterial streets should be the same as the curb to curb width of the street.

HORIZONTAL CLEARANCE TO OBSTRUCTIONS

Freeway (Interstate) - Same as rural, see DD-601.

Other Arterials - Clear roadside recommended. If curbed, 1.5ft minimum between face of curb and object. 3 ft desirable particularly near turning radii at driveways and intersections.

Collectors - If curbed, 1.5 ft minimum between face of curb and object. If a continuous parking lane exists, no clearance required, but 1.5 ft setback to obstructions is desirable.

Local Streets - 1.5 ft minimum between face of curb and object.

VERTICAL CLEARANCE

Freeway (Interstate) - Same as rural, see DD-601.

Other Arterials - New or reconstructed, 16 ft clearance over entire roadway. In highly urbanized areas, 14 ft clearance may be provided if there is one route with 16 ft clearance. Additional clearance (0.5 ft) should be allowed for future overlays of the underpass.

Collectors - 14 ft over the entire roadway plus an allowance (0.5ft) for future overlays of the underpass.

Local Streets - Same as "Collectors."

BICYCLE / PEDESTRIAN ACOMMODATION

See DD-813

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 611
ADDITIONAL OR REVISED
ACCESS POINTS TO THE INTERSTATE SYSTEM
January 28, 2021
Supersedes September 21, 2011

Title 23 United States Code, Section 111 prohibits new or revised access points, including removal of ramps or the addition of locked gate access, to the Interstate System without approval of the Federal Highway Administration.

All revisions to Interstate access shall be in accordance with the attached FHWA memorandum and *Policy on Access to the Interstate System* or latest revisions thereto.

Attachment

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION** Changes to FHWA's Policy on Access to the Interstate System

Date: May 22, 2017

From: Thomas D. Everett
Associate Administrator for Infrastructure

Hari Kalla
Acting Associate Administrator for Planning, Environment, and Realty

In Reply Refer To: HIPA; HEPE

To: Directors of Field Services
Division Administrators

Section 111(a) of Title 23, United States Code, provides that State departments of transportation (State DOTs) may not add any points of access to, or exit from, the Interstate System without prior approval of the Secretary. The Secretary has delegated this authority to the Federal Highway Administrator pursuant to Title 23, Code of Federal Regulations, Paragraph 1.48(b)(10). To implement this authority, FHWA is issuing the attached new Policy on Access to the Interstate System (Policy). The Policy was initially published in October 1990 and subsequently updated in 1998 and 2009. The new Policy replaces the 2009 Policy.

The FHWA has identified several areas where the current Policy may be streamlined to eliminate duplication with other project reviews. The new Policy will now focus on the technical feasibility of any proposed change in access in support of FHWA's determination of safety, operational, and engineering acceptability. Consideration of the social, economic, and environmental impacts and planning considerations will be addressed through the National Environmental Policy Act (NEPA) review of the project. This change will eliminate the potential for duplicative analysis of those issues in the State DOT's Interstate Access report and the NEPA documentation. The change will allow State DOTs to submit only a single technical report describing the types and results of technical analyses conducted to show that the change in access will not have significant negative impact on the safety and operations of the Interstate System.[1]

The FHWA will be seeking public comment on this updated Policy. In the interim, division offices are directed to begin using the updated Policy for all new change-in-access requests

[1] The changes discussed in this memorandum do not alter or restrict the option to delegate approval authority for Interstate access justification reports to State DOTs pursuant to 23 U.S.C. 111(e).

effective May 22, 2017 (this includes projects to be processed within the division office as well as those that are forwarded to Headquarters). The FHWA will evaluate Interstate Access requests under the updated Policy as follows:

- The FHWA will rely on the information developed for NEPA reviews to account for the social, economic, and environmental impacts of the change in access. The information collected for the NEPA review of the access request should include a discussion of the need for the action (for example, why the need is not satisfied by existing interchanges or by reasonable transportation system management, geometric design, or improvements to the Interstate System or local roads); evaluation of consistency with local and regional land use and transportation plans; a comprehensive corridor or network study if the potential for future multiple interchange additions exist; and demonstration of coordination with proposed transportation system improvements when the proposal is due to a new, expanded, or substantial change in current or planned future development or land use.
- The FHWA will consider and analyze information regarding the technical feasibility of the change in access as a separate review. The FHWA's determination of safety, operational, and engineering acceptability will be based on a detailed review of this technical report.
- The FHWA's determination of acceptability, along with the supporting information, will be included as an appendix to the NEPA documentation.

Regardless of the type of NEPA action selected for the project, a separate technical report will be required to be submitted to FHWA for determination of safety, operations, and engineering acceptability. This technical report can be submitted as an appendix to the NEPA documentation in the case of an EIS, EA, or D-List CE, or as a separate stand-alone document in the case of a C-List CE. This procedure will ensure that the technical information considered during the analysis of impacts under NEPA is readily available to the public and others.[2]

Note that a State DOT may choose to send a separate technical report prior to a State DOT proceeding with the full NEPA documentation so that FHWA may determine the safety, operational, and engineering acceptability of the alternatives prior to engaging in the environmental impacts analysis.

If you have questions, please contact Michael Matzke, HIPA-20, at michael.matzke@dot.gov or (202) 366-4658.

Attachment

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[2] State departments of transportation (State DOTs) may assume FHWA environmental review responsibilities under 23 U.S.C. 326 (Categorical Exclusion assignment program) or 23 U.S.C. 327 (Surface Transportation Project Delivery Program). The FHWA retains final approval authority of the Interstate System Access change request once the project receives safety, operational, and engineering acceptability; and environmental review. The FHWA will develop specific guidance on how this memorandum and Policy update is addressed in NEPA Assignment States.

Policy on Access to the Interstate System
May 22, 2017

Policy

It is in the national interest to preserve and enhance the Interstate System to meet the needs of the 21st Century by assuring that it provides the highest level of service in terms of safety and mobility. Full control of access along the Interstate mainline and ramps, along with control of access on the crossroad at interchanges, is critical to providing such service. Therefore, the Federal Highway Administration's (FHWA) decision to approve new or revised access points to the Interstate System under Title 23, United States Code (U.S.C.), Section 111, must be supported by substantiated information justifying and documenting that decision. The FHWA's decision to approve a request is dependent on the proposal satisfying and documenting the following requirements:

Considerations and Requirements

1. An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, and ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (Title 23, Code of Federal Regulations (CFR), paragraphs 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute, and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

2. The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit or high occupancy vehicle and high occupancy toll lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)). In rare instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analyses to the partial-interchange option. The report should also include the mitigation proposed to compensate for the missing

movements, including wayfinding signage, impacts on local intersections, mitigation of driver expectation leading to wrong-way movements on ramps, etc. The report should describe whether future provision of a full interchange is precluded by the proposed design.

Application

This policy is applicable to new or revised access points to existing Interstate facilities regardless of the funding of the original construction or regardless of the funding for the new access points. This applicability includes routes incorporated into the Interstate System under the provisions of 23 U.S.C. 103(c)(4)(A) or other legislation.

Routes approved as a future part of the Interstate System under 23 U.S.C. 103(c)(4)(B) represent a special case because they are not yet a part of the Interstate System. Because the intention to add the route to the Interstate System has been formalized by agreement, any proposed new or significant changes in access beyond those covered in the agreement, regardless of funding, must be approved by FHWA.

This policy is not applicable to toll roads incorporated into the Interstate System, except for segments where Federal funds have been expended or these funds will be used for roadway improvements, or where the toll road section has been added to the Interstate System under the provisions of 23 U.S.C. 103(c)(4)(A). The term "segment" is defined as the project limits described in the Federal-aid project agreement.

Each break in the control of access to the Interstate System right-of-way is considered to be an access point. For the purpose of applying this policy, each entrance or exit point, including "locked gate" access, is considered to be an access point. For example, a diamond interchange configuration has four access points.

Ramps providing access to rest areas, information centers, and weigh stations within the Interstate controlled access are not considered access points for the purpose of applying this policy. These facilities must be accessible to vehicles only to and from the Interstate System. Access to or from these facilities and local roads and adjoining property is prohibited. The only allowed exception is for access to adjacent publicly owned conservation and recreation areas, if access to these areas is available only through the rest area, as allowed under 23 CFR 752.5(d).

Generally, any change in the design of an existing access point is considered a change to the interchange configuration, even though the number of actual points of access may not change. For example, replacing one of the direct ramps of a diamond interchange with a loop, or changing a cloverleaf interchange into a fully directional interchange would be considered revised access for the purpose of applying this policy.

All requests for new or revised access points on completed Interstate highways must closely adhere to the planning and environmental review processes as required in 23 CFR 450 and 771.

The FHWA approval constitutes a Federal action and, as such, requires that the transportation planning, conformity, congestion management process, and the National Environmental Policy Act procedures be followed and their requirements satisfied. The final FHWA approval of requests for new or revised access cannot precede the completion of these processes or necessary actions.[1]

To offer maximum flexibility, however, any proposed change in access can be submitted by a State department of transportation (State DOT) to the FHWA division office for a determination of safety, operational, and engineering acceptability.[2] This flexibility allows agencies the option of obtaining this acceptability determination prior to making the required modifications to the transportation plan, performing any required conformity analysis, and completing the environmental review and approval process. In this manner, State DOTs can determine if a proposal is acceptable for inclusion as an alternative in the environmental process. This policy in no way alters the planning, conformity, or environmental review and approval procedures as contained in 23 CFR 450 and 771, and 40 CFR 51 and 93.

An affirmative determination by FHWA of safety, operational, and engineering acceptability for proposals for new or revised access points to the Interstate System should be reevaluated whenever a significant change in conditions occurs (e.g., land use, traffic volumes, roadway configuration or design, or environmental commitments). Proposals may be reevaluated if the project has not progressed to construction within 3 years of receiving an affirmative determination of engineering and operational acceptability (23 CFR 625.2(a); see also 23 CFR 771.129). If the project is not constructed within this time period, FHWA may evaluate whether an updated justification report based on current and projected future conditions is needed to receive either an affirmative determination of safety, operational, and engineering acceptability, or final approval if all other requirements have been satisfied (23 U.S.C. 111, 23 CFR 625.2(a), and 23 CFR 771.129).

Implementation

State DOTs must submit requests for proposed changes in access to their FHWA Division Office for review and action under 23 U.S.C. 106 and 111(a), and 23 CFR 625.2(a). The FHWA Division Office will ensure that all requests for changes in access contain sufficient information, as required in this policy, to allow FHWA to independently evaluate and act on the request.

Effective Date

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[1] State DOTs may assume FHWA environmental review responsibilities under 23 U.S.C. 326 (Categorical Exclusion assignment program) or 23 U.S.C. 327 (Surface Transportation Project Delivery Program). The FHWA retains final approval authority of the Interstate System access change request once the project receives safety, operational, and engineering acceptability and environmental review.

[2] The FHWA may delegate approval authority for some Interstate access justification reports to State DOTs pursuant to 23 U.S.C. 111(e). See https://www.fhwa.dot.gov/design/interstate/160426.cfm. The FHWA retains final approval authority of the Interstate System access change request once the project receives safety, operational, and engineering acceptability and environmental review.

This policy replaces the policy of August 27, 2009 on "Access to the Interstate System," published at 74 *Federal Register* 43743. The changes in this policy are made to ensure this policy focuses on safety, operational, and engineering issues. The consideration of social, economic, and environmental impacts discussed in the 2009 policy are removed from this policy. However, the removal from this policy does not eliminate the need to consider those matters. Those issues will be addressed under the National Environmental Policy Act and other statutes and regulations applicable to the approval process.

This policy is effective as of May 22, 2017.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

621
INTERSECTIONS (SIGHT DISTANCE)
May 16, 2012

In order to assure that proper sight distances are provided at all ramp terminals and major intersections, a minimum sight distance and/or sight triangles shall be determined according to the different type of traffic control; found on page 9-32 of the 2011 AASHTO publication, *"A Policy on Geometric Design of Highways and Streets"*, as follows:

Case A – Intersections with no control
Case B – Intersections with stop control on the minor road
Case B1 – Left turn from the minor road
Case B2 – Right turn from the minor road
Case B3 – Crossing maneuver from the minor road
Case C – Intersections with yield control on the minor road
Case C1 – Crossing Maneuver from the minor road
Case C2 – Left or right turn from the minor road
Case D – Intersections with traffic signal control
Case E – Intersections with all-way stop control
Case F – Left turns from the major road

The character of the traffic service on the intersecting road shall be considered, and a higher type design vehicle shall be used if deemed appropriate.

If it is necessary to provide a lesser sight distance, an explanation shall be furnished by the designer.

MAINLINE	CROSSROAD		
	ARTERIAL	COLLECTOR	LOCAL ROAD
Arterial	WB-50	SU	SU
Collector		SU	SU
Local Road			P

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

622
INTERSECTIONS ON RURAL DIVIDED HIGHWAYS
October 3, 2012

Attached is the West Virginia Department of Transportation, Division of Highways' Intersections on Rural Divided Highways guide. It shall be used on all applicable projects.

Attachment

INTERSECTIONS ON RURAL DIVIDED HIGHWAYS

Turn lanes are to be provided for intersections on rural divided highways in accordance with the attached drawing and the requirements as listed below. All references to pages, tables and exhibits herein are contained in the 2011 AASHTO publication *"A Policy on Geometric Design of Highways and Streets*".

LEFT TURNS

Left-turn lanes are to be provided on all rural divided highways. Where the design hourly volume (DHV) for the turn from the through roadway is equal to or greater than 30, a taper, a deceleration lane, and a storage bay (minimum 100 feet long) shall be provided.

RIGHT TURNS

Where the DHV is less than 30, an appropriate turning radius will be provided.

Where the DHV from the through roadway is equal to or greater than 30 and less than 100 a right-turn taper shall be provided. An appropriate turning radius will be provided at the end of the taper.

When the DHV turning right is 100 or greater and/or the DHV on through lanes in one direction is 500 or greater, a deceleration lane and taper will be provided.

In certain situations where right-turn traffic movement delays cause problems with through traffic, a storage length (min. 100 feet) must be considered.

MEDIAN CROSSOVERS

A four lane rural facility should have adequate median width to provide for protected left turns.

Where a median crossover is provided along a superelevated multi-lane highway with a median less than 18 feet wide and without provisions for a storage lane, the profile grade shall be carried in the center of the median.

Where a median crossover is provided along a superelevated multi-lane highway with a median of 18 feet or more and/or where a storage lane is provided, separate profile grades shall be carried for each set of lanes. A differential in grade lines (bifurcation) shall be used where required to provide a smooth median crossover grade, with the desirable grade being 2 percent toward the low side. Excessive bifurcation is not desirable due to the possibilities of future widening of the roadway and possible future intersections being constructed on the roadway.

See Figure 9-59 "Above Minimum Design of Median Openings**",** page 9-155 of the 2011 AASHTO publication *"A Policy on Geometric Design of Highways and Streets"*.

WVDOH uses a control radius of 75 feet for the design of median openings.

INTERSECTION DETAILS

Special details are required for all intersections. The pavement and shoulders shall be contoured to assure that superelevation, drainage, aesthetics, safety features and other aspects of the design have been properly considered. Pavement elevations will be indicated at 10 feet intervals around the returns and on the centerline of the side roads.

INTERSECTIONS ON DIVIDED HIGHWAYS

Note 1:

R To Be Determined From Table 9-15 Pages 9-57 to 9-59, And Table 9-16 Pages 9-60 to 9-63, Use As Applicable.

Note 2:

Minimum Taper Length 300' Min. For Curved Roadways With Design Speeds ≥ 50 MPH. See Figure 9-49 For L And R Values.

Note 3:

Auxiliary Lanes Should Have Same Width As Through Lanes.

Note 4:

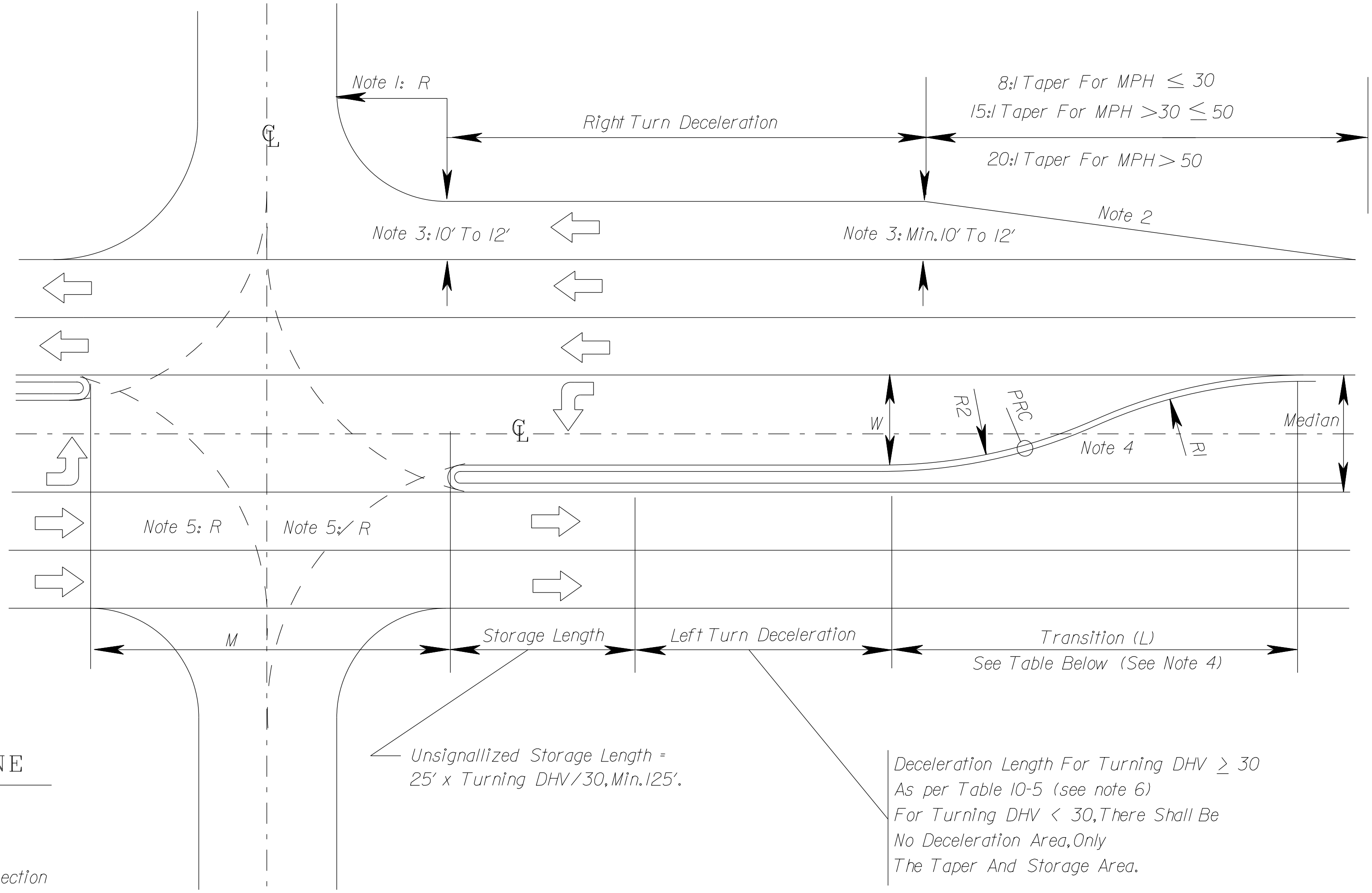
When a Non Curbed Typical Is Used A Straight Taper May Be Utilized.

Note 5:

R Is To Be Determined From Figure 9-59. WVDOT Uses Min. Radius Of 75 Feet.

Note 6:

For Turning DHV > 30 to 100, One Half (1/2) Of The Transision Length May Be Considered Part Of The Deceleration Length.



RIGHT-TURN LANE

For Turning DHV ≥ 30, But < 100, Use Taper Only.
For Turning DHV ≥ 100 And / Or Thru Lanes One Direction > 500, Deceleration Length (As Per Table 10-5) Plus Taper.

Note - Median opening (M) Is Dependent On R.

See Table 9-27 Min. Design Of Median Openings. (75' Control Radius)

Transition (L)									
Turn Lane Width (W)	30 MPH or Less			> 30 MPH to 50 MPH			> 50 MPH		
	8:1 Taper			15:1 Taper			20:1 Taper		
	L	R1	R2	L	R1	R2	L	R1	R2
12	96	262	131	180	906	453	240	1,606	803
11	88	240	120	165	828	414	220	1,470	735
10	80	218	109	150	752	376	200	1,338	669

DD-622

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

623
INTERCHANGE CONTOURED SITE GRADING PLANS
November 1, 1994

Site grading plans will be provided for all interchanges and major intersections. The site grading plans shall show finished contours at 2-foot intervals in solid lines blended to existing contours shown as dashed. Special emphasis shall be given to providing smooth lines by the use of drainage swales and drop inlets in lieu of ditches and wingwalls.

Major intersections shall be the intersection of or with heavily traveled routes where site grading will assist the designer in clearly presenting proper sight distance and aesthetics.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-624
RAMP TERMINALS
July 11, 2012

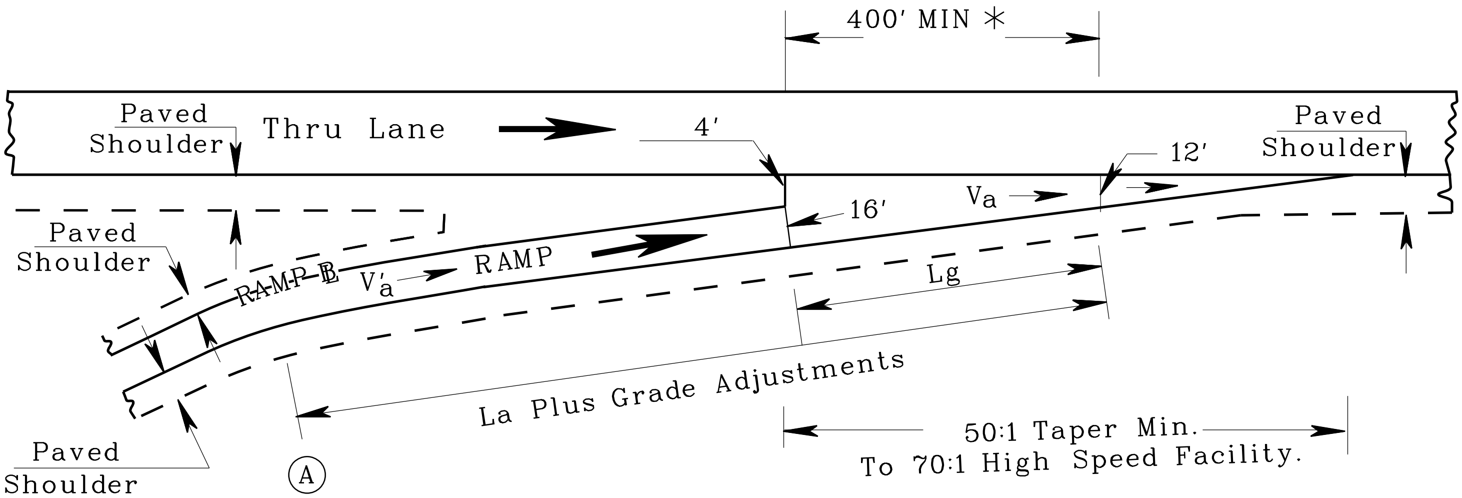
The attached drawings are for your use in the design of ramp terminals.

Additional information concerning the subject may be found in Chapter 10 of the 2011 AASHTO publication *"A Policy on Geometric Design of Highways and Streets."*

Generally, the attached tapered designs will be used but conditions may warrant parallel design, especially entrance ramps.

Attachments

SINGLE LANE ENTRANCE RAMP TERMINAL



Legend:

1. La Is The Required Acceleration Length As Shown In Table 10-3 Or As Adjusted By Table 10-4.
2. Point A Controls Safe Speed On The Ramp. La Should Not Start Back On The Curvature Of The Ramp Unless The Radius Equals 1000′ Or More.
3. Lg is Required Gap Acceptance Length. Lg Should Be A Minimum Of 400′ Depending On The Taper Rate. *
4. The Value Of La Or Lg, Whichever Produces The Greater Distance Downstream From The Nose, Shall Be Used In The Design Of The Ramp Entrance.
5. Va Is The Speed Reached By A Vehicle Entering The Thru Lane.
6. V′a Is The Initial Speed Of An Entering Vehicle.

RAMP ACCELERATION LENGTHS

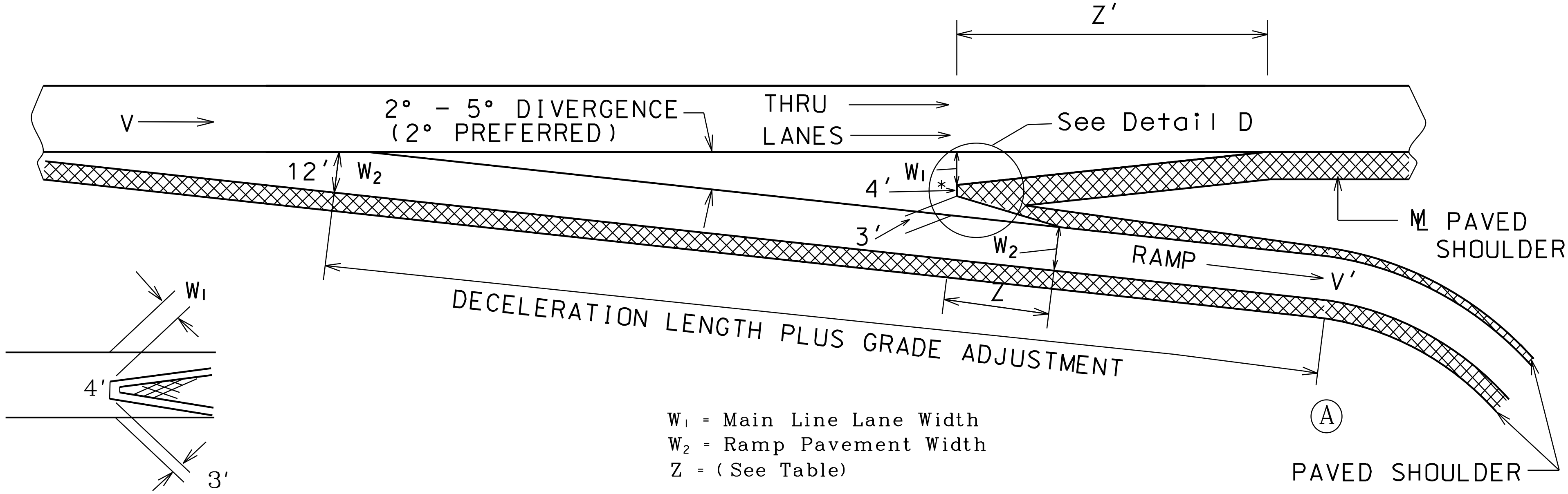
US CUSTOMARY										
Acceleration Length, L (ft.) For Entrance Curve Design Speed (mph)										
Highway		Stop Condition	15	20	25	30	35	40	45	50
Design Speed, V (mph)	Speed Reached, Va (mph)	And Initial Speed, V′ a (mph)								
		0	14	18	22	26	30	36	40	44
30	23	180	140	-	-	-	-	-	-	-
35	27	280	220	160	-	-	-	-	-	-
40	31	360	300	270	210	120	-	-	-	-
45	35	560	490	440	380	280	160	-	-	-
50	39	720	660	610	550	450	350	130	-	-
55	43	960	900	810	780	670	550	320	150	-
60	47	1200	1140	1100	1020	910	800	550	420	180
65	50	1410	1350	1310	1220	1120	1000	770	600	370
70	53	1620	1560	1520	1420	1350	1230	1000	820	580
75	55	1790	1730	1630	1580	1510	1420	1160	1040	780

NOTE: Uniform 50:1 and 70:1 Tapers Are Recommended Where Lengths Of Acceleration Lanes Exceed 1300 Feet.

Table 10-3 Minimum Acceleration Length For Entrance Terminals With Flat Grades Of 2 Percent Or Less.

DD-624

SINGLE LANE EXIT RAMP TERMINAL



Detail D

RAMP DECELERATION LENGTHS

Highway Design Speed, V (mph)	Speed Reached, Va (mph)	Stop Condition	15	20	25	30	35	40	45	50
		Deceleration Length, L (ft.) For Design Speed Of Exit Curve, V' (MPH)								
		For Average Running Speed On Exit Curve, V'_a (mph)								
		0	14	18	22	26	30	36	40	44
30	28	235	200	170	140	-	-	-	-	-
35	32	280	250	210	185	150	-	-	-	-
40	36	320	295	265	235	185	155	-	-	-
45	40	385	350	325	295	250	220	-	-	-
50	44	435	405	385	355	315	285	225	175	-
55	48	480	455	440	410	380	350	285	235	-
60	52	530	500	480	460	430	405	350	300	240
65	55	570	540	520	500	470	440	390	340	280
70	58	615	590	570	550	520	490	440	390	340
75	61	660	635	620	600	575	535	490	440	390

V = Design Speed Of Highway (mph)
V_a = Average Running Speed Of Exit Curve (mph)
V' = Design Speed Of Exit Curve (mph)
V'_a = Average Rinning Speed On Exit Curve (mph)

Table 10-5. Minimum Deceleration Lengths For Exit Terminals With Flat Grades Of 2 Percent Or Less.

GRADE ADJUSTMENTS "See Table 10-4 On Previous Page"

Design Speed of Approach Highway (mph)	Length Of Nose Taper (Z) Per Unit Width Of Nose Offset
30	15.0
35	17.5
40	20.0
45	22.5
50	25.0
55	27.5
60	30.0
65	32.5
70	35.0
75	37.5

Table 10-2 Minimum Length Of Taper Beyond An Offset Nose

Legend :

A Point Controlling Safe
(Normally P.C. Of Exit Ramp Curve)

V = Design Speed of Highway
V' = Design Speed Of Exit Curve
Z' Is Tapered Distance Along Thru Lane
Z Is Tapered Distance Along The Ramp
Z & Z' Have Same Taper Rate Per Foot

GRADE ADJUSTMENTS

US CUSTOMARY					
Design Speed Of Highway (mhp)	Deceleration Lanes Ratio Of Length On Grade To Length Of Level For Design Speed Of Turning curve (mph)[a]				
All Speeds	3 To 4% Upgrade 0.9				3 To 4% Downgrade 1.2
All Speeds	5 To 6% Upgrade 0.8				5 To 6% Downgrade 1.35
Design Speed Of Highway (mhp)	Acceleration Lanes Ratio Of Length On Grade To Length Of Level For Design Speed Of Turning curve (mph)[a]				
	20	30	40	50	All Speeds
	3 To 4% Upgrade				3 To 4% Downgrade
40	1.3	1.3	-	-	0.7
45	1.3	1.35	-	-	0.675
50	1.3	1.4	1.4	-	0.65
55	1.35	1.45	1.45	-	0.625
60	1.4	1.5	1.5	1.6	0.6
65	1.45	1.55	1.6	1.7	0.6
70	1.5	1.6	1.7	1.8	0.6
	5 To 6% Upgrade				5 To 6% Downgrade
40	1.5	1.5	-	-	0.6
45	1.5	1.6	-	-	0.575
50	1.5	1.7	1.9	-	0.55
55	1.6	1.8	2.05	-	0.525
60	1.7	1.9	2.2	2.5	0.5
65	1.85	2.05	2.4	2.75	0.5
70	2.0	2.2	2.6	3.0	0.5

Ratio From This Table Multiplied By The Length In Exhibit 10-70 Or Exhibit 10-73 Gives Length Of Speed Change Lane On Grade.

Table 10-4. Speed Change Lane Adjustment Factors As A Function Of Grade

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-625 **INTERCHANGE WARRANTS** *June 18, 2014*

This purpose of this Design Directive is to provide guidance for determining whether to construct at-grade intersections or interchanges on roadways classified as expressways for the West Virginia Division of Highways. Information is given to aid the designer in choosing between an at-grade intersection or an interchange based on design-year traffic combined with sound engineering judgment. A procedure and a table for the warrant determination are given.

Attachment

10. Introduction and Background

Traffic signals are not safety devices; rather they function by alternately assigning the right of way to conflicting traffic streams. Signals are thus the most restrictive form of traffic control device.

When one of these traffic streams is traveling at a high speed (55 mph or greater) there may be safety issues involved with interrupting it. The presence of the signal can cause intersection capacity problems by itself. The steps that must be taken to assure good traffic operations can further degrade the intersection's capacity.

The goal of the West Virginia Division of Highways (WVDOH) is to place as few signals as possible on expressway-type facilities. Agreement was reached with the Federal Highway Administration in 1982 to use what are called the "Bleyl Numbers" for the design year traffic at an intersection. The "Bleyl Numbers" were defined by Robert Bleyl, who was the State Traffic Engineer in Utah at the time of the definition of the numbers. He utilized the Minimum Vehicular Volume (Warrant 1) and the Interruption of Continuous Traffic (Warrant 2) in the 1961 Manual of Uniform Traffic Control Devices (MUTCD) to define the numbers. In the 2000 or later issues of the MUTCD these two warrants were combined into Warrant 1, Eight-Hour Vehicular Volume with Conditions A and B. The attached table is based on Table 4C-1 of the 2003 MUTCD.

It is this warrant that the WVDOH will utilize to predict the future need for a traffic signal at any intersection on an expressway facility. The "Bleyl Numbers" table is attached to and made a part of this Design Directive.

If the warrant analysis shows that there is greater than a 95% probability that a signal will be required in the design year, then an interchange rather than an at-grade intersection, should be considered for construction at the time the facility is built. Other factors conforming to sound engineering judgment must be considered also. See Section 30 of this DD.

A traffic signal is NOT an interim measure for the future construction of an interchange. The signal which is warranted in the design year may or may not be warranted at the time of construction and opening to traffic of the facility, or for many years to come. Unwarranted signals have the potential to cause significant safety and delay problems at any intersection on any roadway, but especially at intersections on expressways.

20. Procedure

The designer is to follow the following steps to determine whether an interchange may be warranted instead of an at-grade intersection.

A. Acquire the design Average Annual Daily Traffic (AADT) volumes (20 or 25 years into the future from the predicted year of the facility opening to traffic) for each intersection on the new or reconstructed expressway facility. This information is obtained from the Traffic Modeling and Analysis Unit of the Planning Division, and is the same future year ADT data that is shown in the Design Designation block on the project's Title Sheet. See DD-802.

B. Compare these projected AADT's to the volumes shown in the attached table, by utilizing the number of lanes on the approach roadways, Major and Minor, as determined by the Designer. The expressway is normally the major road, but the designer may determine otherwise as long as the decision is documented to the project file. Satisfaction of the appropriate volumes indicates there is a 95% probability that a traffic signal will be warranted in the design year, in which case an interchange should be considered instead of an at-grade intersection.

C. Verify the conclusion reached in Step "B" above by dividing the AADT values used in that step by two, and comparing the result to eight times the required hourly warrant values.

D. Furnish the results of the analysis to the Traffic Engineering Division for verification, and for possible consideration of other factors that may affect the analysis, such as trucks, speed, pedestrians and/or bicyclists, which may affect the installation or operation of a signal.

E. Upon verification of the analysis by the Traffic Engineering Division, copies of all analyses and documentation are to be placed in the project file, as well as the Master File.

30. Other Considerations

There are other items that the Designer must consider after the determination is made that an interchange is or is not to be considered at any particular intersection. These include costs of right-of-way, utility relocation, future cost of construction versus the cost to construct the interchange at the present time, etc.; maintenance of traffic; environmental impacts; adjacent development; the impact the interchange will have upon the existing roadway and traffic network; etc. More conditions that the designer must examine are contained on Pages 10-3 through 10-5 in the 2011 issue of the AASHTO publication "*A Policy on Geometric Design of Highways and Streets*".

After careful consideration of these and all other possible factors by the Designer, the conclusion that an interchange may not be possible to construct where one is warranted by this DD may be reached, or an intersection may be constructed where an interchange is warranted.

All factors, to include the warrant, are to be considered when the decision is made to build an at-grade intersection or an interchange at any intersection along expressway-type facilities. There is a possibility that a grade-separated mainline roadway with a two-way connector road (crossover to one side required on the mainline) could be constructed instead of a full interchange or full crossover to both sides. It is crucial that documentation of the reasons for the decision be placed in the project file and the Master File.

TABLE OF BLEYL NUMBER VALUES

NUMBER OF LANES FOR MOVING TRAFFIC ON EACH APPROACH		DESIGN YEAR AADT PROJECTIONS				EIGHT TIMES HOURLY MUTCD WARRANT VOLUME			
Warrant 1, Condition A - Minimum Vehicular Volumes									
MAJOR	**MINOR**	**MAJOR**		**MINOR**		**MAJOR**		**MINOR**	
1	1	9,600	*6,700*	5,750	*4,000*	4,000	*2,800*	1,200	*840*
2 OR MORE	1	11,550	*8,100*	5,750	*4,000*	4,800	*3,360*	1,200	*840*
2 OR MORE	2 OR MORE	11,550	*8,100*	7,700	*5,400*	4,800	*3,360*	1,600	*1,120*
1	2 OR MORE	9,600	*6,700*	7,700	*5,400*	4,000	*2,800*	1,600	*1,120*
Warrant 1, Condition B - Minimum Vehicular Volumes									
MAJOR	**MINOR**	**MAJOR**		**MINOR**		**MAJOR**		**MINOR**	
1	1	14,400	*10,100*	2,900	*2,050*	6,000	*4,200*	600	*424*
2 OR MORE	1	17,300	*12,100*	2,900	*2,050*	7,200	*5,040*	600	*424*
2 OR MORE	2 OR MORE	17,300	*12,100*	3,850	*2,700*	7,200	*5,040*	800	*560*
1	2 OR MORE	14,400	*10,100*	3,850	*2,700*	6,000	*4,000*	800	*560*

NOTES:

1. See Section 4C of the 2003 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).

2. The higher of the two minor approach volumes is to be used in the analyses.

3. The italicized values represent a reduction to 70% of the volumes corresponding to the MUTCD warrant. This reduction is taken where the major street speed is greater than 40 mph or the intersection lies in an isolated community with a population of less than 10,000.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-631
BRIDGE APPROACHES
May 12, 2010

This Design Directive provides the designer with the West Virginia Department of Transportation, Division of Highways policy for approach slabs and transition pavement for bridges. Certain other Division manuals are referenced herein, and are hereby incorporated into and made a part of this Design Directive.

10. General

The purpose of an approach slab at the ends of most bridges is to provide a safe and comfortable transition from the roadway to the bridge, and to provide a structurally sound transition from the roadway to the bridge. The approach slab helps reduce the “bump” that sometimes is created when the embankment under the bridge approach undergoes settlement.

The area between the roadway embankment and the bridge abutment frequently receives inadequate compaction or a different degree of compaction than the roadway fill. Another cause of differential settlement between roadway pavement and the bridge structure is subsidence of compressible original soil layers under the approach roadway fill's weight, while the bridge is normally founded on more unyielding foundation of solid rock or piling. In order to prevent pavement failure, an unacceptable differential elevation between the pavement and the bridge pavement, and excessive loading on the abutment, an approach slab is constructed to span from the abutment over the roadway embankment.

20. Design and Plan Presentation Requirements

Approach slabs are to be designed for the conditions found at the bridge site. Joints required with the approach slab and bridge transition pavements are also to be designed for conditions found at the bridge site, and with consideration of the type of bridge designed. Requirements and types of joints will be discussed later in this Design Directive. See the latest issue of the West Virginia Department of Transportation, Division of Highways’ Bridge Design Manual for more information concerning certain bridge types which do not require an approach slab. All bridges except those described therein shall have approach slabs.

Approach slabs (when required) for bridges are considered an integral part of the bridge and are to be included in the roadway plans and quantities. The length of a bridge will be computed from paving notch to paving notch.

When approach embankments are to be constructed over soft or unstable soils, at least one core boring should be taken at each embankment to assess the foundation soils for possible settlement or stability problems. The core borings will be taken in accordance with the latest issue of the Division’s Bridge Design Manual.

A bridge that is let separately shall include the approach slabs and the length of project or contract thereof shall include the approach slabs. The title sheet shall indicate, by length and stations, the breakdown between bridge and roadway. This breakdown is to be carried through to the estimate used in the PS&E assembly.

On projects for grade, drain, pave and structure, the quantities on the proposal are to be separated into roadway and structures with the approach slab included in the roadway items.

30. Materials

The material for base course for an approach slab shall be Item 307001-*, "Class 1 Aggregate Base Course," per cubic yard, six inches in thickness for the area of the approach slab or Item 311006-*, "Open Graded Free Draining Base Course," per cubic yard, thickness as per approach roadway for the area of the approach slab, with a statement that the same material as used for base on the adjacent pavement may be used under the approach slab at the unit price bid for the roadway item.

40. Joints

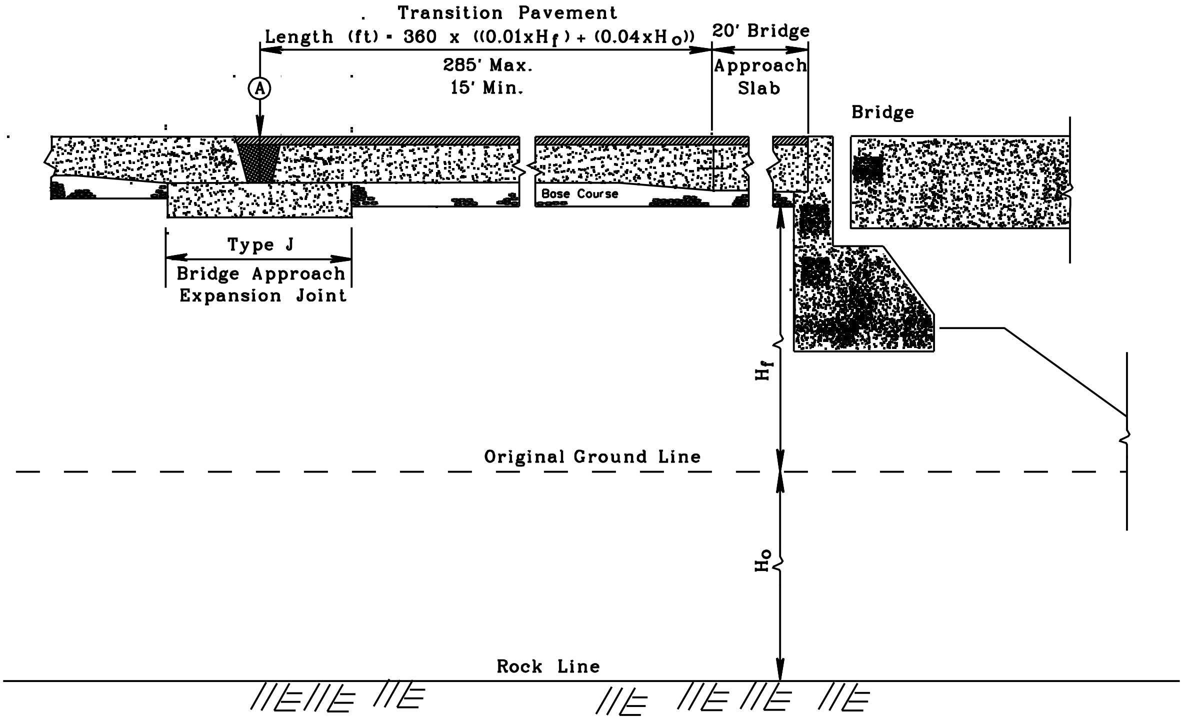
Bridges with integral abutments have differing joint requirements than bridges with expansion joints at the abutments. Joints between the bridge deck and the approach slab, the approach slab and bridge transition pavement, as well as differing bridge transition pavement joint requirements must be evaluated and carefully selected. Selection of joints is based on anticipated thermal movement of the bridge. See the latest issue of the Bridge Design Manual for more information concerning the proper selection of these joints.

The location and type of all required joints as per the Bridge Design Manual for all bridges will be shown on the plans.

When a Type J bridge approach joint is required, it shall be designed as per the attached detail. If the length of the bridge transition pavement is zero (i.e. H_f and H_o are zero, pavement section is constructed into rock), the Type J Joint will not be applicable.

Attachment

BRIDGE APPROACH TRANSITION PAVEMENT



Notes:

1. H_f And H_o To Be Measured At The Back Of Abutment
2. Point (A) Is Located At The Center Of The 4' Wide Type J Bridge Approach Expansion Joint. The Location Of This Point Shall Be Shown On The Plans.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-632
PAINTING OR DISMANTLING STRUCTURES, CONTAINMENT OF DEBRIS CLEANED FROM STRUCTURE AND PAINTING OVERSPRAY
October 1, 2003

All structures that are to be painted in the field or dismantled must have containment levels specified on the plans. The containment levels are selected at a joint field inspection attended by the West Virginia Department of Transportation, Division of Highways, and the Department of Environmental Protection personnel. The joint field inspection is to take place early in the plan development process.

The project manager shall contact the Materials Control, Soil and Testing Division by memorandum. The following information shall be provided.

1. Project Number
2. Bridge Number
3. County
4. Route Number
5. Bridge Name
6. A county map with location noted
7. A short description of project, such as
    A. New bridge
    B. Complete repainting
    C. Spot repainting
8. Estimated PS&E date

An example memorandum is attached.

Attachments

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division Of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0440 • 304/558-3505

Bob Wise
Governor

Fred VanKirk, P. E.
Secretary/Commissioner

Jerry Bird
Assistant Commissioner

February 12, 1998

MEMORANDUM

TO: DM

FROM: DD

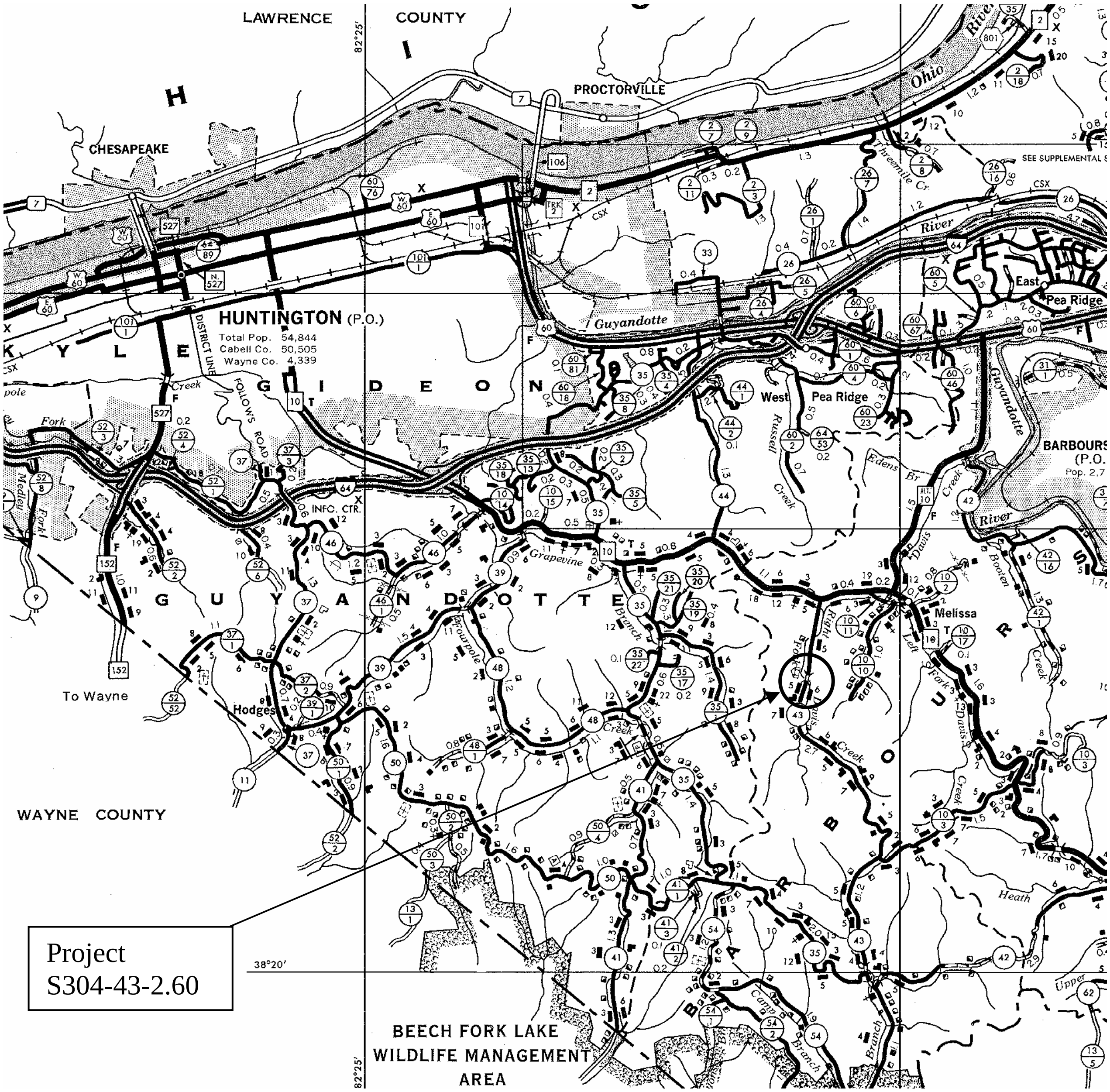
SUBJECT: State Project S304-43-2.60, Cabell County
Davis Creek Truss Bridge #3838, County Route 43
Field Inspection for Selection of Containment Levels

The subject structure is to be completely cleaned and repainted. The proposed PS&E date for this project is May 1998. We would appreciate your comments as to containment levels by April 1, 1998.

Attachment

cc: DD(AR[DA], MF)

JES:dk


LAWRENCE COUNTY
PROCTORVILLE
CHESAPEAKE
HUNTINGTON (P.O.)
Total Pop. 54,844
Cabell Co. 50,505
Wayne Co. 4,339
GUYANDOTTE
GIDEON
KYLE
BARBOURSVILLE
West Pea Ridge
Pea Ridge
Melissa
Hodges
To Wayne
WAYNE COUNTY
BEECH FORK LAKE
WILDLIFE MANAGEMENT
AREA
Project
S304-43-2.60

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-641
PAVEMENT TYPE SELECTION GUIDE
June 18, 2014

Attached is the West Virginia Department of Transportation, Division of Highways policy on *pavement type* selection. A *pavement type* selection will be performed on all projects requiring pavement in accordance with this document.

Attachment

PAVEMENT TYPE SELECTION GUIDE

10. INTRODUCTION

Pavement type selection is a combination of engineering and economic analysis, which provides data to assist the engineer or manager in choosing a cost-effective pavement. The engineering analysis consists of a pavement structural design procedure with consideration of other factors that may influence the selection of a pavement. *Pavement type* selection has not evolved to an exact science, and there is no absolute or indisputable mathematical solution for all selections. The 1993 AASHTO *Guide for the Design of Pavement Structures* and *1998 Supplemental* allows for "other factors," both principal and secondary, which need to be considered along with the engineering and economic data to select the *pavement type* that best fits the needs and conditions of the project. The principal factors, as defined in “DD-646, Pavement Design Guide”, have a major influence on the *pavement type* selection process. The secondary factors described in Section 40 of this design directive will be used when a clear choice is not indicated by the principal factors.

This Guide outlines the process for *pavement type* selection for new and reconstructed pavement structures as well as rehabilitation projects. It provides guidance in the design approach for the cost comparison, life cycle cost, and the use of design parameters. It also discusses principal and secondary factors to be utilized in making a *pavement type* selection. This Guide is provided in compliance with Title 23 Code of Federal Regulations. The latest edition of the *West Virginia DOT, Division of Highways, Pavement Design Manual* is to be used to obtain technical data needed in the analysis.

20. DETERMINATION OF A PAVEMENT SEGMENT

This selection process shall define what *pavement type* should be built on each *pavement segment*. A *pavement segment* shall not be limited by project length but should consider the entire highway system and how that system is to be maintained. A *pavement segment* may be comprised of multiple paving projects (Figure 1).

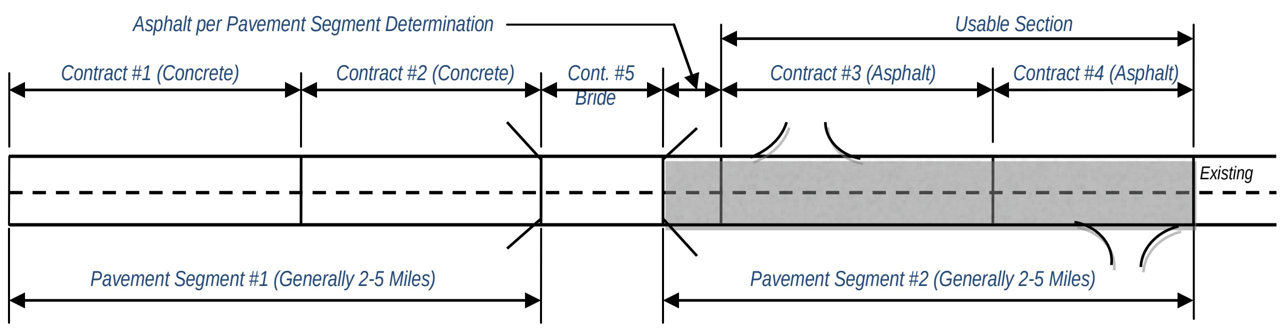


Figure 1. Illustration of ***contracts*** *within* ***pavement segments***

The following criteria should be considered when determining a *pavement segment*:

A. *Pavement segment* length should generally equal a reasonable rehabilitation or resurfacing project length, normally two to five miles, but could vary depending on the termini chosen.
B. Distinction should be made between rural and urban *pavement segments* due to increased future user costs during rehabilitation projects in urban segments.
C. *Pavement segments* should have logical termini such as bridges, interchanges, intersections, or locations where traffic lanes are added or dropped. Bridges should be given the most consideration as logical termini.
D. Determination of *pavement segments* should be limited to the segments in the area of the project being bid. *Pavement segments* should not be chosen for an entire highway corridor prior to final design of the construction contracts.
E. Consider all future maintenance activities required on the segment.
F. The design parameters, such as traffic and geology, should remain relatively constant.

The straight-line diagrams maintained by the Planning Division should be consulted. These diagrams contain a wealth of West Virginia roadway information such as construction year, surface type, and intersection/interchange/bridge locations, which can be used by the designer to determine the termini of *pavement segments*. Also, the Pavement Management Section of the Division of Highway's Maintenance Division is to be consulted for all data concerning the pertinent *pavement segments*. The designer may discover that a *pavement segment* was previously determined for the project area which can be evaluated and recommended as a proposed project *pavement segment*.

The designer shall submit a *pavement segment* to the Deputy State Highway Engineer-Development by memorandum for approval. This memo shall be retained in the project file.

30. PAVEMENT TYPE SELECTION METHOD

Selection of *pavement type* shall be performed using method *A* or *B* below. If no pavement exists in the *pavement segment* at the time of construction, then follow method *A.*

A. Design the pavement alternates according to "DD-646, Pavement Design Guide".

   1. If there are other engineering considerations such as slow-moving, heavy loads, grades, or stop conditions which would dictate a specific *pavement type* then the *pavement type* may be selected independently of the Alternate Design Alternate Bidding (ADAB) process. Other factors to consider in this situation are proper asphalt *pavement types* and binder grades as called for in "DD-644, Asphalt Pavement", or cement content and reinforcement for concrete pavement.

2. Perform the Life Cycle Cost Analyses (LCCA) per "DD-647, Life-Cycle Cost Analysis for Pavement Design."

    a. If the difference in the Net Present Value (NPV) of the LCCA is generally over 20% between the lowest two pavement alternates then the pavement alternate with the lowest NPV can be selected. The 20% difference shall be calculated by multiplying the lowest pavement alternate's NPV by 0.2.
    b. The ADAB method of bidding as described by "DD-648, Alternate Design Alternate Bidding of Pavements" will generally be considered; however, if the NPV of the LCCA is less than 20%, then the ADAB method shall be recommended to the Deputy State Highway Engineer-Development for use on the project.

    If the ADAB process is used, then all of the *pavement type* alternates **may** be used in the bidding process.

B. When a *pavement type* has been selected within a *pavement segment*, a review of the previous selections for that *pavement segment* will be conducted. Issues to consider are:

1. Length of *pavement segment*
2. Length of previously constructed pavement as well as the remaining length to be constructed and the respective construction schedules
3. Length of current project
4. Changes in design parameters such as traffic data, availability of constructed sub-grade values, etc.
5. Review of performance based on the Pavement Management System (PMS) which may be obtained from Maintenance Division
6. Length of time traffic has used previously constructed contract

The Deputy State Highway Engineer-Development shall have the right to approve and/or change the above criteria to better match market conditions on a project by project basis.

The designer shall submit to the Deputy State Highway Engineer-Development the following information:

1. The previously approved *pavement segment* determination
2. The pavement cost percentage of the contract being bid
3. The LCCA
4. The bidding process
5. The *pavement type* recommended if the ADAB process is not being considered

6. Plus the engineering justification for the *pavement type* recommended

The Deputy State Highway Engineer-Development will then approve the bidding process or the *pavement type* and *pavement section* to be used for the contract being bid.

40. Secondary Factors. These factors generally have a lesser influence on *pavement type* selection and will only be considered when there are no overriding characteristics or one alternate is not clearly superior.

1. Performance of Similar Pavements

Recommendations of experienced Division of Highways personnel concerning pavement performance in the field under similar traffic and geological conditions should be obtained. The Pavement Management Systems section of the Maintenance Division should be consulted also.

2. Adjacent Existing Pavements

It is beneficial to use similar *pavement types* for long *pavement sections* because maintenance operations could be assembled for only one *pavement type*.

3. Conservation of Materials

Material shortages usually increase material costs.

4. Availability of Local Materials and Contractors

An effort should be made to use local materials and contractors.

5. Traffic Safety

Traffic Safety is to be a consideration on all projects.

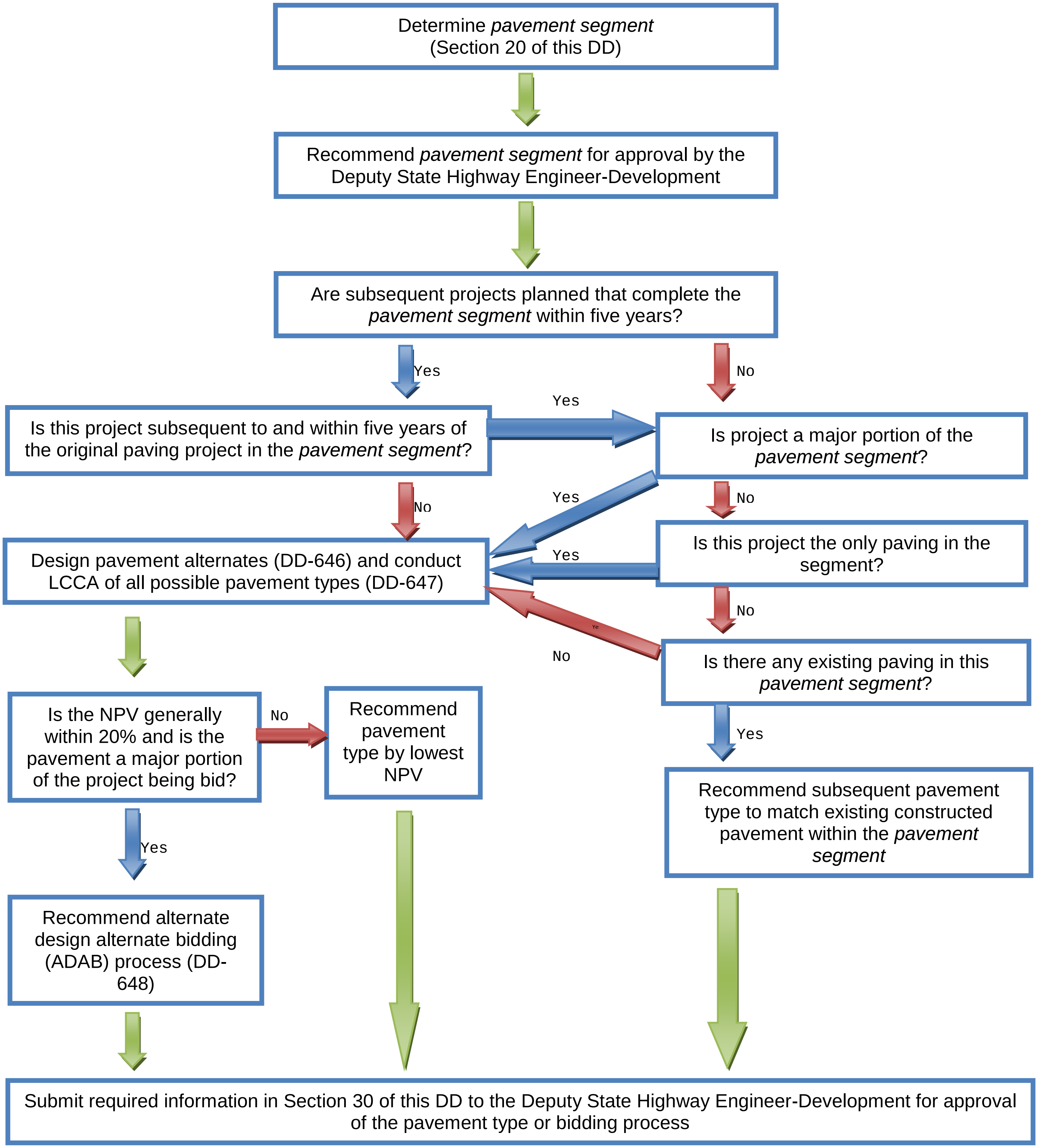
6. Incorporation of Technology

A work plan will be developed and the project evaluated over a performance period if the Division desires to field test a new material, concept, or technology.

50. PROJECTS SUBSEQUENT TO ADAB PROJECTS

On projects that are subsequent to an ADAB project and in the same *pavement segment*, the *pavement type* shall match the *pavement type* in the previously awarded ADAB project and a new pavement design is not warranted. However, if an extended period of time (beyond five years) has passed since the ADAB project was built and/or the design parameters have changed, the project manager should re-evaluate the design to ensure the adequacy of the original pavement design.

Pavement Type Selection Flowchart



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-642
USE OF SUBGRADE
October 1, 2003

Subgrade, Item 207002-*, will be specified for both cut and fill sections of roadway. Subgrade will be 6" thick for all installations and will be placed directly below the base course. Subgrade will extend from daylight point to daylight point when Class 1 Aggregate (Item 307001-*) or any other dense graded base course is specified. When free draining base is specified, subgrade will extend from the roadway edge of the free draining base trench (low side of the typical) to 6" outside the high side shoulder.

On divided highways with depressed medians, subgrade will not be continued through the median. In narrow medians, which may be flush or raised, subgrade should be extended through the median for ease of construction.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-643
USE OF AGGREGATES AND FILTER FABRIC
October 1, 2003

I. OPEN GRADED BASE COURSE

Item 311006-*, "Open Graded Free Draining Base Course," will be used under rigid and flexible pavements for the following:

A. Projects on new alignments.
B. Widening projects with full-lane and shoulder construction.
C. Projects requiring full pavement replacement, if and only if detours are designed or are available for maintenance of traffic.

If traffic must be maintained upon the aggregate base course, "Open Graded Free Draining Base Course" should not be specified.

Item 207034-*, "Fabric for Separation" is to be used under "Open Graded Free Draining Base Course."

II. DENSE GRADED BASE COURSE

Item 307001-*, "Class 1 Aggregate Base Course" shall be used under all rigid and flexible pavements not included in I above.

Item 207034-*, "Fabric for Separation" shall be used under "Class 1 Aggregate Base Course."

III. SHOULDERS

Item 307001-*, "Class 1 Aggregate Base Course" shall be used under all paved shoulders.
Item 307001-*, "Class 10 Aggregate" shall be used on unpaved shoulders.

IV. UNPAVED ROADS

Item 307001-*, "Class 3 Aggregate" shall be used for unpaved roads.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD – 644
ASPHALT PAVEMENT
February 23, 2017
Supersedes July 31, 2014

Attached is the West Virginia Department of Transportation, Division of Highways policy on "Asphalt Pavement".

This Design Directive (DD) provides guidance on selecting *asphalt pavement* mix design methods and types of *asphalt pavement*. It also provides descriptions of situations that require polymer-modified asphalts, and methods for calculating quantities and types of materials that are to be used.

Attachment

ASPHALT PAVEMENT

TYPES OF ASPHALT PAVEMENT

Superpave Asphalt Pavement: "Superpave" stands for Superior Performing Asphalt Pavements. It represents an improved system for specifying the components of asphalt concrete, asphalt mixture design and analysis, and asphalt pavement performance prediction. The Strategic Highway Research Program (SHRP) developed the Superpave asphalt pavement mix design method in the early 1990's.

Marshall Asphalt Pavement: Bruce Marshall developed the "Marshall" method of asphalt mix design in the late 1930's for the Mississippi Highway Department. This method has been used by the WVDOT for at least the past 40 years and was the standard specification.

ASPHALT PAVEMENT MIX DESIGN TYPE SELECTION

Superpave asphalt pavement is to be used for the following type projects:

1. New construction of multilane divided highways where the mainline pavement is asphalt pavement.

2. Overlay or 3R type projects on existing multilane divided highways where the asphalt pavement overlay is 3 inches or more.

3. Overlay type projects on existing National Highway System (NHS) highways where the asphalt pavement overlay is 3 inches or more.

4. Projects on other highways where approved by the Deputy State Highway Engineer for Development or Operations.

Marshall asphalt pavement will be used on all other projects.

For resurfacing projects, polymer-modified asphalt (PMA) may be used in the Asphalt Pavement at the discretion of the District Engineer/Manager or the Director of the Engineering Division on projects where conventional asphalt pavement has exhibited severe rutting or shoving problems due to heavy traffic conditions, such as:

(1) Intersections with very heavy truck traffic,
(2) Truck climbing lanes and ramps,
(3) For the surface lift of asphalt pavements in resurfacing projects where the design ESALS exceed 30,000,000,

Otherwise, PMA is required to be used in the following cases:

(1) For the surface lift (at minimum) of asphalt pavement in new construction projects where the design ESALs exceed 30,000,000 (Refer to DD 646 – Pavement Design Guide) and the pavement system is being designed as a

"perpetual" or "long life" system. Preferably PMA should be used in the top 4" of the pavement structure for a "perpetual" or "long life" pavement system,

(2) For the surface lift on roadways facilitating access to industrial parks, warehouses, production facilities, etc.

(3) High Performance Thin Overlay (HPTO) asphalt pavement in accordance with Special Provision 496.

The specified binder grade shall be a PG 76-22 with polymer-modification. PMA can be used as a long-term solution to severe rutting problems. Due to the significant additional cost of PMA, do not use it on any project without first repairing base failures and removing excessively rutted pavement. PMA should generally be used only in the skid surface mix (preferably a 12.5 mm mix), but may also be used in the underlying base course depending on the severity of the traffic conditions. Always use the preferred thickness from the Superpave asphalt pavement recommended lift thickness tables as a minimum thickness when using PMA. Any mix design to be used as a scratch course shall not be specified to use PMA.

Either Superpave or Marshall asphalt pavement should normally be used exclusively on a project. There will be no projects where both specifications are used, unless approved by the appropriate Deputy State Highway Engineer, or as hereinafter provided.

The Designer may consider using both Superpave and Marshall asphalt pavement when a large quantity of each type (>5000 tons of each type on a contract) could be specified in the same contract. This situation can occur when there is enough length of side roads to be paved in the contract to allow more than 5000 tons of Marshall mix to be used. Proper bid items and alternates for both types of asphalt pavement mix will then be included in the contract. Roadways that will be constructed of Marshall asphalt pavement will be indicated as such in the Asphalt Summary Table and on the typical sections for each roadway. If the designer does not desire Marshall asphalt pavement to be used, then no items and alternates for this mix will be indicated in the contract.

On overlay or 3R projects which require pavement and/or base failure repairs to be made before the overlay is placed, the designer shall indicate which mix type (Superpave or Marshall) is to be used for these repairs, and include proper bid items and quantities in the contract. If mix type substitutions are allowed by the designer, then alternate bid items and quantities will be included in the contract as shown in the example below. The pavement method design type, "HMA", aggregate alternate, and mix type is indicated in the example below for illustrative purposes only.

Example:

AA1 401001-020 MARSHALL HMA BASE CRSE, SG, TY 2, TN (Pavement Repair)

AA2 401001-021 MARSHALL HMA BASE CRSE, S, TY 2, TN (Pavement Repair)

BB1 401001-042 SUPERPAVE HMA BASE CRSE, SG, TY 25, TN (Pavement Repair)

BB2 401001-043 SUPERPAVE HMA BASE CRSE, S, TY 25, TN (Pavement Repair)

ASPHALT SPECIFICATION TYPE SELECTION

Section 410 of the Standard Specifications, *Asphalt Base and Wearing Courses, Percent Within Limits (PWL)* and the appropriate pay items will be used on the following type projects:

1. New Construction of multilane divided highways where the mainline pavement is asphalt pavement.
2. Overlay projects on existing multilane divided highways.
3. Asphalt paving on National Highway System (NHS) routes. *
4. Projects on other highways where approved by the Deputy State Highway Engineer for Development or Operations.

*Any two-lane highway on the NHS system requires special consideration and review by the Pavement Engineer at the Materials Control, Soils and Testing Division.

Section 401 and/or 402 and the appropriate pay items will be used on all other projects.

DETERMINATION OF "EQUIVALENT SINGLE AXLE LOAD" (ESAL) COUNT

The "ESAL Calculator" program shall be used to calculate the 20-year projected design ESALs for all projects unless one of the following applies.

1. The "ESAL Calculator" program produces a value exceeding 10,000,000.

2. When a traffic study has been performed. (i.e. When traffic movements or traffic counts are provided by the Traffic Modeling and Analysis Unit of the Planning Division.)

3. On roadway realignment projects that exceed 1000 feet of relocated roadway.

4. When there is an expected development in the area that may change or alter the nature or character of the expected traffic. (i.e. Shopping centers, schools, etc.)

5. The project is on the CRTS (Coal and Resource Transportation System).

The "ESAL Calculator" program can be obtained from the Technical Section of the Engineering Division or on the West Virginia Department of Transportation's web site at http://www.transportation.wv.gov/highways/engineering/Pages/Manuals.aspx, then under the "Paving" heading choose "ESAL Calculator".

A. When the "ESAL Calculator" program cannot be used to calculate the ESALs then the ESALs or the percentage of traffic in each of the 13 classes shall be obtained from the Traffic Modeling and Analysis Unit of the Planning Division. The designer is cautioned that the development of appropriate data to establish accurate ESAL counts may require significant lead time. The Traffic Modeling and Analysis Unit of the Planning Division should therefore be notified as early as possible so they may supply the information.

PLAN REQUIREMENTS

Projects using either Superpave or Marshall asphalt pavement will show the 20-year projected design ESALs on both the general notes sheet and the typical section sheet(s) showing the pavement details. This includes new construction, reconstruction, AND resurfacing projects (including ALL bridge replacement projects regardless of the length of pavement placed). The design ESALs shall be shown for the mainline and all other affected roadways where more than 500 feet of pavement is being placed.

A. Superpave Asphalt Pavement

The PG Binder grade will normally be one of the standard grades specified in Section 401.2 of the standard specifications. However, if a project requires the use of a nonstandard grade, the binder grade(s) shall be provided on both the general notes sheet and the typical section sheet(s) showing the pavement details.

B. Marshall Asphalt Pavement

Projects using Marshall asphalt pavement, including District-designed projects, will designate the use of "Medium Mix Design" or "Heavy Mix Design" as well as the design ESALs on both the general notes sheet and the typical section sheet(s) showing the pavement details. The designer should note that the terms "Medium" and "Heavy" refer to Equivalent Single Axle Loads (ESALs), and not to the quality of the asphalt pavement. After determining the ESALs by either using the ESAL Calculator or obtaining the value from the Planning Division, the mix design type shall be determined from the following criteria.

Medium Mix Design - This design is intended for use on local service roads or rural resurfacing projects with a 20-year projected design ESALs of less than 3,000,000.

Heavy Mix Design - This design is intended for use on new construction projects and on projects with a 20-year projected design ESALs of equal to or greater than 3,000,000.

ESTIMATING QUANTITIES

A. Asphalt Pavement

The quantity for asphalt pavement shall be estimated at 1.980 ton/cy for stone and gravel mixes, 1.890 ton/cy for slag mixes and 2.10 ton/cy for steel slag mixes.

B. Patching and Leveling

The quantity for Patching and Leveling Course shall be estimated by multiplying the nominal depth of the irregularity to be repaired plus ¾ inch by the irregularity's surface area. Then the conversion rates of 1.980 ton/cy for stone and gravel mixes, 1.890 ton/cy for slag mixes and 2.10 ton/cy for steel slag mixes will be utilized.

C. Scratch Course

The quantity for Scratch Course shall be estimated at a thickness of one-half inch (0.028 ton/sy) for the entire area to be covered with Scratch Course.

D. Asphalt Material (Tack Coat)

The quantity for Asphalt Material (Tack Coat) shall be estimated as indicated in Table 408.11 in the latest issue of the Standard Specifications. No application rate will be shown on the typical sections.

E. Cover Aggregate

Cover aggregate will be used by the contractor when necessary as directed by the Project's Construction Engineer. The designer shall estimate this item at 10 to 15 lb/sy and include the cost in the unit bid price estimate for Item 408, Asphalt Material. No quantity is to be shown in the plans.

TYPE SELECTION

A. Patching and Leveling

General: Patching and Leveling is to be placed at various locations throughout the project to remove irregularities in the existing pavement, such as dips, or to raise the outside edge of the existing pavement to provide a uniform template prior to placing a base or wearing course. Patching and Leveling shall not be specified as a continuous layer or course to be placed over the full width and length of the project.

Project Selection: Patching and Leveling should be used only in resurfacing or rehabilitation projects, not in the construction of new pavements. It shall be specified when the deviations in the existing pavement are 1 inch or greater in depth.

Typical Sections: Patching and Leveling shall be shown on the plan typical sections as a layer with thickness specified as "variable - 2" maximum lift thickness. No application rate shall be shown. Patching and Leveling thickness is not included in the structural design of the pavement.

B. Scratch Course

General: Scratch Course shall be specified when the deviations in the existing pavement are less than 1 inch in depth. Scratch Course can be placed over the entire project or to the limits established by the designer. If the Scratch Course is not to be placed over the full width of the project, it should be specified at least at a full lane width. Although Scratch Course can be placed over the complete project, it is not a constant thickness layer. The term "Scratch Course" comes from the method of placement of this item. The paving equipment is set to drag on or "scratch" the high areas of the existing pavement, only depositing material in the low areas; thereby creating a smooth surface on which to place the next layer of asphalt pavement. If milling is performed on the project, Scratch Course shall not be used.

The Designer should specify Scratch Course in the contract if the overlay is the first overlay over an existing Portland Cement Concrete Pavement (PCCP), or if previous asphalt pavement overlays will be milled deep enough to expose the original PCCP. This will not include newly constructed PCCP or approach slabs.

Project Selection: Scratch Course is normally used in rehabilitation or resurfacing projects. Scratch Course may be specified to be placed on top of Type 1 or Type 37.5 Base Courses prior to placing the final wearing or skid course in new construction projects, if a Type 2 or a Type 19 Base Course is not used as the top lift of the base courses.

Typical Sections: Scratch Course shall be shown on the plan typical sections as a line without a thickness or application rate. Scratch Course is not included in the structural design of the pavement.

C. Base Courses

General: It is recommended that in multi lift pavements when Type 1 or Type 37.5 Base Course is used, the top lift of base course be a Type 2 or 19 to improve the smoothness of the finished pavement. This would eliminate the use of a Scratch Course prior to placing the final wearing or skid course.

1. Marshall Asphalt Pavement

a. Type 1 Base Course shall be specified when the total base course thickness for new construction is greater than 3.25 inches. On resurfacing projects, Type 1 Base Course shall not be specified where temporary traffic control requirements prohibit an edge drop off of 3 inches.

b. Type 2 Base Course shall be specified when the total base course thickness is less than or equal to 3.25 inches.

Recommended Lift Thickness for Marshall Asphalt Pavement				
Mix Type	**Aggregate Nominal Maximum Size**	**Minimum Lift Thickness**	**Maximum Lift Thickness**	**Preferred Thickness**
2	0.75 inch (19 mm)	2.0 inches (50 mm)	3.0 inches (75 mm)	2.0 inches (50 mm)
1	1.5 inches (37.5 mm)	3.25 inches (82 mm)	5.0 inches (125 mm)	4.0 inches (100 mm)

2. Superpave Asphalt Pavement

a. Type 37.5 Base Course shall be specified when the total base course thickness for new construction is greater than or equal to 4.5 inches. On resurfacing projects, Type 37.5 Base Course shall not be specified where temporary traffic control requirements prohibit an edge drop off of 3 inches.

b. Type 19 or 25 Base Course shall be specified when the total base course thickness is less than 4.5 inches.

Recommended Lift Thickness for Superpave Asphalt Pavement					
Mix Type	Marshall Equivalent Designations	Aggregate Nominal Maximum Size	Minimum Lift Thickness	Maximum Lift Thickness	Preferred Thickness **
19	Base-2	0.75 inch (19 mm)	2.25 inches (56 mm)	3.5 inches (88 mm)	2.5 inches (63 mm)
25	Heavy Duty Base-2	1 inch (25 mm)	3.0 inches (75 mm)	4.0 inches (100 mm)	3.5 inches (88 mm)
37.5	Base-1	1.5 inches (37.5 mm)	4.5 inches (113 mm)	6.0 inches (150 mm)	5.0 inches (125 mm)

** Min. Thickness with Polymer Modified Binders

D. Wearing Courses

General: The wearing course is a single lift constant thickness course to be placed over the entire pavement surface. The wearing course is the riding surface on which traffic travels. Type 4 or Type 19 Wearing Course is intended for use in heavy truck traffic situations. On projects with a current ADT of 3000 or more vehicles per day, the wearing course shall be a skid resistant mix in accordance with Section 402 of the Standard Specifications. Only Type 1, Type 4, Type 9.5, Type 12.5 or Type 19 shall be specified as a skid resistant mix.

1. Marshall Asphalt Pavement

Recommended Lift Thickness for Marshall Asphalt Pavement				
Wearing or Skid Mix Type	Aggregate Nominal Maximum Size	Minimum Lift Thickness	Maximum Lift Thickness	Preferred Thickness
3	No. 4 (4.75 mm)	0.5 inch (12.5 mm)	0.75 inch (19 mm)	5/8 inch (16 mm)
1	3/8 inch (9.5 mm)	1.0 inch * (25 mm)	1.5 inches * (37.5 mm)	1.0 inch * (25 mm)
4	0.75 inch (19 mm)	2.0 inches (50 mm)	2.0 inches (50 mm)	2.0 inches (50 mm)

* 1½ inch (37.5 mm) thickness on resurfacing projects where the Wearing Course is the only asphalt pavement material being placed exclusive of Patching & Leveling and Scratch Courses.

2. Superpave Asphalt Pavement

Recommended Lift Thickness For Superpave Asphalt Pavement					
Wearing or Skid Mix Type	**Marshall Equivalent Designations**	**Aggregate Nominal Maximum Size**	**Minimum Lift Thickness**	**Maximum Lift Thickness**	**Preferred Thickness ****
4.75	Wearing-3	No. 4 (4.75 mm)	5/8 inches (14.25 mm)	1.0 inches (24 mm)	5/8 inches (16 mm)
9.5	Wearing-1	3/8 inch (9.5 mm)	1.5 inches * (37.5 mm)	2.0 inches * (50 mm)	1.5 inches * (37.5 mm)
12.5	Heavy Duty Wearing-1	½ inch (12.5 mm)	1.5 inches (37.5 mm)	2.5 inches (63 mm)	2.0 inches (50 mm)
19	Wearing-4	¾ inch (19 mm)	2.25 inches (56 mm)	3.5 inches (88 mm)	2.5 inches (63 mm)

* 1½ inch (37.5 mm) thickness on resurfacing projects where the Wearing Course is the only asphalt pavement material being placed exclusive of Patching & Leveling and Scratch Courses.
** Minimum Thickness with Polymer Modified Binders

E. Prime Coat and Asphalt Material (Tack Coat)

Prime Coat (Item 409) is discontinued.

Asphalt Material (Tack Coat) (Item 408) shall be specified for placement on all existing pavement prior to placing asphalt pavement. This item shall also be specified for placement on new asphalt pavement when traffic must be maintained on each layer of asphalt pavement during construction for periods of time in excess of 2 weeks.

F. Milling existing pavement surfaces

Milling is used to remove surface distresses, create a better bond for an overlay, restore cross slope, and maintain vertical geometric properties, such as bridge clearance, guardrail height, and grade with gutter area. *Milling of Asphalt Pavement Surfaces*, Section 415 of the Standard Specifications, contains three types of milling: Standard Milling, Fine Milling, and Micromilling. These are differentiated primarily by the carbide tooth spacing, typically 15, 8, and 5 mm respectively, resulting in finer textured surfaces. These milling types specify the final surface texture prior to any overlay.

1. Standard Milling is used as the default milling of asphalt pavement. It is intended to be used when the Division plans to remove existing asphalt pavement without a high level of profile and slope control.
2. Fine Milling is used when the Division intends to overlay the milled surface with a thin lift asphalt course. It shall also be used when the contract contains pay items from Section 410 of the Standard Specifications, *Asphalt Base and Wearing Courses, Percent Within Limits (PWL)*. It is intended be used when control of the profile and slope of the milled surface is important.
3. Micromilling is used for smoothness correction, skid correction, bump and/or grade corrections on existing or newly paved surfaces. This milling is typically less than an

inch. It is not intended to be used when standard overlays are to be used.

When milling is specified by the contract, the thickness of milling specified by the Designer should be at least ¼" into the layer just below the layer(s) being removed. The intent is to mill off entire layers, and not leave any partial layers. If partial layers are to remain in place, the thickness to remain should be at least one and one-half times the nominal diameter of the aggregate of the existing asphalt pavement course being removed.

SPECIAL SITUATIONS

General: The Specifications have been written to account for the majority of the situations that would occur during construction. However, there are always special situations that require the designers' attention.

Specification requirements should only be altered after careful consideration and when, in the opinion of the designer, there is no practical way for the work to be performed in accordance with the specifications. Additional notes that modify existing specifications shall not be used without the approval of the Engineering Division or the District Engineer.

Compaction. The specification density requirement in the latest issue of the Standard Specifications shall not be modified when asphalt pavement is placed at normal paving widths. It is possible that asphalt pavement will be placed in certain areas of the project where densities of this magnitude cannot be obtained. These areas usually have an irregular shape, which will not allow the proper use of compaction equipment. Listed below is a situation where the density specification may be modified by plan note and the plan note to be used.

Situation	Plan Note
Concrete pavement repair *	Compaction testing shall be in accordance with the Lot-by-Lot method and the rollerpass method shall not be used for acceptance testing for compaction. The engineer may reduce the target density requirement if the contractor has made every reasonable effort at obtaining the required density.

* If the proper density is not obtained during placement, traffic will continue to compact the asphalt pavement in the pavement repair area, causing additional settlement. This will be very noticeable because the surrounding overlay will be placed on the existing concrete pavement, which is rigid and will not settle.

The designer is encouraged to use concrete to repair an existing concrete pavement.

Surface Tolerance: To comply with the specifications, projects receiving 3 inches or more of asphalt pavement must meet a smoothness requirement. It is possible that asphalt pavement will be placed on certain projects or in certain areas of a project where this specification cannot be met. Listed below is a situation where the surface tolerance specification may be modified by plan note and the plan note to be used.

Situation	Plan Note
Urban projects with numerous side streets where traffic must cross through the paving operation.	The first three paragraphs of Section 401.7.2 shall not apply to this project.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-645
RUMBLE STRIPS
March 29, 2012

The purpose of longitudinal rumble strips is to enhance safety by preventing crossover or run off road collisions from occurring. Rumble strips are intended to alert drivers by creating an audible (noise) and tactile (vibratory) warning sensation that the vehicle is leaving the traveled way and that a steering correction is required. Accident studies have indicated that both crossover and run off road type crashes may be reduced significantly by the use of rumble strips.

The intent of the rumble strip is to gain the attention of a driver. The byproduct of this measure is noise. When installed in a suburban or urban area, the noise from rumble strips may be quite disruptive to nearby residents. The noise issues should be considered in the decision to place rumble strips in such areas.

Rumble Strips shall be included in contracts by the use of the appropriate item number(s). The Standard Details Book Volume 1 contains the details of how to construct rumble strips. While previous details allowed various methods of construction, milled or sawn rumbles are the only current options.

Rumble Strips are to be placed in new pavement only.

Thermoplastic striping is recommended when striping over centerline rumble strips.

Edgeline Rumble Strips

Edgeline rumble strips are primarily intended for rural high speed roadways. This does not exclusively exclude urban applications if they are otherwise warranted. When recommending continuous edgeline rumble strips the conditions of the overall corridor or system shall be considered instead of individual projects or locations. An exception would be locations with high run off the road crash history. Due to the difficulty in determining where a driver will become distracted or drowsy, it is recommended that rumble strips be installed system-wide or in corridors, prioritized by the frequency of the specific crash types targeted by the treatment. Within a corridor application, however, there may be spots where discontinuing the rumble strip installation may be prudent.
Edgeline rumble strips will be placed in shoulders of rural roadways meeting all of the following conditions:

- On roadway systems with design speeds 45 mph or greater.

- Where travel lanes are 11’ or greater.
- Typical shoulder width is 4' or more.

Exceptions to 4’ shoulder width:

- Mainline shoulders on divided highways, if typical shoulder width is 3' or greater.
- Shoulders adjacent to one-way ramps which connect to arterial highways, if typical shoulder width is 3' or greater.
- Shoulders adjacent to climbing lanes on arterial highways, if typical shoulder width is 3' or greater.
- In locations with high run off the road crash history, regardless of design speed and shoulder width.

Centerline Rumble Strips

The use of centerline rumble strips shall be based on the following criteria:

- Based on the crash history of crossover rates
- On roadway systems with design speeds of 45 mph or greater.
- Where travel lanes are 11’ or greater.

Noise Mitigation

Rumble strip installations may produce noise complaints where there are nearby residences. The following modifications may be made to rumble strips individually or in combination to reduce noise.

- Reduce depth of rumble strips to 3/8”. This should be modified using a general note.
- Increasing the offset distance from edge of pavement to the rumble strip up to a

total dimension of 2'. This decreases the number of inadvertent hits to the strip. This should be done by general note.

- Non use of the rumble strips in spot locations, so as not to prevent their use along a corridor.

Bicycle Mitigation

Where bicycle traffic exists or is anticipated the following mitigation techniques should be used individually or in combination.

- Provide a longitudinal gap of 12' for every 48' of rumble strip placed.
- Reduce depth of rumble strips to 3/8". This should be modified using a general note.
- Where rumble strips are placed within 6" of the edge of pavement, a minimum clear shoulder width of 4' should be provided from the outside edge of the rumble strip to the edge of the paved shoulder, or 5' from the front face of a barrier or guardrail. If this clear area cannot be provided then increasing the offset or deletion of the rumble strip should be considered.
- Increasing the offset distance from edge of pavement to the rumble strip up to a total dimension of 2'. This should be done by general note.
- Non use of the rumble strip.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-646
PAVEMENT DESIGN GUIDE
April 23, 2015

A pavement design will be completed for all projects requiring pavement (excepting certain Resurfacing, Restoration, and Rehabilitation projects), in accordance with the Division of Highways' *Design Directive 641, Pavement Type Selection Guide.*

This Design Directive (DD) provides a means to standardize the process to design and evaluate pavement designs throughout all development units of the West Virginia Division of Highways (WVDOH).

Attachment

PAVEMENT DESIGN GUIDE

10. INTRODUCTION

Pavement design is a combination of engineering and economic analyses, which provides data to assist in choosing a cost-effective pavement structure and thickness. The engineering analysis consists of a pavement structural design procedure with consideration of “other factors” which may influence the thickness of the pavement section. The 1993 AASHTO *Guide for the Design of Pavement Structures and 1998 Supplemental* allows for these "other factors", both principal and secondary, which will be considered along with the engineering and economic data to select the pavement section for the project. The principal factors have a major influence on the thickness of the pavement section. The secondary factors will be used to evaluate the designed thickness.

This Guide outlines the process for pavement design for new or reconstructed pavement structures and rehabilitation projects. It provides guidance in the design approach for the cost comparison, the use of design parameters and discusses principal factors to be utilized in making a selection of a pavement type for design. This guide is provided in compliance with Title 23, Code of Federal Regulations Part 626. The following list provides other sources of information related to this DD:

- *West Virginia Division of Highways Pavement Design Manual,* 1997
- *AASHTO Mechanistic-Empirical Pavement Design Guide,* 2000 (and associated software)
- Westergaard Equations (for design of concrete slabs)
- Asphalt Pavement Alliance *PerRoad* software

The *designer* may also use engineering judgment based on past performance of other pavements in the project area, provided the pavements are of the same type, the geotechnical data, traffic characteristics, etc. are similar. Coordination with the Pavement Management System Section in the Maintenance Division is essential to gather information on past performances of differing types of pavement and rehabilitations in the different geological regions of the State.

If the criteria listed below are true then consider an *analysis period* of 50 years or more along with the design of a “perpetual pavement” or a “long-life pavement”. Additionally, the *Mechanistic-Empirical Pavement Design Guide* (M-E PDG) software should be used to verify the results of the *DARWin* analysis when the following situations are true:

- ESAL values are greater than 30,000,000.00
- *DARWin* software indicates that an asphalt pavement is greater than 13 inches
- When Plain Jointed Portland Cement Concrete Pavement (PCC) is 10 inches or thicker.

> ***NOTE:*** The *M-E PDG* is not yet approved by AASHTO; however, it may be used if the designer is both familiar with it and can obtain the required material property values.

The *PerRoad* software from the Asphalt Pavement Alliance gives the thickness of an asphalt pavement known as a "Perpetual Pavement", which is a pavement with a structural performance period greater than 50 years. Ride-ability overlays still must be considered with a perpetual pavement. These overlays are "mill and fill" overlays where the thickness milled out is replaced with an identical thickness of asphalt. PCC pavements with a structural performance period more than 50 years are known as "long-life pavements" and thicknesses are given by the Westergaard Equations. While the thicknesses are given by these equations, PCC pavements designed by this method must have full-depth, tied PCC shoulders for lateral support, as the equations assume that the edge of the PCC pavement has adequate lateral support so the slabs do not spread apart. These PCC pavements also require ride-ability rehabilitation techniques to be performed throughout the 50-year lifespan of the pavement.

In general, a minimum 40-year *analysis period* shall be used unless the conditions for a "perpetual pavement" or "long-life pavement" are met. In this case, an analysis period of at least *50 years* will be considered. The conditions for the use of a 50-year analysis period are listed in paragraph four of "Section 10" of this DD.

20. PAVEMENT DESIGNS

Pavement designs shall be required for all pavement types with LCCA when more than one type of pavement is to be considered in the pavement type selection procedure. See *DD-641, Pavement Type Selection Guide*, for the criteria to be used for this determination.

An LCCA is not required on projects where pavement replacement or reconstruction is less than 1,000 feet on a single roadway segment or less than 500 feet of each bridge approach roadway. In these cases, the pavement design process can be based on engineering judgment; however, *pavement designs* shall be *required* on all other project types, with the exception of rehabilitation projects. The project manager shall give due consideration to selected *pavement segments*, considering in-kind replacement, adjacent pavement type and condition, past pavement performances as described in "Section 10" above, and future improvements when exercising judgment during the design process.

The asphalt overlay thickness for rehabilitation projects is to be based on historic practices utilized by the West Virginia Division of Highways, engineering judgment supported by a field review of the existing pavement and the past performance of asphalt overlays on similar projects, or if necessary a pavement design in accordance with this DD.

1. PRINCIPAL FACTORS

"Principal factors" are those which can have a major influence on the design. Some of these factors are included in the basic design procedures as they influence the structural requirements of the pavement design or sub-grade or the embankment treatments. In such cases, they are assigned an economic value for comparative purposes. The following discussion documents Division policies and practices for principal factors not considered in basic design procedures.

a. Traffic

Shifts occur in the economic activity of manufacturing and service industries throughout the state. These activities should be considered as factors affecting the proposed alternative and required method for construction of the selection. In urban areas or on roadways with heavy traffic, the need to minimize disruptions may be a major consideration.

b. Soils Characteristics

The design is to give full consideration to any unusual soils characteristics. Subsurface exploration is an essential part of the design process which includes investigation, sampling and testing, identification of materials types and the distribution of soils materials throughout the project. Based on past experience, the characteristics of the roadbed soils have been found to have a major influence on pavement performance.

c. Recycling

It is the Division's policy to promote recycling of existing roadway materials. The current edition of the *West Virginia Division of Highways Standard Specifications, Roads and Bridges* allows recycled materials to be incorporated in the pavement section.

30. RESPONSIBILITIES AND SELECTION PROCEDURES

The project manager will perform the design analysis utilizing appropriate software for all pavement alternates, when applicable. The analysis period shall be the same for each type of pavement with pavement rehabilitation strategies developed to give an equivalent performance.

The project manager will document the “principal factors” as they relate or apply to the project. Weighing the factors and any related costs along with the costs of alternates from the LCCA, a pavement design and bidding method will be submitted to the Deputy State Highway Engineer-Development for approval. Refer to *DD-647, Life-Cycle Cost Analysis for Pavement Design*, for more information concerning LCCA.

40. SAFETY

All projects, whether new construction, reconstruction or rehabilitation, will have skid resistant properties suitable for the needs of traffic. Refer to *DD-644, Asphalt Pavement,* for related criteria.

50. GENERAL TYPES

Consider the following types of pavement alternates:

A. Rigid

The pavement will be jointed Portland Cement Concrete (PCC) as required by the design parameters**,** current design policy, or as selected by use of *DD-641, Pavement Type Selection Guide*. Joint spacing shall be in accordance with details set forth in the current edition of the *WVDOT/DOH Standard Details, Volume 1*.

B. Flexible

Flexible pavement will be asphalt. *Applications* and asphalt *mix types* shall be in accordance with *DD-644, Asphalt Pavement*.

C. Base Courses

Base course(s) will be specified as per *DD-643, Use of Aggregates and Filter Fabric.*

D. Shoulders

Joint spacing on PCC shoulders shall match the spacing of the mainline pavement. For both PCC and asphalt pavements, the paved shoulder thickness shall match the mainline pavement section for:

- Urban arterials
- Projects with an ADT of 6,000 and truck traffic of 15% or greater
- Projects with an ADT greater than 15,000

60. PERFORMANCE PERIOD - NEW PAVEMENTS

Performance periods for new pavements will be selected based on past design practices, experiences, and a review of pavement data.

The WVDOH’s current historical data regarding the initial performance period of original asphalt pavements indicates an average of 18 years to the first rehabilitation. This may be extended by as much as 4 years if one of the following is true:

- The initially constructed asphalt pavement utilized a polymer binder in at least the top 4 inches of the asphalt mix.
- A rut-resistant base (such as a Superpave 19 mm, 25 mm, 37.5 mm mix, or a combination of these) was used to the elevation of the bottom of the surface course and the surface course utilized has a polymer binder.

The WVDOH's current historical data indicates an average initial performance period of 22 years for original PCC pavements.

70. PERFORMANCE PERIOD - REHABILITATION

Rehabilitation projects are to be based on performance periods as described below. These performance periods vary by rehabilitation techniques (asphalt overlays vs. Concrete Pavement Restoration (CPR)) as well as original pavement types (asphalt vs. PCC).

Performance periods of subsequent asphalt overlays over asphalt pavements vary from 8 to 12 years (based on WVDOH historic data), which may be extended by up to 4 years when a polymer binder is used in at least the top 4 inches of the final pavement thickness.

Performance periods of subsequent rehabilitations over PCC pavements range between 10 and 14 years for Concrete Pavement Restoration techniques (based on national experience), and 6-10 years for asphalt overlays (based on WVDOH historic data), which may be extended by up to 4 years when a polymer binder is used for the entire thickness of the asphalt overlay mix. An additional four years should not be anticipated with minimal thickness polymer wearing course overlays.

The designer is cautioned to investigate all available historical data regarding past pavement performance, including overlays, when determining pavement rehabilitation schemes for the LCCA of newly constructed pavements. This is also true when considering rehabilitation schemes for existing pavements. The Pavement Management Systems Section of Maintenance Division is to be consulted for guidance in this matter.

80. TRAFFIC DATA

Traffic factors for growth rates, equivalent single axle loads (ESAL), and directional distribution percentage are to be obtained from the Traffic Modeling and Analysis Unit of the Planning Division.

90. ROADBED SWELLING AND FROST HEAVE

Recommended values from Table 1 of this DD are to be used unless project-specific information is available and approved by the Deputy State Highway Engineer-Development.

100. SERVICEABILITY

Recommended values from Table 1 of this DD are to be used unless project-specific information is available and approved by the Deputy State Highway Engineer-Development.

110. MATERIALS PROPERTIES

A. Effective roadbed soil resilient modulus data are to be obtained from Materials Control, Soil and Testing Division. Soil samples are normally obtained during the design phase; however, if a paving project is to be bid after the grading has been completed and enough time is available to perform in-place testing of the sub-grade, the Designer should request the Materials Control, Soils, and Testing Division to re-test the sub-grade prior to designing the final pavement section.

Recommended values from Table 1 of this DD are to be used unless project-specific information is available and approved by the Deputy State Highway Engineer-Development.

120. PAVEMENT STRUCTURAL CHARACTERISTICS

Recommended values from Table 1 of this DD are to be used unless project-specific information is available and approved by the Deputy State Highway Engineer-Development.

130. PAVEMENT THICKNESS

The final pavement thickness will be based on the structural analysis. The minimum layer thickness will be consistent with standard construction methods and/or material requirements. For all pavement types, the total design thickness shall be rounded up to the nearest half-inch. Refer to *DD-644*, *Asphalt Pavement*, for information on pavement layer thickness criteria for asphalt pavements.

140. REHABILITATION PROJECTS

The Division recognizes that there are a variety of rehabilitation methods and strategies available to restore pavements. As all factors that influence pavement performance and life expectancy have not been quantified, the latest information and recommendations from the Pavement Management System Section of Maintenance Division should be considered in the selection type and process outlined herein.

The asphalt overlay thickness for overlay types of rehabilitation projects is to be based on historic practices utilized by the West Virginia Division of Highways, engineering judgment supported by a field review of the existing pavement and the past performance of asphalt overlays on similar projects, or if necessary a pavement design in accordance with this DD.

In situations where the use of an asphalt overlay as the rehabilitation method is questionable, the following process can be used to select the rehabilitation method best suited to the project:

A. Project Evaluation

The type of pavement rehabilitation to be considered begins with an evaluation of pavement distress, smoothness or ride-ability and consideration of general conditions within the proposed project area. For asphalt pavement, distress evaluations are based on the amount of rutting, longitudinal cracks, transverse cracks, alligator cracks, and smoothness. For concrete pavements, the distress will be measured on the basis of the amount of faulting, longitudinal cracking, transverse cracking, pumping, joint deterioration and smoothness. This information will normally be available from pavement management inventories collected by the Pavement Management Section of Maintenance Division. Project conditions will be gathered based on a field review by the project manager.

B. Project Analysis

Upon completion of evaluations, alternative solutions will be considered for the project. The following alternates considered by the designer may vary with the type of pavement being overlaid, the amount of distress and smoothness values. The alternates will be analyzed as to their constructability, performance period, initial agency costs, and life cycle costs. The performance periods may be chosen by the designer from the ranges given below, considering input from other Division and District personnel, and the Pavement Management Section of Maintenance Division will consider the vertical clearances, traffic control, and construction conflicts.

NOTE: Full and partial depth patching are normally considered maintenance and occur prior to rehabilitation. Maintenance performed at a separate time and under a separate contract is not included in rehabilitation; however, full and partial patching performed in conjunction with an overlay *is* included in the LCCA and the rehabilitation project.

1. Original PCC Pavements

a) All Phases of Rehabilitation

1) Concrete Pavement Restoration Techniques

A performance period of up to 14 years may be considered when Concrete Pavement Rehabilitation (CPR) techniques are selected. These techniques may be as follows:

(a) Joint and crack repair (full and partial depth) for spalling or faulting joints
(b) Diamond grinding for IRI improvement

More information for the designer concerning joint repair and diamond grinding can be obtained at the Federal Highway Administration's website at the following address: http://www.fhwa.dot.gov/pavement/guid.cfm. This page conveys links to technical guidance papers for all types of pavements, rehabilitation techniques and materials, among other pertinent information.

If reconstruction is determined to be the preferred design after a thorough field evaluation of the existing pavement and consultation with the Pavement Management System Section, then the required initial performance period shall be as described in "Section 70" of this DD for the type of pavement selected.

2) Superpave and Marshall Mix Designs

If reconstruction is determined to be the preferred design after a thorough field evaluation of the existing pavement and consultation with the Pavement Management System Section, then the required initial performance period shall be as described in "Section 70" of this DD for the type of pavement selected.

3) Concrete Overlays

The service life of a concrete overlay is up to the designer and can range from 10-40 years and is designed to provide the selected extended performance. The overlay can be either bonded or unbounded depending on the pavement condition and desired service life. More information for the designer can be obtained from the following web address:
http://www.fhwa.dot.gov/pavement/concrete

4) Asphalt pavement on rubblized PCC pavement

Asphalt pavement on rubblized PCC pavements should be designed as new, full-depth pavements. It is critical to properly assess the conditions under the concrete slabs and the uniformity of the rubblized layer to ensure the desired performance of the asphalt pavement.

2. Original Asphalt Pavements

a) All Phases of Rehabilitation

1) Superpave and Marshall Mix Designs

The asphalt overlay thickness for these types of rehabilitation projects is to be based on historic practices utilized by the West Virginia Division of Highways engineering judgment supported by a field review of the existing pavement and the past performance of asphalt overlays on similar projects, or if necessary a pavement design in accordance with this DD.

An 8 to 12 year performance period is appropriate and may be extended up to 4 years if the top 4 inches of the final pavement thickness (after the overlay is applied) has a polymer binder in the asphalt mix(s), or a large stone rut-resistant base (such as a Superpave 19 mm, 25 mm, 37.5 mm mix, or a combination of these) was used to the elevation where the surface course was applied.

If reconstruction is determined to be the preferred design after a thorough field evaluation of the existing pavement and consultation with the Pavement Management System Section, then the required initial performance period shall be as described in "Section 70" of this DD for the type of pavement selected.

2) Whitetopping (Overlaying With Concrete Pavement)

No "ultrathin" whitetopping will be permitted. Only unbonded whitetopping overlays with a 5-inch minimum thickness will be permitted.

Whitetopping overlays may be designed for a 10 to 20-year service life.

The following FHWA publication provides guidance and references for use of whitetopping on asphalt pavements: http://www.fhwa.dot.gov/pavement/concrete **.**

C. Project Design

The design strategy will be to bring the Present Serviceability Index up to near the initial value of 4.2. The design of overlays will be in accordance with methods previously outlined.

D. Project Implementation

Rehabilitation projects will be initiated on an annual program in accordance with pavement management data and the budget.

Table 1 - Pavement Design Inputs

Input	Range of Input	Recommended for West Virginia
Design Variables		
Analysis Period (Years)		(See Note 1)
Initial Performance Period (Years)	0.1 to Analysis Period	Flexible Pavement: 18 (if polymer binder used add 4 years) Rigid Pavement: 22
Traffic Variables		
Growth Rate/Year	-9.99 to 99.99%	Data from the Traffic Modeling and Analysis Unit of the Planning Division
Type of Growth Rate	Simple or Compound	Compound
Initial Yearly 18-kip ESAL's (Both Directions)		Data from the Traffic Modeling and Analysis Unit of the Planning Division
Directional Distribution Factor	1% - 100%	100% (See Note 2)
Lane Distribution Factor	1% - 100%	One Way: 1 Lane - 100%, 2 Lane - 85% Two Way: 2 Lane - 50% to 80%
Overall Standard Deviation	0.001 - 0.999	Flexible Pavement: 0.45 Rigid Pavement: 0.35
Reliability	50% - 99.99%	<3000 ADT & Low Truck Traffic: 85% 3000 - 6000 ADT: 90% >6000 ADT: 95%
In-Situ Variables		
Roadbed Swelling:		
Vertical Rise	0.00 - 99.99"	0
Probability	0 - 100%	0
Rate Constant	0 - 0.30	0
Frost Heave:		
Serviceability Loss	0 - 5	0.5
Probability	0 - 100%	100% (See Note 3)
Rate per Day	0 - 50 mm	2.5 mm (See Note 3)
Performance Criteria - Present Serviceability Index		
Initial	0 - 5.0	4.2
Terminal	0.01 - 3.99	>3000 ADT: 2.5 <3000 ADT: 2.3

Note 1: A minimum 4**0-year** *analysis period* shall be used unless the conditions for a **50-year** *analysis period* are met. These conditions are described in paragraph 4 of "Section 10" of this DD.

Note 2: The Traffic Modeling and Analysis Unit of the Planning Division has applied the Directional Distribution Factor when the traffic data is submitted.

Note 3: Use for frost-susceptible conditions. Other values are appropriate when conditions warrant.

Table 1 (Continued)

Input		Range of Input	Recommended for West Virginia
Material Properties			
Effective Roadbed Soil Resilient Modulus			Data from Materials Control, Soils, and Testing Division
Effective Modulus of Subgrade Reaction			Calculated in DARWin software
Pavement Layer Characteristics			HMA Elastic Modulus = 450,000 psi
			PCC = 4,200,000 psi
			Crushed Agg. Base Course = 36,000 psi
			Free-Draining Base = 200,000 psi
PCC Modulus of Rupture			660 psi
Flexible Pavement Layer Coefficients		Wearing Courses:	Superpave mixes 9.5, 12.5, and 19; Marshall Wearing mix 1 and 4, base mix 1: if PMA (PG 76-22) is to be used: use 0.54. (See **Note 5** below).
			All other mixes without PMA: use 0.44. (See **Note 5** below).
		Base Courses:	Superpave mixes 25 and 37.5, Marshall mix Base 1: use 0.40. (See **Note 5** below).
			Crushed Agg. Base Course: 0.14
			Free-Draining Base: 0.30 (See **Note 4**)
			Broken/Seated Concrete Pavement: Good Condition: 0.35 Poor Condition: 0.14
Pavement Structural Characteristics			
HMA Pavement:			
	Drainage	0.40 - 1.40	1.00
	Free-Draining Base	0.40 - 1.40	1.20
Rigid Pavement:			
	Drainage	0.70 - 1.25	1.00
	Free-Draining Base	0.70 - 1.25	1.20
	Load Transfer with tied shoulders	2.30 - 2.90	2.60
	Load Transfer without Tied Shoulder	2.9 - 3.2	3.20
	Loss of Support	0.00 - 3.00	0.00
Base Course Thickness			
Crushed Agg. Base Course			6.0"
Free-Draining Base Course			4.0"

Note 4: 2% Asphalt content or Type I cement with a minimum of 150 pounds per cubic yard.

Note 5: The designer may choose to evaluate the pavement condition and utilize layer coefficients found in the 1993 AASHTO Pavement Design Guide.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-647
LIFE-CYCLE COSTS ANALYSIS FOR PAVEMENT DESIGN
May 30, 2014

This Design Directive (DD) gives guidance for the Division of Highways' (DOH) policy on Life-Cycle Cost Analysis (LCCA) for pavements.

This DD provides a means to standardize the process required to analyze and report the pavement design Life-Cycle Costs throughout all development units of the DOH. The general procedure for performing the LCCA is detailed herein. References for more in-depth LCCA analyses are also given.

Attachments

10. General

The purpose of an LCCA for a particular pavement design within a defined *pavement segment* is to evaluate the overall long-term economic efficiencies of competing design alternates. Initial (construction) and discounted future (future rehabilitations, user, etc.) costs over the projected life of the pavement are added together to obtain a Net Present Value (NPV) for each *pavement type* selected. This process improves decisions concerning the utilization of limited funding for pavement in a construction project within a *pavement segment.*

20. Life-Cycle Cost Analysis (LCCA)

The WVDOH generally follows the LCCA methodology recommended in the FHWA Pavement Division's interim technical bulletin *Life-Cycle Cost Analysis in Pavement Design – in Search of Better Investment Decisio*ns, 1998. The publication number for this document is *FHWA-SA-98-079* and is available electronically at http://isddc.dot.gov/OLPFiles/FHWA/013017.pdf . It contains standard procedures for estimating and comparing the long-term costs of *asphalt* and *Plain Jointed Portland Cement Concrete* (PCC) pavements over an analysis period under specified traffic and environmental conditions. The WVDOH uses an analysis period of at least 40 years for both the asphalt and PCC pavements. See *DD-641*, *Pavement Type Selection Guide*, for more information regarding pavement type selection parameters, and *DD-646*, *Pavement Design Guide*, for information concerning the design of the pavement structure itself.

The WVDOH generally follows the FHWA's recommendations for LCCA input data unless local data is available. Local input data includes, but is not limited to, traffic characterization, duration of construction, and construction costs. It is important to note that only differential costs are considered between alternates in the LCCA.

The Life Cycle Cost Analysis, if required per DD-641, will be performed on each *pavement segment* upon receipt of necessary soils data, existing pavement cores, and traffic data.

The base bid quantities for grading will be for the thicker pavement section. The *designer* may allow a lower profile grade but hold the cross-section to avoid additional earthwork. The profile grade can be lowered by using a straight horizontal taper rate of 0.25%. This will occur at, but not be limited to, the ends of structures and at tie-ins to existing pavements. If the *designer* does not allow a lower profile grade, bid items for adjusting the grade must be added to the contract and included in the LCCA for that particular alternate; however, the contractor will not be permitted to raise the profile grade above that shown for the thickest pavement alternate. Costs common to each pavement alternate such as mobilization, signing/pavement marking, grading, drainage, rights-of-way, utility relocation, etc. are not included.

User delay costs are another important element in LCCA. Estimation of user delay costs follows the procedures in *Life-Cycle Cost Analysis in Pavement Design – In Search of Better Investment Decisions*, 1998. The user delay costs considered are the differential costs between competing alternates such as work zone costs including duration, setting traffic control, resetting traffic control for construction phasing, etc. User delay costs can differ by pavement type. The designer must carefully examine all facets of the planned work to accurately estimate user delay costs. Routine maintenance is not included in this analysis.

User costs are further divided into the *working day* and *non-working day* daily user costs. In most cases, the travel capacity of a construction zone on a *working day* is less than the capacity on a *non-working day*. For the purposes of this Directive, a *non-working day* is any day throughout the course of construction that traffic is not impeded in any way by lane/shoulder closures. User costs associated with *non-working days* are excluded from the analysis.

If the LCCA is performed on an entire *pavement segment* and the *segment* is not being fully constructed in one contract, then the result of the analysis will be pro-rated using the contract length divided by the entire *pavement segment* length. See *DD-648, Alternate Design Alternate Bidding of Pavements*, for more information on this matter.

30. Alternate Design Alternate Bid (ADAB)

The ADAB bid process is described in greater detail in *DD-648*.

40. Steps in LCCA

A standard procedure has been developed to perform the LCCA analysis. The *project manager* is responsible for the LCCA, using software that is specifically designed for use with *Life-Cycle Cost Analysis in Pavement Design – In Search of Better Investment Decisions*, 1998. The following steps are to be followed:

40.1 Project Selection

Criteria to be used for evaluating projects for inclusion in the LCCA process are described in DD-641.

40.2 Alternative Pavement Design Strategies

See DD-646 for selection of alternate design strategies and for information on the pavement design and rehabilitation process itself. The analysis period shall be at least 40 years.

The designer will develop reasonable design strategies for each alternative based on past pavement performance; that is, an initial pavement structure followed by a series of rehabilitations to cover the analysis period. The analysis period will be the same for each alternative considered.

40.3 Estimate Agency Costs

Initial agency costs of the pavement section are the construction costs incurred by the WVDOH. These are official estimates prepared by the Division’s *designer* or *project manager*. See the latest issue of DD-707, Development of Engineer’s Estimate, for more information regarding the development of the official cost estimate.

Future agency costs are the costs incurred by the WVDOH to overlay, rehabilitate, or reconstruct the roadway in the 40 year (or longer) analysis period specified. All of these future costs must be considered in the LCCA for each pavement type considered for use.

40.4 Estimate User Costs

User costs are estimated according to the recommendations made in *Life-Cycle Cost Analysis in Pavement Design – In Search of Better Investment Decisions*, 1998. As stated above, only work zone user costs are estimated in the LCCA process. Estimation of user costs requires three steps: calculate the appropriate daily user costs, determine the duration of the construction activities and apply the daily user costs to the expected duration of the construction.

Data used for computation of LCCA user delay costs will be obtained from the Traffic Engineering Division and the Planning Division. The *designer* will be responsible for compiling all the required information from these sources and running the aforementioned program.

40.5 Compute Net Present Value (NPV)

In the broadest sense, LCCA is a form of economic analysis used to evaluate the long-term economic efficiency between investment options; therefore, the NPV of cash flow is calculated.

Economic analysis focuses on the relationships between costs, timings of costs, and discount rates employed. Once all costs and their timings have been developed, future costs must be discounted to the year of initial construction (the “base year”) and added to the initial cost (the construction estimate cost) to determine the NPV for each LCCA alternate. Again, more information on the calculation and use of NPV is available in *Life-Cycle Cost Analysis in Pavement Design*, 1998. The designer is encouraged to consult this publication. Software designed from this publication will be used to determine the NPV of all cash flows.

Once completed, all LCCA's should be subjected to a sensitivity analysis. Sensitivity analysis is a technique used to determine the influence of major LCCA inputs, assumptions, projections, and estimates on the various LCCA results. In a sensitivity analysis, major input values are varied over a reasonable range of values, while all of the other variables remain constant. The input variables may then be ranked according to their effect on the results. This allows the designer to subjectively get a feel for the impact of the variability of individual inputs on overall LCCA results.

Sensitivity analyses, at a minimum, evaluate the influence of the discount rate on LCCA results. The discount rate accounts for the time value of money. It takes into account fluctuations in the inflation and interest rates to show the actual rate of increase in the value of money over time. Using the discount rate allows the designer to use today's dollars in the LCCA. The higher the discount rate, the lower the present value of future cash flows. The discount rate to be utilized in all LCCA's will be the latest effective 30-year value of *real treasury interest rates* on *treasury notes* and *bonds* of *specified maturities* as given in the United States' Office of Management and Budget's *Circular A-94*, Appendix C. A table summarizing the past history of and giving the latest years' rate is available at http://www.whitehouse.gov/omb/circulars_a094/A94_appx-c.

If the *designer* finds that any LCCA is sensitive to a particular input, then the *designer* is to perform LCCA's utilizing a reasonable range of that input, and submit these results to the Deputy State Highway Engineer-Development in the package required by DD-641.

Comments

As projects utilizing LCCA are *let to construction*, their associated unit bid prices will be monitored to determine any trends in costs. Also, salvage values will not be considered in the LCCA's.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-648
ALTERNATE DESIGN AND ALTERNATE BIDDING OF PAVEMENTS
June 15, 2010

This *design directive* (DD) gives guidance on the West Virginia Division of Highways' (WVDOH) policy on *alternate design and alternate bidding* (ADAB) of pavements.

Use of this DD provides a means to standardize the process required to utilize ADAB for pavements throughout all development units of the DOH; however, this DD does not detail the procedure for designing pavements and performing life-cycle cost analyses (LCCA), but references to publications written in detail concerning these subjects are given for the *designer's* use.

Attachments

10. General

The objective of the ADAB process is to promote more cost-effective usage of highway construction funds. This is achieved by allowing contractors to select the *pavement type* constructed through the bidding process; consequently, increasing competition as well as making that competition more equitable. The Federal Highway Administration's (FHWA) Memorandum: *Clarification of FHWA Policy for Bidding Alternate Pavement Type on the National Highway System*, November 13, 2008, can be accessed at: http://www.fhwa.dot.gov/pavement/081113.cfm.

The ADAB process requires the WVDOH to consider future roadway rehabilitation, traffic control associated with that rehabilitation, and user delay costs. The process utilizes traditional *life-cycle cost analysis* (LCCA) concepts to model the cost of pavement section alternatives over a selected performance period. The selection process is then accomplished through an ADAB procedure, which essentially allows the bidder with the lowest *life-cycle costs* (LCC) to determine which pavement type will be constructed. See DD-647, *Life-Cycle Cost Analysis of Pavements*, for more information concerning LCCA.

To accomplish the ADAB process, the "A + B + C" bidding method is utilized for all bids submitted. Factor "A" is the contractor's bid, factor "B" is the time *in days* to construct the initial pavement, and factor "C" is the *net present value* (NPV) of all future rehabilitation costs, plus the NPV of *present* and *future* user costs for the pavement's analysis period. The lowest bidder is identified by adding "A + C".

The time factor "B" is not normally added to the contractor's bid. This factor may be used on projects that consist of total pavement reconstruction in order to capture the user costs associated with the initial construction. This *time factor* is usually zero (0) because most projects are on new alignments, and traffic is not impeded during the initial construction of a project.

If a particular project is not approved by the Deputy State Highway Engineer-Development or the FHWA's *Special Experimental Projects No. 14 – Alternative Contracting* (SEP-14) for the ADAB process, then the *designer* is to consider the following to recommend a *pavement type only* for approval:

- The LCCA
- *Secondary factors* as described in DD-641, *Pavement Type Selection Guide*, Section 40
- Sound engineering judgment

If the ADAB process is approved on any particular project, the *designer* may be required to submit a request to the FHWA headquarters, through the local office, to approve the use of ADAB on a project-by-project basis under the FHWA's SEP-14.

The following FHWA website contains additional information concerning SEP-14 submittals:
www.fhwa.dot.gov/programadmin/contracts/sep_a.cfm

20. Criteria for Selection of Projects for the ADAB Procedure

Section 30 of DD-641 describes the criteria to be followed for selection of projects that will use the ADAB procedure for bidding of alternate pavement types.

30. Alternate Design and Alternate Bid (ADAB)

The ADAB bid model is accomplished by adding a factor "C" to each contractor's base bid factor "A". Factor "C" represents future rehabilitation and user delay costs for a particular pavement alternate. The implementation of ADAB, in general, may result in comparing multiple competing pavement structures with differing total thicknesses between the top of the sub-grade and the final pavement surface. A threshold of 20 percent in the difference of the NPV of the LCCA is a reasonable zone within which pavement types can compete.

In a contract in which the pavement is bid by the ADAB procedure, both the *asphalt* and the *jointed plain concrete* pavements shall be bid as a *pavement system* in square yards (sy). The *pavement system* is the entire pavement section, including fine grading, sub-grade, base and pavements. This approach allows an equal bidding process.

Note: The contract documents will include price adjustment factors for fuel, asphalt, and cement.

40. Steps in ADAB

A standard procedure has been developed to perform the ADAB analysis. This procedure has the following steps.

40.1 Project Selection

Criteria to be used for evaluating projects for inclusion in the ADAB process are described in DD-641, as mentioned in "Section 20" above.

40.2 Alternative Pavement Design Strategies

Refer to DD-641 for selection of alternate design strategies for the chosen analysis period, and DD-646, *Pavement Design Guide* for information regarding the pavement design process.

40.3 Estimate Agency Costs

Initial agency costs are the construction costs incurred by the WVDOH. These are official estimates prepared by the Division's *designer* or *project manager*. See the latest issue of DD-707, *Development of Engineer's Estimate*, for more information regarding the development of the official cost estimate.

Future agency costs are the costs incurred by the WVDOH to overlay, rehabilitate, or reconstruct the roadway in the 40 year (or longer) *analysis period* specified. All of these future costs must be considered in the LCCA for each pavement type considered for use.

40.4 Estimate User Delay Costs

See DD-647 for more information concerning computation of user delay costs.

40.5 Compute Net Present Value (NPV)

Refer to DD-647 for more information concerning computation of the NPV for each pavement alternate considered.

40.6 Analyze Results And Calculate Life-Cycle Cost Adjustment Factor "C"

After the total NPV for each alternate is computed, the results are then compared. If the difference in the total NPV between the lowest two alternates is greater than 20 percent, the alternate with the lower total NPV only is selected for bidding. The *designer* shall eliminate any pavement alternate that is considered, in the *designer's* judgment, to be impracticable for the project. Otherwise, alternate pavement designs will be included in the bidding documents and a *life-cycle cost* adjustment factor "C" will be included in the *schedule of prices* for each alternate.

The *life-cycle cost adjustment* factor, "C", is calculated as ***C = total NPV of the LCCA – construction cost.*** As part of the ADAB process, this "C" factor will be added to the contractors' bid. The lowest bidder identified by adding the "C" factor to the contractors' base bid "A" factor; thus, the lowest total is then selected.

If the LCCA is performed on an entire *pavement segment* and the *segment* is not being fully constructed in one contract, then the "C" factor will be pro-rated using the project length divided by the entire *pavement segment* length.

If the "C" factors are essentially equal (1% or less of the lowest cost initial *pavement section*) for all of the paving alternates considered, then “C” factors do not need to be added to the contractor’s bids in order to determine the low bid.

Refer to “Section 30” of this DD for information on the handling of multiple pavement types in both the LCCA and bidding processes.

50. Comments

As Projects utilizing LCCA are *let* to construction, their associated unit bid prices are monitored to determine any trends in costs. Also, salvage values are not be considered in the LCCA’s.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-650
PAVEMENT SAFETY EDGE
January 10, 2012

This Design Directive provides all designers with the West Virginia Department of Transportation (WVDOT), Division of Highways' (DOH) policy for providing a "safety edge" on all pavements meeting the required criteria.

10. General

Roadway Departure, in which a vehicle unintentionally departs its lane and either runs off the roadway, crosses the centerline or median, goes airborne, or hits a fixed object is the leading cause of fatalities on West Virginia roadways. Approximately 70% of all roadway fatalities are attributed to roadway departure in West Virginia.

Pavement edge drop-offs are a recurring problem between the pavement and the graded material that makes up the shoulder or roadside. Paved shoulders increase the chance of recovery but do not reduce the occurrence of drop offs from the shoulder to the roadside. Research has shown that even small drop-offs can create problems for drivers attempting to recover.

The Safety Edge is a simple, low cost technique that can make an edge drop-off significantly safer. The safety edge provides the driver with greater ease in returning the vehicle to the roadway, and reduction of the risk of over-steering and possible loss of control of the vehicle. With the safety edge in place, any interference in driving across any drop-off between the pavement edge and shoulder is mitigated by the slope of the safety edge, preventing tire “scrubbing” and thus providing errant drivers more opportunity to regain control of their vehicle and either avoid or lessen the severity of a crash.

20. Criteria for Use

The safety edge will be required on all NHS highway routes, and all routes designated “arterial” and “collector” in accordance with DD-601. It is to be used on both asphalt and concrete pavements unless the roadway or shoulder is curbed or is bounded by a barrier such as a single-slope barrier (usually in the median of 6-lane (or more) expressways and Interstate highways, but can be at the edge of the shoulder in certain applications). The Safety Edge is recommended for all other designated roadways in accordance with DD-601.

On overlay projects, Safety Edge is recommended if the total overlay thickness (scratch excluded) is 1.5” or greater. Safety Edge will not be placed if total overlay thickness is less than 1.5”. In addition, if overlay project involves milling and replacing in kind on mainline only (commonly referred to as “mill and fill” projects), then Safety Edge will not be utilized.

30. Design and Plan Requirements

The angle of the bevel from the slope of the pavement is critical for the safety edge to function properly. Measured from the cross slope of the pavement, the required angle ranges from 30 to 35 degrees.

For pavements with safety edge, shoulder aggregate shall be placed and maintained to the top of the pavement elevation.

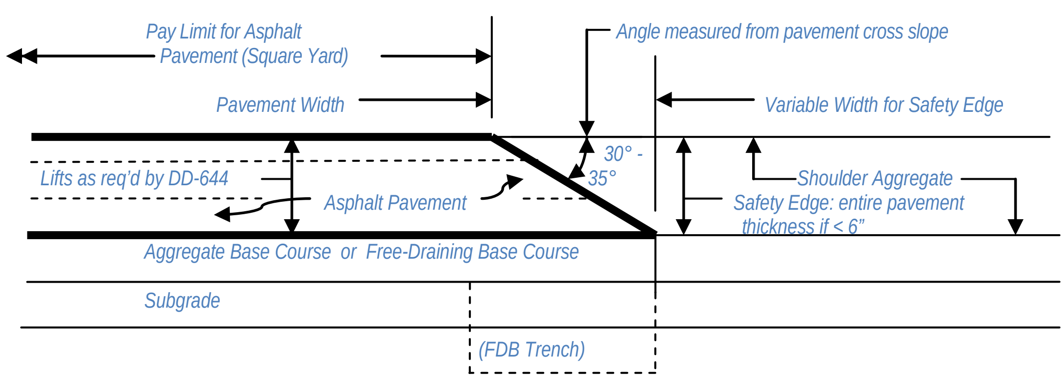
In areas where the shoulder is soft and cannot be compacted, or for other reasons it cannot provide support for the safety edge, widening of the pavement shall be provided to support the edge. Field investigations should be made to check for any condition that will not support the safety edge. However if this condition exists at locations where the shoulder is non-existent and the edge of pavement is at the top of a roadside ditchline, the outside point of the safety edge (the toe) should be placed at the original edge of pavement, with the edge stripe at the safety edge's breakpoint. The designer must use sound engineering judgment when resurfacing existing roadways regarding the location of the new edge of pavement, placement of the safety edge, and any pavement widening.

When safety edge is required, it will be detailed on the typical sections. If there are any areas where the edge is not required or cannot be placed, limiting stations will also be given.

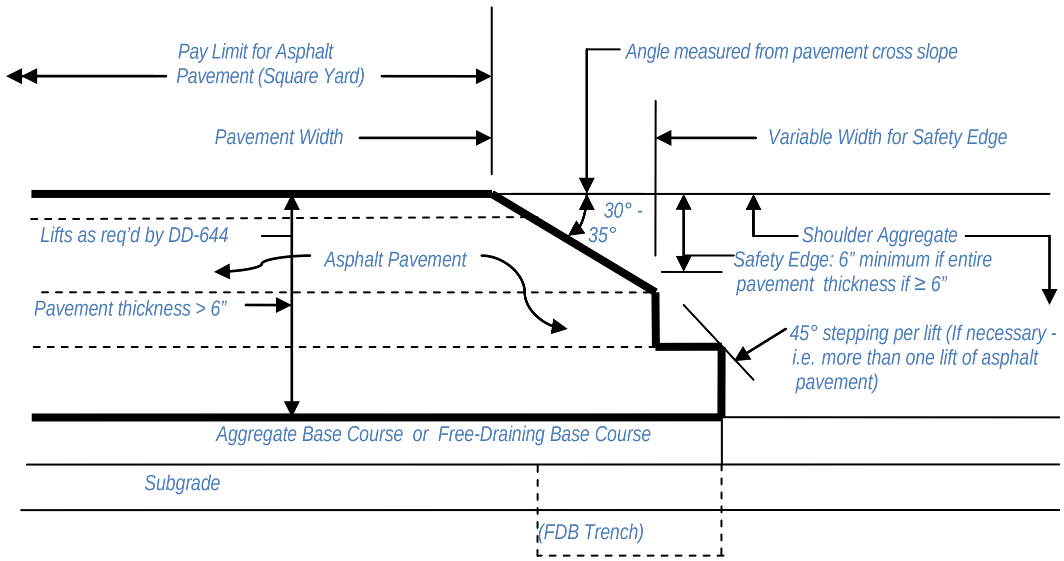
The following sketches are not to scale and represent a schematic detail for the purpose of showing configurations and dimensions only. Also, the free-draining base course trench may not be located as shown in these sketches.

A. Asphalt Pavement and Overlays

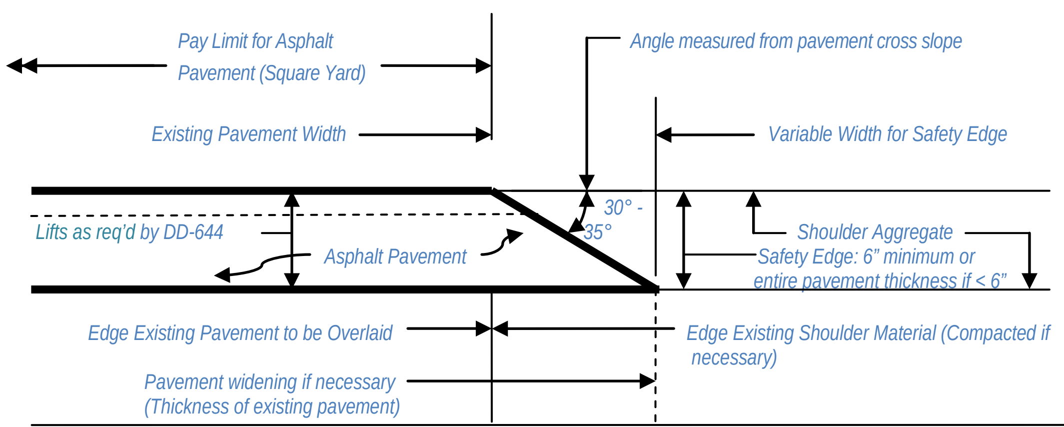
For projects bid in Tons (Megagrams) the asphalt quantity will be the actual quantity computed, including the safety edge. Note that the safety edge can be constructed on each lift of asphalt.



Safety Edge Dimensions for Asphalt Pavement (New Construction < 6" thickness)



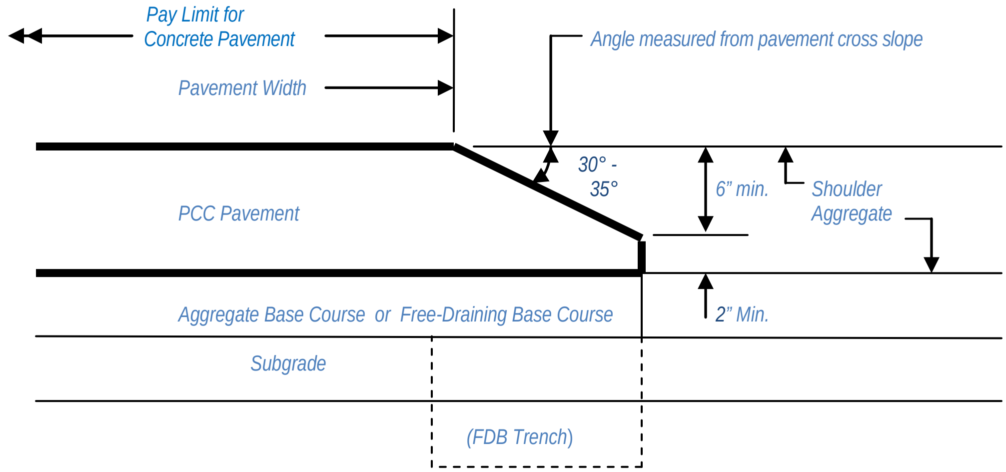
Safety Edge Dimensions for Asphalt Pavement (New Construction >/= 6" thickness)



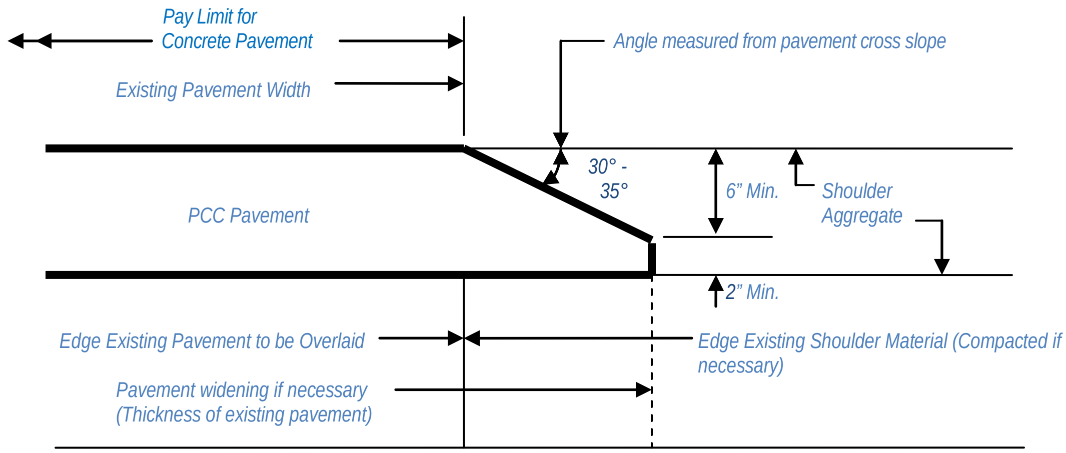
Safety Edge Dimensions for Asphalt Pavement (Overlay – for Roadways with Established Design Criteria, i.e. Interstate, APD, NHS and US Routes)

B. Concrete Pavement and Overlays

The sloped portion of the safety edge is to be 6" minimum in vertical height. To allow proper finishing by a slip-form paver, a minimum 2" vertical face is required at the bottom outside of the safety edge.



Safety Edge Dimensions for Concrete Pavement (New Construction)



Safety Edge Dimensions for Concrete Pavement Overlay – for Roadways with Established Design Criteria, i.e. Interstate, APD, NHS and US Routes)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-661
SAFETY
August 1, 2003

Reference is directed to the most current and officially adopted version of the “Roadside Design Guide” as developed by the AASHTO Task Force for Roadside Safety, published by the American Association of State Highway Transportation.

The recommendations in this publication are to be considered and incorporated where feasible in all plans. All current designs are to be critically reviewed and any features that are in conflict with this safety publication and on which compliance cannot be obtained without extensive plan revisions or a substantial increase in construction costs, are to be brought to the attention of the Director of the Engineering Division in writing with recommendations.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-662
GUARDRAIL
June 1, 2017

Attached is the West Virginia Department of Transportation, Division of Highways' policy for the type, location, and termination of guardrail on highway projects. Designers shall incorporate these requirements in all contract plans.

Attachment

GUARDRAIL DESIGN POLICY

TYPE AND CLASS OF GUARDRAIL:

Type 1 Guardrail (Galvanized Steel Deep Beam) shall be specified on all new projects except Type 5 (Double-Faced Type 1) will be specified when double-faced guardrail is required.

The "Classes" of guardrail are as follows:

Class I: 6' 3" post spacing with blocks
Class II: 12' 6" post spacing with blocks
Class III: 12' 6" post spacing without blocks
Class IV: 3' 1-1/2" post spacing without blocks
Class V: 3' 1-1/2" post spacing with blocks

On National Highway System (NHS) projects, all guardrail specified shall be Class I.

For projects not on the NHS, the class shall be in accordance with the following table, unless otherwise directed.

DESIGN YEAR ADT	Low Volume Road 399 or less	400 or Greater or Multi-Lane	
DESIGN/OPERATING SPEED*	25 MPH	Less than 40 MPH	40 MPH or Greater
CLASS	III, IV**	II, V**	I, V**

*Design speed shall be used when specifying guardrail for a new highway. The higher of Operating speed or Speed Limit shall be used when specifying guardrail for an existing highway. The operating speed shall be obtained from the Traffic Engineering Division.
** 3' 1-1/2" post spacing provides lower guardrail deflection for locations with obstacles 4' or less behind the guardrail. A minimum 25' length of Class V should be used for obstacles. Other means of reducing deflection should also be considered.

APPROACH END TERMINALS:

Under ideal circumstances, all guardrail should be terminated outside the clear zone. In most cases, this cannot be accomplished requiring the installation of an approach end terminal.

The design of approach end terminals must be done on a case-by-case basis. When specifying an approach end terminal, the designer must insure that the location at which the approach end terminal is specified provides the proper width, run out area, and cross slopes to allow proper installation of the approach end terminal.

When Class I Guardrail must be terminated within the clear zone, a Manual for Assessing Safety Hardware, latest edition, (MASH) approved approach end terminal as discussed below shall be specified. All end terminals on NHS projects to be let to construction after June 30, 2018, shall conform to the latest edition of MASH. When Class II or Class III Guardrail must be terminated in the clear zone, an approved approach end terminal need not be specified; however, the guardrail shall be flared away from traffic. The minimum width of flare should be 4'-0". This information will be shown on the plan sheet.

The clear zone can be defined as the area available for use by errant vehicles starting at the edge of the traveled way and terminating at the closest obstruction. The width of the clear zone must be established for each project based on the type of highway, operating speed, traffic volume and roadside geometry. Refer to DD-606, Non-NHS 3R Policy and Chapter 3 of the AASHTO "Roadside Design Guide", current approved edition, (RDG), for more information on determination of the clear zone.

NHS PROJECTS:

The standard approach end terminal is the Cut Slope Terminal (CST) as detailed on Standard Sheets GR4 through GR4B. If the use of a CST is not possible then the designer should use, in order of preference, a Flared End Terminal (FET) or Tangent End Terminal (TET) as detailed on Standard Sheets GR5 or GR6 respectively.

Both the CST and the FET require flared installation, as well as modifications to the normal shoulder slope in the area of the flare. The FET also requires grading behind the guardrail. In order to accommodate these installations, consideration must be given to drainage. When the treatments, especially the CST, are placed on the downstream end of a cut, an inlet and carrier pipe may be necessary to drain the cut ditch.

The TET, which does not require a flare, is currently available. Its use should be limited to cases where high traffic volumes and high speeds exist, and the above treatments are impractical or not feasible.

The TET shall have a 4'-0" minimum offset from the inside edge of the extruder terminal to the outside edge of the traveled way. For narrow existing shoulders that have an offset of 5'-0" or less from the face of rail to the edge of the traveled way, the rail and terminal may be flared from the normal face of rail. The flared offset distance shall be 1'-0" at a taper rate of 25:1 or 50:1, which yields flare lengths of 25'-0" or 50'-0" respectively.

NON-NHS PROJECTS:

The NHS criteria will be used when Class I Guardrail is specified. As previously stated when Class II or Class III Guardrail is used, an approved approach end terminal need not be specified; however, the guardrail shall be flared away from traffic. The minimum width of flare should be 4'-0". This information will be shown on the plan sheet.

3R PROJECTS:

Guardrail design for resurfacing, restoration and rehabilitation projects shall conform to the criteria previously established for NHS projects or Non-NHS projects, whichever is applicable. The following information is intended to supplement these criteria.

Guardrail design for 3R projects presents unique challenges to the designer such as limited shoulder width and limited run out area at approach end terminals. The designer should not accept the location of the existing guardrail and end terminals as being correct and simply replace them with new material. The designer’s goal should be improved safety.

The approach end terminals, as described above, shall be specified on 3R projects, if applicable, based on the class of guardrail being installed. On all NHS 3R projects, the approach end terminals in the project area shall be upgraded to a CST, FET, or TET as previously described. On all Non-NHS 3R projects requiring Class I Guardrail, NHS criteria will be used. This may require that additional work be specified such as site grading, which may require a quantity of borrow excavation, or raising the elevation of the adjacent ditch line. It may be necessary to extend the guardrail beyond the point of theoretical need in order to place the approach end terminal in a location where it can be installed in accordance with the appropriate Standard or Special Detail. The designer is encouraged to eliminate short gaps between runs of guardrail especially when the approach end terminal cannot be installed in accordance with the appropriate Standard or Special Detail. This decision would be influenced by the cost of the end terminals versus the cost of the guardrail.

On Non-NHS 3R projects where the FET or the TET is the desired end terminal, but cannot be installed in accordance with Standard Detail Sheet due to lack of run out area behind the end terminal, the following guidance shall apply:

The area immediately behind and beyond the approach end terminal should be reasonably traversable and free from fixed-object hazards to the extent practicable. If a clear run out path is not attainable, this area should at least be similar in character to upstream unshielded roadside areas.

Ownership and storage location of any guardrail removed and stored (Item 607010) will be indicated in the plans by a General Note.

SPECIAL TRAILING END TERMINALS:

The Special Trailing End Terminal (STET) shall be specified when Class I Guardrail is specified; and, the guardrail is outside the clear zone of the opposing traffic. Generally, this will be on divided highways.

When the guardrail is not located outside the clear zone of the opposing traffic, it shall be designed as an approach end. The guidelines as mentioned in the Approach End Terminals Section are to be followed.

BRIDGE TRANSITIONS:

When the bridge shoulder width is less than the roadway shoulder width, a transition in the guardrail on the approach end and trailing end of the bridge is required. These transitions should occur on 15:1 straight tapers. There shall be a minimum of 12'-6" of standard guardrail between the bridge transition guardrail and the tapered guardrail.

BRIDGE TRANSITIONS – CONNECTIONS:

The Thrie-Beam Guardrail Bridge Transition-Connection Detail, as shown on Standard Sheet GR11, is to be used on all new projects when transitioning approach end guardrail to a concrete shape. New bridges will have a vertical concrete face as detailed in the plans.

Existing bridges that do not have the proper vertical concrete endpost, as shown on Standard Detail Sheet GR11, will require the installation of the Modified Concrete Endpost. Special Detail Sheets for the Modified Concrete Endpost can be obtained from the Engineering Division.

Guardrail that must tie to new or existing bridges that have steel guardrail parapets rather than concrete parapets shall tie directly to the steel guardrail parapet.

The post spacing of the approach guardrail shall be equal to or less than the post spacing of the guardrail on the bridge. If the post spacing of the approach guardrail is greater than the post spacing of the bridge guardrail, the post spacing of the approach guardrail shall be decreased by one-half every twenty-five feet until the post spacing of the approach guardrail and the bridge guardrail are equal.

THEORETICAL POINT OF NEED, WARRANTS, AND LENGTH OF NEED:

The best available guide for guardrail theoretical point of need determination and warrants is the RDG. It shall be used on all projects.

An assumed encroachment angle for a vehicle leaving the highway will be used for length of need determination in lieu of the run-out lengths as shown in the RDG. When a vehicle is approaching the obstacle, this angle will be 8 degrees for NHS projects and 15 degrees for Non-NHS projects. When the trailing end is being considered, this angle will be 15 degrees for all projects. The use of these angles should be limited to tangent or near tangent sections of roadway. Scaling as demonstrated in Section 5.6.4 and Figure 5-48 of the RDG should be used in other cases. Results shall be documented in the project files.

The designer is cautioned to fully investigate each guardrail/end treatment installation to assure that the runout area is free of obstacles, including cut or fill slopes, and is traversable. The guardrail/end treatment installation may have to be lengthened to protect secondary obstacles behind the installation. See Section 8.3.3.3 of the RDG for more information.

GUARDRAIL LOCATION IN RELATION TO THE SHOULDER SLOPE (P.I.):

On new designs where Class I or Class II Guardrail is specified, the P.I. shall be offset 1'-0" from the back of the guardrail post. The post will be between the P.I. and the edge of pavement.

On new designs where the typical has not been set and Class III Guardrail is specified, the P.I. shall be offset 2'-0" from the face of the guardrail. The guardrail will be between the P.I. and the edge of pavement.

GUARDRAIL LOCATION - 3R PROJECTS:

On Interstate and APD 3R projects, the guardrail offset from edge of pavement shall be as originally constructed.

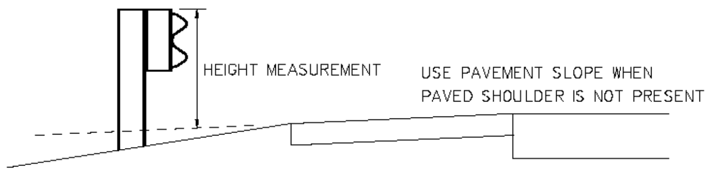
On all other 3R projects, the back of the guardrail post shall preferably be set at 1'-0" from the P.I. If this results in restricting the usable shoulder width, 8'-0" long posts shall be specified and the guardrail shall be placed at its prior location.

GUARDRAIL HEIGHT:

In accordance with the revised standard details regarding guardrail height, all new guardrail shall be 2’-1” to center of the W-beam section (31” to top of rail), per the following guidelines:

- Existing guardrail and end treatments with no other deficiencies are acceptable at current height.
- New installations and replacement sections, that do not tie to existing guardrail shall be 31” height.
- New installations, replacement sections, or remove and reset sections that tie to existing guardrail will generally be “in kind” with regard to height. Guardrail height will taper as necessary to existing elements per standard details.
- The Roadside Design Guide, currently adopted edition, shall be used to determine disposition of existing guardrail with regard to height for remove and reset sections on overlay and 3R projects. For these projects, guardrail having a top-of-rail height of 26 ½” or higher (AFTER the overlay is placed) may remain as is.
- The above guidelines generally apply to end treatments, with the following notes:

Special Trailing End Terminal is acceptable at both 28-1/2” and 31” height.
Approach Terminals – Use Approved Product List for each height. Separate lists will be maintained for both 28-1/2” and 31” height.
CST Terminal – Transition guardrail down to 28-1/2” height before terminal.



GUARDRAIL HEIGHT DETERMINATION

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-663
CURB
September 21, 2012

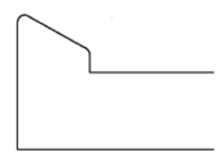
Type and location of curbs affect driver behavior which affects the safety and utility of a highway. Curbs are used to control drainage, delineate pavement edge, reduce right-of-way requirements, improve aesthetics, reduce maintenance operations, and/or assist in orderly roadside development.

The Standard Details Book, Volume 1, details four types of curbing. When curbing is necessary, the following guidelines will be used for type selection.

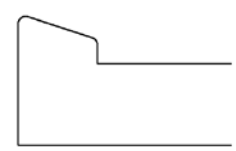
1. Type I curbing (6” face) should be used in urban conditions for design speeds up to and including 25 MPH.

2. Type II curbing (2” face, 6” back) should be specified for design speeds

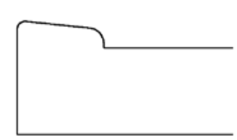
   - less than 45 MPH in rural conditions
   - above 25 MPH and less than 45 MPH in urban conditions.



3. Type III curbing (2” face, 4” back) will be specified for design speeds 45 MPH and greater.



4. Type IV curbing (2” face) will be specified when driveways and approaches intersect Types I, II, or III curbing.



Caution should be exercised in the use of curbs on rural highways. Curbs should be omitted on rural highways when the same objective can be attained by other acceptable means. In general, curb is not desirable on high speed roadways, If curbing must be used, only Type III will be specified for design speeds 45 MPH and greater.

When obstructions exist behind curbs, a minimum lateral offset of 3 ft should be provided beyond the face of the curb to the obstruction at intersections and driveway openings. A minimum lateral offset of 1.5 ft should be used elsewhere. This lateral offset should not be construed as a clear zone distance. New construction should provide the suggested clear zone distances. Values above are more applicable to existing facilities.

The general use of any curb/guardrail combination should be discouraged at locations where high-speed, high-angle impact are likely. Where no feasible alternative to this combination exists, use a Type III curb with a modification to stiffen the guardrail thereby reducing deflection. Methods to improve performance may include bolting a W-beam to the back of the posts, reducing post spacing, nesting the rail, or adding a rubrail. The following table shall be used for curb/guardrail combination placement.

Curb	Type I	Type II	Type III	Type III
Design Speed		0-<45 mph	45-50 mph	> 50 mph
Guardrail Location with Respect to Curb	Not Recommended with Guardrail	Flush or ≥8' Behind	Flush or ≥ 13' Behind	Flush

Guardrail Placement with Curb

Distances are from Face of Curb to Face of Guardrail

Curb should be placed no closer than the outer edge of shoulder when used on freeways or other high speed arterials. For low speed street conditions, curb may be placed at the edge of a through lane, although a 1' or 2' offset is preferred.

For 3R and retrofit type projects not currently meeting the above requirements, efforts will be made to comply with the above requirements. For example, if there is an existing 8" curb and a 4" pavement overlay is to be provided, no additional work will be required since the end result is a 4" curb.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-664
MEDIAN BARRIER WARRANTS
June 25, 2015

Reference is directed to the most current and officially adopted version of the "Roadside Design Guide" (RDG) as developed by the AASHTO Task Force for Roadside Safety, published by the American Association of State Highway Transportation Officials, chapter on Median Barrier Warrants.

The Median Barrier Warrants for Freeways and Expressways, as shown in the RDG, consider only median widths and average daily traffic as warrants for median barriers. Other factors should be considered when making the decision on specifying a median barrier, such as but not limited to the following:

a) Accident data, including crossover crash rates
b) Cost
c) Median Width
d) Median Slopes
e) Traffic Volumes
f) Vehicle Types
g) Horizontal and Vertical Geometry

The Median Barrier Warrants for Freeways and Expressways, as shown in the RDG, were developed for full access control highways. Use of median barriers on partially controlled access roadways is more complex and requires additional engineering analysis and judgment with respect to the following factors.

a) Sight Distance at intersections
b) Number of intersections and driveways
c) Right of way constraints
d) Barrier terminals

Use of median barriers for conditions outside those specified in the RDG shall be approved by Deputy State Highway Engineer Development.

The following median barrier selection form should be used to aid in selection and documentation of final decision. The selection form is to be included in the PS&E package and included with request for approval.

Median Barrier Selection Criteria

	Project:
	Date:
	By:

Description	Value or Narrative
Full and Partial Access Control	
ADT, % Trucks	
Accident Data	
Crossover Rate	
Median Width(s)	
Median Slopes	
Vehicle Classification	
Horizontal Geometry	
Vertical Geometry / Grades	
Median U-Turns	
Other Factors	
Partial Access Control	
Intersection Sight Distance	
Number of Intersections	
Number of Driveways	
Right of Way Contraints	
Barrier Terminals	
Other Factors	
Proposed Barrier / Justification	

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE - 665
CABLE BARRIER DESIGN
November 15, 2018
SUPERSEDES January 25, 2013

DESIGN CRITERIA:

Cable barrier design shall be in accordance with *NCHRP Report 711, "Guidance for the Selection, Use, and Maintenance of Cable Barrier Systems"*, and in accordance with the currently adopted AASHTO Roadside Design Guide and A Policy on Geometric Design of Highways and Streets.

LOCATION:

The WVDOH uses cable barrier to help reduce or lessen the severity of roadway departures to the median on divided highways. The Traffic Engineering Division shall make the final determination on locations to install cable barrier based on the following criteria:

1. On roadways with higher than normal crossover accident rates.
2. On divided highways with 40' or greater median widths (measured from edge of travel way to edge of travel way).
3. Cost estimates with applicable alternates considered.
4. Engineering judgment based on criteria in NCHRP Report 711.

DESIGN:

The Division's requirements for cable barrier are listed below:

1. The system shall be a high-tension cable barrier meeting the NCHRP 350 or MASH criteria at Test Level 3 (TL 3).
2. The system shall be a tested 4-cable system meeting TL 3 on a slope of 6:1 or steeper.
3. Have a maximum 10.5' post spacing.
4. Have socketed posts set in concrete footings.
5. Have concrete mow strips.
6. Have line post and end terminal foundations designed per individual soil conditions.
7. Soil condition information is to be provided by the WVDOH in the contract plans.
8. Specifications shall require swage connections. Open wedge connections will

not be allowed.

9. The designer is required to coordinate with the Engineering Division and the Traffic Engineering Division in the placement of cable barrier or other barrier(s) to shield obstructions in the median.

SLOPES:

Per NCHRP Report 711 cable barrier on slopes as steep as 4:1 is allowable, but not preferable. Better performance is achieved on slopes of 6:1 or flatter. Therefore, the WVDOH strongly prefers cable barrier be placed on slopes no steeper than 6:1. At a minimum, existing slopes should be spot checked in the field to verify compliance.

When embankment is added to existing slopes to flatten to 6:1, the design and specifications need to consider proper drainage and fill compaction. Saturated or poorly compacted material negatively affects the installation and performance of cable barrier post foundations.

COST ESTIMATES:

On existing roadways with slopes steeper than 6:1, a cost comparison of alternate designs shall be investigated with other factors, such as safety, being fully considered. As a minimum, the following alternates should be evaluated:

1. Cable barrier placed on existing slopes. Note that separate runs of cable barrier on each side of the median may be required or considered.
2. Flattening slopes to 6:1 typically requires raising inlets, addressing free draining base outlet slope walls and other drainage costs including erosion and sedimentation control.
3. Class I or Class V, W-beam guardrail.
4. Concrete median barrier.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-681
WORK ZONE SAFETY AND MOBILITY
June 13, 2014

The West Virginia Division of Highways (WVDOH) is committed to providing a safe and efficient work zone environment. It is the Division's goal to minimize traffic delays to the traveling public, reduce work zone crashes and fatalities, and to promote a safe work place by improving mobility of the motorist and providing the utmost protection of the construction work force.

Compliance with this policy will benefit the traveling public, construction industry, and the business community by reducing work zone accidents, construction, and travel time.

The attached policy outlines procedures to be followed during all phases of development and construction or maintenance. It also assigns responsibilities for implementation to fulfill its requirements.

The requirements of this policy apply to all highway projects, regardless of the funding source.

Attachment

Background

The Federal Highway Administration (FHWA) published the Final Rule on Work Zone Safety and Mobility, 23 CFR 630 Subpart J in September 2004. This rule, referred to as Work Zone Safety and Mobility, applies to State and local governments that receive Federal-aid highway funding. All transportation agencies are required to comply with the provisions of the Rule by October 12, 2007. This rule updates and broadens the former regulation, "Traffic in Highway and Street Work Zones," to address present and future work zone issues.

The final rule requires agencies to:

- Implement a policy that facilitates systematic consideration of work zone safety and mobility on all Federal-aid highway projects. Implementing the policy for non-Federal-aid highway projects is also encouraged.
- Develop procedures to assess and manage work zone impacts throughout the various stages of the project's development and construction. The agency must consider work zone impacts during project development, manage work zone impacts during construction, and assess work zone performance after implementation.
- Use work zone data to manage work zone impacts for specific projects and to improve the State processes and procedures.
- Ensure personnel are trained appropriately to the work zone job decisions for which they are responsible.
- Perform process reviews at intervals no greater than two years.

The final rule also requires each agency to identify significant projects as early as possible and provide Traffic Management Plans (TMP) with strategies in accordance with the complexity of the project. The Plans, Specifications and Estimate are required to include pay items for the TMP.

Additional information on the Final Rule on Work Zone Safety and Mobility is available at: http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm.

Classification of Projects

Significant Project

A significant project is one that, alone or in combination with other concurrent projects nearby is anticipated to cause sustained work zone impacts that are greater than what is considered tolerable based on this policy and/or engineering judgment. Work zone impacts refer to work zone-induced deviations from the normal range of transportation system safety and mobility. The extent of the work zone impacts may vary based on factors such as, functional classification, area type (urban, rural), traffic and travel characteristics, type of work being performed, time of day/night, and complexity of the project. These impacts may extend beyond the physical location of the work zone itself, and may occur on the roadway on which the work is being performed, as well as on other highway corridors and other modes of transportation.

The WVDOH shall identify upcoming projects that are expected to be significant. A significant project shall be identified at the Project Programming stage and re-evaluated periodically throughout to the project development and delivery process. For full oversight projects, the determination of significance should be made in cooperation with the FHWA. The State's work zone policy provisions, the project's characteristics, and the magnitude and extent of the anticipated work zone impacts should be considered when determining whether a project is significant or not.

All Interstate or Expressway projects that have an ADT greater than or equal to 25,000 or projects on other state highway routes that have an ADT greater than or equal to 15,000 and that occupy a location for more than three days with either intermittent or continuous lane closures will be considered significant. Exceptions for NHS significant projects may be granted from the FHWA. Exceptions on non-NHS significant projects may be granted from the State Highway Engineer. Exceptions to these criteria will be granted based on ability to show that the specific project does not have sustained work zone impacts.

Project Levels

Depending on the complexity of the project, it will be assigned a classification of transportation management plan Level I, II or III, which determines the TMP requirements for the project. Any project identified as a significant project is a Level III project. Level II projects are those with a moderate level of construction activity with the primary traffic impact limited to the roadway containing the work zone. Level I projects are those with low complexity and may include simple construction projects, maintenance or utility work. Further information on these levels and the TMP requirements and recommendations associated with each is provided under "Plan Requirements" section of this policy.

Transportation Management Plans and Work Zone Management Strategies

The *Transportation Management Plan (TMP*) provides strategies to manage the work zone impacts of a project. At a minimum, the TMP includes a Temporary Traffic Control Plan (TTC). A Public Information (PI) component and a Transportation Operations (TO) component may also be included depending on the anticipated impacts. The overall success of a TMP must first be initiated early in the design process and developed throughout the design and delivery of the project.

The *Temporary Traffic Control plan (TTC)* describes Temporary Traffic Control measures to be used for facilitating the road user's passage through a work zone or an incident area. The TTC plan should be consistent with WVDOH policies, guidelines, and standards as described in this policy and in the "Manual on Temporary Traffic Control for Streets and Highways", 2006 Edition. TTC Strategies include:

- Control Strategies
- Traffic Control Devices
- Project Coordination, contracting and innovative construction strategies

The *Public Information (PI)* component of the TMP should include communication strategies that seek to inform all affected stakeholders about the project, the expected work zone impacts, and the changing conditions of the project. The scope of the PI component should be determined by the level of the project as set forth in this document. PI Strategies include:

- Public Awareness Strategies
- Motorist Information Strategies

The *Transportation Operations (TO)* component of the TMP should include the identification of strategies that will be used to mitigate impacts of the work zone on the operation and management of the transportation system within the impact area. TO Strategies include:

- Demand Management Strategies
- Corridor/Network Management Strategies
- Work Zone Management Strategies
- Traffic/Incident Management Strategies

Various work zone management strategies may be employed to minimize traffic delays, increase traveler and worker safety, and complete the work in a timely manner while maintaining access for businesses and residents. The strategies listed above are not meant to be all-inclusive, but to present a number of suggestions for consideration while developing TMPs. For a more extensive listing and general information on work zone management strategies refer to Appendix A of this directive.

The plans, specifications, and estimates shall include the TMP and appropriate individual pay items. Additional guidelines for development and implementation of TMPs can be found in the "TMP Guidelines" section of this policy.

Training

All WVDOH personnel will be trained in temporary traffic control design, deployment, operation, and maintenance consistent with the level of their responsibility. Individuals may gain this training through either division provided courses or outside sources. The Development, Construction, and Operations Divisions shall each work with the Training Section of Personnel to develop training programs for Central Office and District Staff in their organization. Guidelines for who should be trained and suggested courses are included in Appendix B of this directive.

Stakeholders and Public Information

Highway improvements and the work zones to implement them are intended for the benefit of the traveling public. WV DOH personnel will work with appropriate stakeholders at every stage of projects to develop work zone strategies and keep them informed. Detailed information on stakeholders is included in Appendix C of this directive.

In addition to the work zone specific Public Information activities, the WVDOH provides general work zone information to the public through various outlets. These include, among other things, publication of a statewide work zone map and work zone driving safety tips, posting of current work zone locations and conditions to the internet, promotion of Work Zone Safety Awareness Week, and advertisement of work zone related messages via radio, television, and billboards. Through these efforts, WVDOH positively promotes work zone safety and mobility, as motorists gain access to information they need to plan their trips and become more work zone conscious.

Transportation Management Plan Guidelines

This section provides guidelines for developing and implementing project TMPs. These guidelines shall also be in compliance with the most recent version of The West Virginia Division of Highways Design Directives (DD). These plans will enhance our accountability and ensure that all options have been considered during the project development process as described in DD-200. These guidelines are to be used by Project Managers, Roadway and Bridge Designers, Traffic Engineers, Planning and Research Engineers, Maintenance Engineers, and all Districts within the Division of Highways responsible for acquiring the information to develop Transportation Management Plans. The FHWA Area Engineer shall be involved in each step of the project's review process on full federal oversight projects. These guidelines require the evaluation of work zone traffic control and communication strategies during the project development process and during all phases of construction. All Temporary Traffic Control Plans shall be in compliance with the information published in the "Manual on Temporary Traffic Control for Streets and Highways, Latest Edition." Any deviations from the Manual shall be approved by the Traffic Engineering Division and noted in the plans and project file.

Initial Engineering – Identify potential work zone impacts using field observations, review of available crash data, and other relevant operational information. Determine preliminary work zone management strategies in conjunction with alternative project options and design schemes. Identify other coordination issues such as utilities, enforcement, and community impacts.

Relevant operational information should include but is not limited to, project definition (scope, project level of complexity, roadway and traffic characteristics, and TMP category), construction phasing/staging of equipment and materials, as well as temporary traffic control, public communications and transportation operations strategies. Acquire traffic and crash data, develop a preliminary public information plan, and explore possible alternate/detour routes. A preliminary cost estimate for the projects transportation management plan shall be developed during this phase of the Project Development in accordance with DD-200 and DD-202.

Preliminary Engineering – Assess impacts of various work zone management alternatives. Consider design, construction, contracting and transportation management options. Select appropriate strategies. Develop TMP, including appropriate items in plans, specifications, and estimates for the project.

Public Information Meeting – Review the Preliminary TMP as incorporated by the Roadway Designer (includes Temporary Traffic Control Plan, Public Information Plan, and Transportation Operations Plan, as required) in accordance with DD-201.

Pre-Bid Conference – Complete the significant projects final TMP for review in accordance with DD-104 and include in pre-bid conference discussion.

Construction – Inspect the work zone during the first week of each phase of construction (Project Engineer, District Traffic Engineer, and Contractor) to ensure the compliance with the TMP and monitor safety and operation. Consult appropriate stakeholders to evaluate strategy performance and keep them informed. Review the TMP as needed to improve the work zone performance.

Any required changes to the TMP to enhance the work zone's safety and mobility shall be approved by the Traffic Engineering Division. All such changes shall be documented and, if the project is a full federal oversight project, should be reviewed with an FHWA Area Engineer. An on-site review of the project's work zone traffic control by the Project Engineer, District Traffic Engineer, Contractor, and a representative from the Traffic Engineering Division's Safety, Planning, and Analysis Section shall be conducted within 48 hours of any fatal incident/crash within the work zone.

Report all fatal crashes that occur within the limits or that may be work zone related to the Traffic Safety, Planning & Analysis Section of the Traffic Engineering Division.

Transportation Management Plan Evaluation – For significant projects, a review of the effectiveness of the project's TMP shall be completed during a Post Construction meeting and included with the Post Construction Report. A copy of the specific information on the effectiveness of the TMP will be forwarded to the Central Office Traffic Engineering Division's Design and Operations Sections for review.

Roles and Responsibilities

The following guidance is provided to ensure that each member of the project development process understands their role and responsibilities in the development of the project's TMP. Individuals noted below shall have direct responsibilities for the proper development of the TMP during the Plan Development Process.

Engineering Division

Shall ensure the proper design and presentation of all aspects of the TMP by providing the following detailed information in the plan development:

- Profile, alignment, superelevation and lane widths for all traffic lanes, turning lanes, lane shifts and detour routes not identified on existing roadways
- Earthwork/grading that must be completed prior to the next construction phase
- Utility work that can be completed within the project's guidelines for the TMP
- Identify all temporary pavement locations and temporary drainage items
- Illustrate the placement of all temporary signs, messages boards, electric arrows, devices, barriers, attenuators, temporary pavement markings and markers in the temporary traffic control plans for all construction phases (excluding temporary lane and shoulder closings) for Traffic Engineering Division's information and review.
- Identify and note all signal timing within the work zone and all detour routes
- Complete TMP cross sections
- Complete special design details and insert sheets
- Movement and staging of equipment and materials
- Need and placement of temporary bridge parapet and traffic barriers
- Need for the setting of beams over traffic
- Use of temporary bridges
- Need for demolition over traffic
- All temporary/permanent easements needed for construction are included in the plans
- Ensure that all utilities will not conflict with temporary traffic control and other safety devices for all phases of construction.

Traffic Engineering Division

Shall ensure the safety of the construction workers and the safe movement of traffic through the project's work zone by providing the Project Manager with the following recommendations, and verifying that the applicable information is included in the project's TMP:

- Lane width(s)
- Number of recommended traffic lane and turning lanes
- Provide existing pavement markings
- On-site and off-site detour routes
- Identify and provide all signal phasing within the work zone and all detour routes
- Requirements on the use of barriers, devices, and attenuators, etc
- Type and placement of all signs, message boards, electric arrows, etc
- Type and location of pavement markings and markers for each phase
- Time of day, weekend, and holiday restrictions
- Access to all businesses and private dwellings
- Transportation operations recommendations
- Perform assessment of the Work Zone Traffic Impact
- Perform annual work zone review.

Programming Division

- Program project funding from Federal and State balances
- Coordinate schedules between adjacent or nearby projects to mitigate conflicts

Planning Division

- Collect and maintain traffic volume data as necessary for the project area
- Using information provided by the project manager, identify and report significant project
- Review appropriate PS&E items for level of anticipated TMP in projects.

Maintenance Division

- Monitor maintenance operations with ongoing projects and be compliant with the WVDOH Permitted Lane Closure Map to ensure statewide uniformity
- Coordinate district level maintenance projects with ongoing projects
- Provide assistance to field maintenance organizations during emergencies.
- Ensure that appropriate staff are trained at the project level who has the primary responsibility, with sufficient authority, for implementing the TMP and other safety and mobility aspects of the project.

Office of Communications

Ensure that the transportation management plan is communicated to appropriate key stakeholders (motorists, police, businesses, schools, emergency service providers, residents, elected officials and media). Strategies will include:

- Developing a project-specific communications plan to keep key stakeholders informed about construction-related impacts before and during construction
- Communicating and promoting ways that users can avoid construction-related delays
- Developing an emergency communications plan which outlines steps to be taken during a major incident and includes emergency contact information
- Determine the need and types of community meetings needed to inform the public on the various aspects of the construction project
- Continuously update the WVDOH “projects under construction” webpage to alert motorists of such projects and available alternate routes.

District Engineers/Managers

Ensure the appropriate district staff shall implement the transportation management plan as set forth in this document. The key responsibilities include:

- Designate appropriate staff to review work zone traffic control during first week of each new phase of construction for all significant projects and identify areas of need for improvement

- Designate appropriate staff to monitor locations of projects and recommend change in TMP if needed due to proximity of projects
- Coordinate with other districts when lane closures or projects are affected by other lane closures or projects across district boundaries
- Ensure lane closures for all projects are in compliance with the Permitted Lane Closure Map
- Coordinate short-term maintenance activities with existing projects of a longer duration
- Designate appropriate staff to participate in work zone fatal crash accident reviews and gather any needed information from the accident in a timely fashion
- Ensure that appropriate staff are trained at the project level, and who has the primary responsibility, with sufficient authority, for implementing the TMP and other safety and mobility aspects of the project.

Contractor – Responsibilities of the contractor include:

- Designating a certified trained person at the project level who has the primary responsibility, with sufficient authority, for implementing the TMP and other safety and mobility aspects of the project
- Ensure that all contractor personnel are trained in traffic control to a level consistent with each of their responsibilities
- Advising the Project Engineer, as required, at least two working days before any work requiring a lane closure begins
- Working with the Project Engineer to ensure all lane closures are minimized
- Ensuring work zones are neat, orderly and effective for the safety of highway workers and motorists
- Minimizing delay and disruption experienced during construction
- Performing quality control of work zones to promote consistency and ensure compliance with contract documents, policies, and guidelines
- Recommend traffic control improvements to the Project Engineer to address field conditions pertaining to traffic flow, visibility, and worker and motorist safety.

Work Zone Fatal Crash Review -- A Fatal Crash Review Team may investigate all fatal traffic crashes that are work zone related. The team will be comprised of the following personnel: District Construction (or Maintenance) Engineer (or representative), Project (or Maintenance) Supervisor, Claims Investigator, District Safety Officer, District Traffic Engineer/Technician, Traffic Engineering Division Representative, and FHWA representative. The team's responsibilities include to conduct a review of work zone, field documentation, any modifications made to the Traffic Control Plan, the crash report (if available), and develop any recommendations as appropriate.

Work Zone Review Team – The Work Zone Review Team will consist of representatives from Central Office, District, FHWA, and may consist of stakeholders. Responsibilities of the review team:

- Conduct annual reviews of work zone planning, design, implementation, management, and operation in multiple districts to ensure compliance with this policy

- Identify and document strengths and weaknesses observed during the review
- Communicate findings and recommendations to WVDOH management and personnel

Plan Requirements

This section provides guidance to Central Office and District Personnel for establishing a project's TMP requirements based on the project's level of complexity. These guidelines categorize a project into three types of transportation management. The project's level identifies the minimum TMP requirements and recommendations to be used by personnel responsible for the development and implementation for of a project. In general, the TMP shall consist of a temporary traffic control plan and as required, public information and a transportation operations plan. The specific project level requirements for plan content are listed below:

Level I

- Typical Projects: Minimum plan, Single Phase Construction, Maintenance projects, Utility and Work done under Permit
- Project Type: Simple Project – widening of pavement, adding turn lanes or entrances. Sequence consists of temporary lane closures and flagging operations with no shifting of traffic onto temporary pavement and with two-way traffic operation maintained at all times or at new construction locations with no existing traffic.
- Impact on Traffic: All lane closures and time restrictions will comply with the WVDOH Permitted Lane Closure Map
- Major Components:
- Temporary Traffic Control Plan – Major components will consist of General Notes, Typical Sections, and if needed, special details. (This information may be presented as in a narrative format with illustrations/sketches as necessary):
    - General Notes:
        - Identify the work zone location
        - Identify the length and width of the work zone
        - Identify the lanes affected by the project work
        - Note the hours the work zone will be active
        - Identify potential location(s), with the R/W, for construction equipment and material storage
        - Define the proposed traffic control by referencing the specific case(s) in the Manual on Temporary Traffic Control for Streets and Highways, Latest Edition
        - Note any entrances, intersections or pedestrian access points that will be affected by the work zone or by the traffic control devices

    - Typical Sections:
        - Illustrate lane configuration(s) in the work zone

    - Special Details:
        - Show schematically the placement of all traffic control devices

        - Place all traffic control devices and follow symbol conventions for identifying traffic control devices in accordance with the standards in the Manual on Temporary Traffic Control for Streets and Highways, Latest Edition, in the plans
        - Show all details, dimensions and explanatory notes required to execute the traffic control plan

- Public Information Plan – A public information plan is recommended for a roadway when the traffic volumes exceed the allowable ADT and the time of closure is established by the permitted lane closure maps. The public information plan shall provide the following information (this information may be presented in the project plans as part of the Temporary Traffic Control plan in a narrative format):
    - A process to notify the media, District Engineer and staff of scheduled work plans and traffic delays.

- Transportation Operations Plan – A Transportation Operations Plan is recommended when the work zone is greater than ½ mile in length and/or travel lane(s) are reduced. The transportation operations plan shall provide the following information (this information below is minimum requirements and should be presented in the project plans as part of the Temporary Traffic Control Plans in a narrative format):

    - A contact list of local emergency response agencies
    - A process to notify the District Engineer and staff, Traffic Engineering Division, and stakeholders of any incidents and expected traffic delays
    - Procedures to clear the incident and restore normal project traffic operations
    - Details of the process to review incidents for the purpose of modifying the Temporary Traffic Control Plan to reduce the frequency and severity of such incidents.
        - Submit a detour contingency plan, if approved by project manager/designer.

Level II

- Typical Projects: Moderate level of construction activity with the primary traffic impact limited to the roadway containing the work zone.
- Project Type: Moderately Complex Project – widening of pavement and bridges, additional thru lanes and pavement rehabilitation. Sequence consists of lane closures in one or both directions with shifting of traffic that may include temporary pavement or detours for the duration of the work.
- Impact on Traffic:
    - All lane closures and time restrictions will comply with the WVDOH Permitted Lane Closure Map.
- Major Components:
    - Temporary Traffic Control Plan – Major components shall consist of General Notes, Typical Sections, Detail Plans, and if needed, special details. Each

component shall provide the following information per construction phase. This information shall be placed on a coordinated plan sheet. (This information may be presented as in a narrative format with illustrations/sketches as necessary):

- Detail Plans which include all information listed under Level One Projects plus (this information shall be regarded as a minimum) :
  - Narrative describing the Sequence of Construction
  - Type and location of all temporary signs for the work zone and all detour routes
  - Type and location of all temporary pavement markings
  - Type and location of all temporary pavement
  - Type and location of all temporary barrier
  - Type and location of all impact attenuator/end treatments
  - A list of calendar dates for Holidays and any special event(s) within project time frame
  - Identify potential location(s), with the R/W, for construction equipment and material storage
  - Define the proposed temporary traffic control plan by referencing the specific case(s) in the Manual on Temporary Traffic Control for Streets and Highways, Latest Edition.
  - Note any entrances, intersections or pedestrian access points that will be affected by the work zone or by the traffic control devices

- Typical Sections shall contain all the information listed for Level One Projects

- Special Details/Cross Sections/ Profiles shall contain all the information listed for Category One Projects.

- Public Information Plan – A public information plan is recommended for a roadway when the traffic volumes exceed the allowable ADT and the time of closure is established by the permitted lane closure maps. The public information plan shall provide the following information (this information may be presented in the project plans as part of the Temporary Traffic Control plan in a narrative format):
  - All information listed under Level One Projects.

- Transportation Operations Plan – A Transportation Operations Plan is recommended when the work zone is greater than ½ mile in length and/or reduced travel lane(s). The transportation operations plan shall provide the following information (this information below is minimum requirements and should be presented in the project plans as part of the Temporary Traffic Control Plans in a narrative format):
  - All information listed under Level One Projects.

Level III (Significant Projects)

These projects are anticipated to cause sustained work zone impacts greater than what is considered tolerable based on policy or engineering judgment. They should be identified early in the project development process in accordance to DD-200 and in cooperation with the FHWA.

- Typical Projects: Long duration construction or maintenance projects on Interstate and Expressway routes that have an ADT equal to or greater than 25,000 or on other state highway route that has an ADT equal to or greater than 15,000 that occupies a location for more than three days with either intermittent or continuous lane closures. Also, this includes Interstates, Expressways, or other state highway route that may have multi-phase construction, high accident rates, full closures, or multiple work zones (two or more) within two miles of each other.
- Project Type: Complex Project – Multi-phase construction that as a minimum may add additional through lanes, bridge rehabilitation, interchange construction or reconstruction, pavement rehabilitation, reconstruction, and widening on high volumes of traffic as described above. Sequence consists of lane closures in one or both directions with traffic shifting several times and that may include temporary pavement or detours for the duration of the work. Impact of work zone on stakeholders extends beyond the work zone and affects alternate and/or detour routes.
- Impact on Traffic:
    - An assessment of the work zone impact will be completed using Quewz 98, Quickzone 1.0, or and operational-level traffic analysis software simulation program such as CORSIM.
    - Lane closure analysis will be performed and/or approved by the Traffic Engineering Design/Operations Section(s) at the request of the Project Manager/ Project Designer.
    - All lane closures and time restrictions will comply with the WVDOH Permitted Lane Closure Map
- Major Components:
- Temporary Traffic Control Plan – Major components shall consist of General Notes, Typical Sections, Detail Plans, and if needed, special details. Each component shall provide the following information per construction phase. This information shall be placed on a coordinated plan sheet. (This information shall be presented as in a narrative format with illustrations/sketches):
    - Detail Plans which include all information listed under Level Two Projects plus (this information shall be regarded as a minimum) :
    - A list identifying the location of reduced lane width(s)
    - Typical Sections shall contain all the information listed under Level Two Projects
    - Special Details/Cross Sections/ Profiles shall contain all the information listed under Level Two Projects.

- Public Information Plan – A public information plan is required for a roadway when the traffic volumes exceed the allowable ADT and the time of closure is established by the permitted lane closure maps. The public information plan shall provide the following information (this information may be presented in the project plans as part of the Temporary Traffic Control plan in a narrative format):

- All information listed under Level One Projects.

- Transportation Operations Plan – A Transportation Operations Plan is required when the work zone is greater than ½ mile in length and/or results in reduced travel lane(s). The transportation operations plan shall provide the following information (this information below is minimum requirements and should be presented in the project plans as part of the Temporary Traffic Control Plans in a narrative format):
    - All information listed under Level One Projects.

Operational Analysis

QUEWZ – 98 Program

The Division of Highways uses the computer program QUEWZ to determine the queues and user costs that are associated with work zone lane c1osures. Based on the type of lane closures, traffic volumes, time schedules, etc., the program will provide the user with the expected queue length and estimated user costs. The designer may use this program to ensure the proposed traffic control plan is still cost effective. The program user should review the user's manual to determine how to use the program. This analysis will be performed by the Traffic Engineering Division's Design Section.

Inputs

The user must provide the following inputs into the program:

1. lane closure configurations,
2. the schedule of work activities (e.g., work activity hours, lane constriction hours), and
3. the traffic volumes approaching the freeway segment.

The program provides default values for:

1. cost update factor,
2. percentage of trucks,
3 speeds and volumes at various points on a speed-volume curve,
4. capacity of a lane in the work zone,
5. maximum acceptable delay to motorist, and
6. critical length of queue.

To obtain meaningful results, the designer should consider revising the default values to meet the site location. For example, it should be noted that the program assumes that for queues longer than 20 minutes that some drivers will divert. To account for actual queues and the corresponding user costs, the designer may need to adjust the 20-minute time frame to meet the project situation. The designer should review the user's manual to determine if the default values are applicable to the location under consideration.

Outputs

QUEWZ has two output options - road user cost and lane closure schedule. The road user cost output option analyzes a specified lane closure configuration and schedule of work activities and provides estimates of traffic volumes, capacities, speeds, queue lengths, diverted traffic and additional road user costs for each hour affected by the lane closure. The lane closure schedule option summarizes the hours of the day when a given number of lanes can be closed without causing excessive queuing.

In addition to the values obtained from the program, supplemental user cost calculations may be required where changes are expected based on existing traffic patterns and volumes. Supplemental calculations for detours are typically required where an exit or entrance ramp within the construction zone (including those using crossovers) will be closed and where the designer judges that the QUEWZ program is not properly estimating the full amount of diverting mainline traffic.

Experience has shown that additional detour user cost calculations should be conducted for the following:

1. Where exit ramps are closed. Experience has shown that most or all of this traffic will divert from the mainline before the construction zone. Therefore, the exit ramp volumes should be deleted from the input mainline volumes before using QUEWZ and appropriate detour calculations performed.

2. Closed entrance ramps may or may not lead to changes in the input values for QUEWZ. Additional detour calculations will be required for any expected diversions.

Temporary Traffic Control Devices Final Rule

Background

The Federal Highway Administration (FHWA) published the Final Rule on Temporary Traffic Control Devices, 23 CFR 630 Subpart K in December 5, 2007. This rule applies to State and local governments that receive Federal-aid highway funding. All transportation agencies are required to comply with the provisions of the Rule by December 4, 2008. This rule supplements the Work Zone Safety and Mobility Final Rule – Subpart J and applies to all Federal Aid highway projects to include highway construction, maintenance, and utility projects.

Requirements

- Use of positive protection devices to prevent intrusions.
- Exposure control measures to avoid or minimize exposure of workers and road users.
- A Uniformed Law Enforcement policy.
- Guidance for the safe entry and exit of work vehicles and equipment.
- Guidance for payment for traffic control features and operations
- Guidance to help maintain the quality and adequacy of the temporary traffic control devices for the duration of a project.

For additional information on the Final Rule on Temporary Traffic Control Devices – Subpart K, follow this link: http://ops.fhwa.dot.gov/wz/resources/policy.htm

The WVDOT is extending this requirement to all highway projects, regardless of the funding source.

These guidelines should be applied to all new projects and all existing projects that have a due date after December 4, 2008. For existing projects with a due date before December 4, 2008, these guidelines may be applied on a case-by-case basis. These guidelines apply to all projects not requiring plans (e.g., maintenance projects, utility projects, etc.) as of December 4, 2008. These guidelines do not apply to work related to emergency repairs.

Positive Separation Devices

As part of the development of a Traffic Control Plan (TCP), the need for and usefulness of temporary traffic barrier protection should be evaluated throughout the project development process. In general, temporary traffic control barriers should only be installed if it is determined that the barrier offers the least hazard potential.

Installations and determination of Temporary Traffic Barriers are described per sections F.81 and F.82 and Figures 10 (Detail C) and 11 (Detail D) from the *West Virginia Division of Highways Temporary Traffic Control Manual – latest edition* and as described in Design Directive 685. These items can be found by the following links:

http://www.transportation.wv.gov/highways/engineering/Manuals/Traffic/TCM_06L.pdf
http://www.transportation.wv.gov/highways/engineering/DD/2006%20DD%20Manual%20MASTER%2006112013.pdf

In addition to the above, the following should be performed during design of the TCP:

Preliminary Plan*:* Frequently during preliminary design, the TCP has not been developed to the point where an adequate assessment of the use of temporary traffic barrier can be made; however, available data should be used to make an initial determination regarding whether temporary traffic barrier is warranted and whether exposure control measures should be considered.

Final Plan*:* During detailed design, as the TCP is developed further, an evaluation shall be performed to determine whether temporary traffic barrier is required and the most appropriate application of barrier (e.g., standard concrete traffic barrier, moveable concrete barrier, etc.). Factors to be considered in the evaluation include, but are not limited to, the following:

- Project scope and duration
- Anticipated travel speeds through work zone
- Traffic volumes
- Time of day (e.g., night work)
- Vehicle mix
- Pedestrian/bicycle exposure
- Type of work (as related to worker exposure and crash risks)
- Impacts on project cost and duration
- Distance between traffic and workers and the extent of worker exposure
- Escape paths available for workers to avoid a vehicle intrusion into the work space

- Work area restrictions (including impact on worker exposure)
- Consequences from/to road users resulting from roadway departure (e.g., severity of hazard, obstacle, or drop-off/slope)
- Potential hazard to workers and road users presented by device itself and during device placement and removal (e.g., clear zone, barrier end protection, barrier deflection distance)
- Geometrics that may increase crash risks (e.g., poor sight distance, sharp curves)
- Access to/from work space

Exposure Control Measures

The appropriate measures should be taken to limit the exposure of a worker to motorized traffic and exposure of motorists to work zone activities, while also providing adequate consideration to the potential impacts on mobility. A wide range of Temporary Traffic Control Strategies that may be appropriate for a individual project basis to limit these exposures can be found listed in the Appendices of this Design Directive.

Law Enforcement Implementation

The West Virginia Division of Highways has implemented a directive for the use of a Traffic Director as part of a highway project based the following criteria as described in the a Traffic Engineering Directive 604 dated July 30, 2004. This policy reads as follows:

A traffic director shall be a uniformed off-duty law enforcement official with a properly identified police vehicle that displays blue flashing lights. The intent of a traffic director is to enforce the posted speed limit and to increase safety for motorists and workers.

A traffic director shall be included within a traffic control plan when one or more of the conditions noted below exist in a work zone:

1. Nighttime paving operations, nighttime resurfacing operations, or nighttime pavement repair:
    a. On any Interstate or Expressway facility with an ADT greater than 25,000, or
    b. On any non-Expressway facility with an ADT greater than 15,000.

2. Pouring and curing of concrete, day or night, during the overlay of a bridge deck:
    a. On any Interstate or Expressway facility, or
    b. On any non-Expressway facility while maintaining two-way traffic with an ADT greater than 3,000, or
    c. On any one-way non-Expressway facility.

3. Removing or setting of bridge beams:
    a. Over any Interstate or Expressway facility, or
    b. Over any non-Expressway facility with an ADT greater than 10,000.
4. Installation or removal of full span or half span sign structures:
    a. On any Interstate or Expressway facility, or

b. On any multilane Non-Expressway facility.
c. A Traffic Director may be used under other circumstances, as approved by the Traffic Engineering Division.

http://www.transportation.wv.gov/highways/traffic/Pages/TrafficEngineeringDirectives.aspx

Guidance for the safe entry and exit of work vehicles and equipment

The TTC plan should consider the need for a work area access plan. This is a constructability issue in which the designer addresses the question of how the contractor is to get materials and equipment into the work area safely. This is a particularly critical issue on high speed facilities (such as the Interstate) where barrier wall is used to protect median work areas. Some consideration may be given to the design and construction of temporary acceleration and deceleration lanes for the construction equipment. The following should be considered in the design, planning and operation of work zones.

1. Anticipate types of work zones likely to create ingress/egress problems. Examples are median work spaces requiring work vehicles to merge into/out of high-speed traffic and work activities that will generate frequent delivery of materials such as paving projects and the delivery of fill material.

2. Access into/out of the work space should be included in TCP. When operations require access and it is not addressed in the plan the project engineer must address the issue within the limits of their authority.

3. Adequate acceleration/deceleration space for work vehicles should be provided.

4. The location of access openings should provide good sight distance for oncoming traffic.

5. In extreme conditions lane closures may need to be considered.

6. Openings in barrier walls should be planned to ensure that ends are properly protected and that the walls do not create sight problems.

7. Ingress/egress condition may justify lowering the speed limit.

8. Warning signs (W21-10) are available for ingress/egress conditions and should be used when appropriate. Special warning signs may be necessary.

9. The use of Changeable Message Signs and/or Traffic Directors should be considered.

10. Vehicles entering/leaving a work space should use flashing amber lights for improved visibility by oncoming traffic.

11. Drivers and operators should be trained on safe operation and must be supervised and corrections made when unsafe actions occur.

Guidance for payment for traffic control features, operations, and guidelines for maintaining the quality of temporary traffic control devices

The guidance for the payment of operations and maintenance of the traffic control devices implemented for the use on a West Virginia highway construction project is listed under Section 636 of the latest adopted edition of *The West Virginia Division of Highways Standard Specifications for Roads and Bridges*,, as amended by the latest adopted issue of the *West Virginia Division of Highways Supplemental Specifications*.

The guidelines set forth to maintain the quality and adequacy of temporary traffic control devices for the duration of a project will follow the latest adopted edition of *The West Virginia Division of Highways Standard Specifications for Roads and Bridges* as amended by the latest adopted issue of the *West Virginia Division of Highways Supplemental Specifications*, and supplemented with the latest edition of the *Quality Guidelines for Temporary Traffic Control Devices* issued by the American Traffic Safety Services Association (ATTSA). The application of the Standard Specifications and Quality Guidelines will help field personnel to evaluate the condition of devices and assure continued effectiveness.

References

1. The West Virginia Department of Transportation, Division of Highways, *Standard Specifications, Roads and Bridges, Adopted 2000, as amended by the supplemental specifications, dated January 1, 2003*.

2. The West Virginia Department of Transportation, Division of Highways, Engineering Division, *Design Directives – October 1, 2006*.

3. The West Virginia Department of Transportation, Division of Highways, Traffic Engineering Division, *Manual on Temporary Traffic Control for Streets and Highways, 2006 Edition*.

4. The West Virginia Department of Transportation, Division of Highways, Traffic Engineering Division, *Traffic Engineering Directives, February 22, 2005.*

5. FHWA Final Rule Website
   http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm

6. 23 CFR Section 630 (Final Rule Language)
   http://www.ops.fhwa.dot.gov/wz/docs/wz_final_rule.pdf

7. FHWA Work Zone Mobility and Safety Web Site
   http://www.fhwa.dot.gov/workzones

8. FHWA Safety Web Site
   http://www.safety.fhwa.dot.gov

9. WVDOH Permitted Lane Closure Map
   http://www.transportation.wv.gov/highways/traffic/Documents/permitted-lane-closure.pdf

Appendix A

** - The strategies listed below are a minimum requirement for a TMP

Work Zone Management Strategies **Temporary Traffic Control (TTC)**		
Control Strategies	**Traffic Control Devices**	**Project Coordination, Contracting, and Innovative Construction Strategies**
• Construction phasing/staging • Full roadway closures • Lane shifts or closures Reduced lane widths to maintain number of lanes Lane closures to provide worker safety Reduced shoulder width to maintain number of lanes Shoulder closures to provide worker safety Lane shift to shoulder/median to maintain number of lanes • One-lane, two-way operation • Two-way traffic on one side of divided facility	• Temporary signs Warning Regulatory Guide/ information • Changeable message signs (CMS) • Arrow panels • Channelizing devices • Temporary pavement markings • Flaggers and uniformed traffic control officers • Temporary traffic signals • Temporary Lighting • Warning Lights	• Project coordination Coordination with other projects Utilities coordination Right-of-way coordination Coordination with other transportation infrastructure • Contracting strategies Design-build A+B bidding Incentive/disincentive clauses Lane rental • Innovative construction techniques (precast members, rapid cure materials)

• Reversible lanes • Ramp closures/relocation • Night work • Weekend work • Work hour restrictions for peak travel • Pedestrian/bicycle access improvements • Business access improvements • Off-site detours/use of alternate routes		

Work Zone Management Strategies **Public Information (PI)**	
Public Awareness Strategies	**Motorist Information Strategies**
Press releases/media alerts Planned lane closure web site Project web site Public meetings/hearings Community task forces Coordination with media/schools/businesses/ emergency services Work zone safety highway signs	Changeable message signs (CMS) Temporary motorist information signs Dynamic speed message sign Freight travel information Transportation Management Center (TMC)

Work Zone Management Strategies - Transportation Operations (TO)			
Demand Management Strategies	**Corridor / Network Management Strategies**	**Work Zone Safety Management Strategies**	**Traffic / Incident Management and Enforcement Strategies**
Shuttle services	Signal timing/coordination improvements	Speed limit reduction/variable speed limits	ITS for traffic monitoring/management
Ridesharing/carpooling	Temporary traffic signals	Temporary traffic signals	Transportation Management Center (TMC)
Park-and-ride promotion	Street/intersection improvements	Temporary traffic barrier	Surveillance (Closed-Circuit Television (CCTV)
Variable work hours	Turn restrictions	Movable traffic barrier systems	Mile-post markers
	Parking restrictions	Crash-cushions	Tow/freeway service patrol
	Truck/heavy vehicle restrictions	Temporary rumble strips	Total station units
	Reversible lanes	Warning lights	Photogrammetry
	Ramp closures	Automated Flagger Assistance Devices (AFADs)	Coordination with media
	Railroad crossings controls	Project task force/committee	Local detour routes
	Coordination with adjacent construction site(s)	Construction safety supervisors/inspectors	Incident/emergency response plan
		Road safety audits	Dedicated (paid) police enforcement
		TMP monitor/inspection team	Cooperative police enforcement
		Safety awards/ incentives	Increased penalties for work zone violations
		Windshield surveys	

Appendix B

Stakeholders

Stakeholders are individuals, groups and organizations who have a "stake" in a particular highway improvement project. They may be immediately affected by the project because they must travel through the construction work zone. They may be more indirectly involved because of their position in the community or their job responsibilities are affected.

The traveling public is of course the important stakeholder. Motorists are most affected by highway improvement. They enjoy the new highway or the resurfaced highway once the project is completed and they are the ones inconvenienced when caught in the construction zone. They are by far, the largest and most important group a highway improvement project communication plan needs to target.

Major businesses in and around a project work zone are traffic generators. Employees going to and from work may travel through the zone daily. Deliveries to the businesses can create slower moving truck traffic and the timely arrival of some deliveries can be critical to some operations. Informing the businesses before construction starts not only builds good will, but enables them to inform employees and adjust delivery and transport schedules.

Other businesses located in the immediate area of a construction project may not be major employers, but may be traffic generators. The proprietors may be concerned about the construction project interfering or limiting customer access and the resulting loss of business. Being in the communication loop will reassure them and allow them to let their customers and employees know what to expect.

There are other stakeholders or stakeholder groups who may not be directly affected by highway improvement, but who should be considered when doing the construction project's communication plan. The stakeholders may not be located near the work zone. They may not be traffic generators. As individuals, they may not even travel through the work zone or in anyway be inconvenienced. However, because of their position, they need to be informed. It may be as simple as sending them copies of news releases or composing a letter.

Local government officials, such as mayors, city managers, city council members, and county commissioners need to be informed in order to deflect complaints and feel part of the project.

Emergency services and law enforcement agencies have a 'need to know" about highway improvement in their service areas. Often it is a matter of sending news releases to law enforcement headquarters and emergency 911 operations centers.

Legislators at both the state and federal level often have an interest in highway projects in their respective districts. In some cases they have been involved with project funding or they have helped promote the need for projects. State legislators, using the legislative process, develop the state's transportation budget. At the national level, members of congress help decide funding and national transportation policy. An informed legislator is much more likely to answer a constituent's complaint about highway improvement in a positive tone.

Utility companies are another stakeholder that is often contacted during the design process if necessary. But keeping appropriate utility company personnel up to date on the highway improvement project will help promote the image for all parties.

Keep in mind that construction may create some special needs to contact specific individuals or organizations. The **postmaster** may need to reroute mail delivery due to a road closure or inability to access rural mail boxes. **Convention and visitor's bureaus** should have construction information to pass on to meeting planners. **Promoters and managers of special events** (local festivals, street fairs, county fairs, etc.), **entertainment venues and amusement parks** need to understand that construction could affect customer access. Look for opportunities to share construction information with **travel clubs**, such as the American Automobile Association.

Developing an all-inclusive list of stakeholders who have a need to know about any given highway improvement project is dependent on the type of construction, the extent of construction, the length of the construction zone and how long the construction is expected to take. When planning communication for a construction project, consider the construction zone's geography, business and residential environment in order to begin the development of a specific list of stakeholders who need information on the construction project. Remember, an informed group of stakeholders not only builds good will and lessens the complaints, but the stakeholders in turn become communicators to their constituents. Well planned and targeted communication will ensure a positive message is forwarded.

Appendix C

Proposed Work Zone Training Requirements				
Staff	**Number of Individuals**	**Course**	**Time**	**Required**
Design	150	NHI	3 days	Every 5 years
Construction	200	ATSSA	1 -1.5 days	Every 5 years
Maintenance	100	LTAP/T2	1 day	Every 5 years
Programming Planning	15	Peer to Peer	1 day	Every 5 years

Design staff shall be from Traffic Engineering Division, Engineering Division, District Design, District Traffic.

Construction staff shall be from Central Office and District level Construction Engineers, Construction Supervisors, Construction Inspectors, and Utilities Supervisors and Inspectors.

Maintenance staff shall be from Central Office and District level Maintenance Engineers, Maintenance Assistants from the County and Expressway Headquarters.

Programming Division and Planning Division staff shall be from the Central Office.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-682
PAVEMENT MARKINGS
August 1, 2003

All projects using Pavement Marking Design shall be in accordance with the current edition of Traffic Engineering Directive 301, “Centerline, Edgeline, and Laneline Markings”. The Director of the Engineering Division must approve all exceptions. Copies of the Traffic Engineering Directives are available from the Traffic Engineering Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-683
SIGNING
August 1, 2003

All projects that have permanent signing as part of the contract plans shall be in accordance with the current edition of Traffic Engineering Directive 103, "Preparation of Contract Sign Plans". The Director of the Engineering Division must approve all exceptions. Copies of the Traffic Engineering Directives are available from the Traffic Engineering Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-684
ROADWAY LIGHTING DESIGN
August 1, 2003

All Roadway Lighting Design shall be in accordance with the current edition of Traffic Engineering Directive 102, "Roadway Lighting Design". The Director of the Engineering Division must approve all exceptions. Copies of the Traffic Engineering Directives are available from the Traffic Engineering Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAY
DESIGN DIRECTIVE

685
DROP-OFF GUIDANCE
March 17, 1997

This document provides guidance in selecting which treatments should be implemented for various pavement edge drop-off conditions. This guidance is applicable on all construction projects or any maintenance project where the principal activity is one of the following: paving or skip paving with hot-mix asphalt, a localized excavation for concrete repair, or a localized excavation for culvert replacement or repair. The guidance is applicable only during the actual performance of work. These guidelines are intended to increase traffic safety using traffic control devices and safety related appurtenances. The best way to increase traffic safety is to make every attempt to minimize exposure to uneven lanes, milled edges, and edge drop-offs; however, it is appreciated that this is often not possible or feasible. These guidelines are intended to compliment *Traffic Control for Street and Highway Construction and Maintenance Operations.*

Typical Channelizing Device Spacing for Drop-offs	
Speed (mph)	Spacing (feet)
25-45	mph = device spacing
50-70	50

Typical Spacing for Drop-off Signing	
Speed (mph)	Spacing (feet)
20	1000
30	1300
40	1800
50	2200
60	2600
70	3000

A. CASE I

1. Multi-lane divided highways with posted speed limits 45 mph or greater (Conditions 1-3 apply to paving operations).

   a. Condition 1 - **Continuous longitudinal drop-off between open lanes of traffic** - If drop-off between travel lanes is less than or equal to 2", channelizing devices are not required. UNEVEN LANES signs are required.

      If drop-off between travel lanes is greater than 2", close the lane using channelizing devices.

   b. Condition 2 - **Continuous longitudinal drop-off between edge of travel lane and paved shoulder** - If drop-off is less than or equal to 2", channelizing devices are not required. LOW SHOULDER signs are required until drop-off is brought even with pavement.

      If drop-off is greater than 2", channelizing devices are required. SHOULDER DROP OFF signs are required until drop-off is brought even with pavement.

   c. Condition 3 - **Continuous longitudinal drop-off at edge of pavement (if the edge of pavement is the edge of travel lane, then condition 2 will apply).** If drop-off is less than or equal to 3", no channelizing devices are required.

      Drop-offs greater than 3" require channelizing devices and SHOULDER DROP OFF signs until drop-off is brought even with pavement.

   d. Condition 4 - **Excavations greater than 3" deep** - On closed travel lane or on paved shoulder, channelizing devices are required and the excavated area shall be filled or covered as appropriate within 48 hours. Where excavations cannot be filled or covered within 48 hours, use temporary barrier.

      Beyond paved shoulder within 30' of travel lane, channelizing devices are required. Applicable unless the drop-off condition lies behind guardrail or concrete barrier.

      Median Curb Excavations greater than 3" deep - channelizing devices are required at intervals no greater than 50'. Excavation may be left open (without filling or covering) for no more than 48 hours.

B. CASE II

1. All Other Highways (Undivided) with Posted Speed Limits of 45 mph or Greater. (Conditions 1-3 Apply to Paving Operations)

a. Condition 1 - **Continuous longitudinal drop-off between open lanes of traffic** - If drop-off between lanes is less than or equal to 2", no channelizing devices are required. UNEVEN LANES signs are required.

If drop-off between travel lanes is greater than 2", separate traffic using channelizing devices or close the lane with flaggers as necessary.

b. Condition 2 - **Continuous longitudinal drop-off between travel lane and paved shoulder (if existing)** - If drop off is less than or equal to 2", channelizing devices are not required. LOW SHOULDER signs are required until drop-off is brought even with pavement.

If drop-off is greater than 2", channelizing devices are required. SHOULDER DROP OFF signs are required until drop-off is brought even with pavement.

c. Condition 3 - **Continuous longitudinal drop-off at edge of pavement (if the edge of pavement is the edge of travel lane; then condition 2 will apply) -** If drop-off less than or equal to 3", no channelizing devices are required. SHOULDER DROP-OFF signs are required until drop-off is brought even with pavement.

If drop-off greater than 3", channelizing devices are required. SHOULDER DROP OFF signs are required until drop-off is brought even with pavement.

d. Condition 4 **- Excavations greater than 3" deep -** On closed travel lane or on shoulder, Channelizing devices are required and the excavated area shall be filled or covered as appropriate within 48 hours. Where an excavations cannot be filled or covered within 48 hours, use temporary barrier.

Beyond shoulder within 20' of travel lane, channelizing devices are required. Applicable unless the drop-off condition lies behind guardrail or concrete barrier.

C. CASE III

1. Highways with Posted Speed Limits of 40 mph or Less (Conditions 1 and 2 apply to paving operations).

a. Condition 1 -**Continuous longitudinal drop-off between open lanes of traffic**, If drop-off between lanes is less than or equal to 2", no channelizing devices are required. UNEVEN LANES signs are required.

If drop-off between travel lanes is greater than 2", separate traffic using channelizing devices or close the lane with flaggers as necessary.

b. Condition 2 - **Continuous longitudinal drop-off at edge of travel lane or edge of pavement**, If drop-off is less than or equal to 3", channelizing devices are not required.

If drop-off is greater than 3", channelizing devices are required. SHOULDER DROP OFF signs are required until drop-off is brought even with pavement.

c. Condition 3 - **Excavations greater than 3" deep**, On closed travel lane, shoulder, or with 10' of travel lane, channelizing devices are required. Applicable unless the drop-off condition lies behind guardrail or concrete barrier.

Median Curb Excavations greater than 3" deep, channelizing devices are required at intervals no greater than 40'. Excavation may be left open (without filling or covering) for no more than 48 hours.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-686
TEMPORARY MEDIAN CROSSOVERS
August 1, 2003

Temporary Median Crossovers for maintenance of traffic purposes will be designed in accordance with the guidelines specified in this design directive.

Attachment

TEMPORARY MEDIAN CROSSOVER GUIDELINES:

A. INTRODUCTION

This document provides guidance in the location and design of Temporary Median Crossovers used for Maintenance of Traffic purposes on multi-lane, divided highways. Temporary Median Crossovers are utilized on these highways to cross traffic from one of the two-or three-lane, one-way roadways over the median to the opposing two-or three-lane, one-way roadway, for purposes such as bridge renovation or replacement. The opposing roadway thus becomes a two- or three-lane roadway.

B. PLAN PRESENTATION AND DESIGN REQUIREMENTS:

When Temporary Median Crossovers are used, details showing geometric data, typical sections, plans, and profiles shall be included in the project plans. It is also recommended that edge of pavement data for the Crossover pavement be given if it is to be placed in a superelevated section of roadway. A guideline drawing showing the typical geometric layout of Temporary Median Crossovers is attached to and made a part of the Design Directive.

Crossover design shall be based on a taper rate between 30:1 to 15:1. The preferred taper rate is 30:1. Crossovers shall be designed for the operating speed of the highway unless otherwise indicated. Lanes are to be striped a minimum of 15 feet in width for the Crossover. The suggested minimum pavement thickness for Temporary Median Crossovers is 8 inches of Hot-Mix Asphalt, on top of 12 inches of Class 1 Aggregate. The surface course of Hot-Mix Asphalt is to be a skid-resistant mix.

Notes are to be placed in the Maintenance of Traffic Plans indicating that any inlets and slope walls existing in the median and affected by the Temporary Median Crossover shall be covered with a steel plate of sufficient thickness to withstand the loading of the embankment and traffic to be placed upon it. After the Crossover is removed, these items are to be restored to their original condition. Payment methods for this work shall be indicated in these notes.

Details, items, and quantities are to be placed into the project plans for restoration of any existing roadway shoulders removed by construction of the Crossover. The existing roadway shoulder will generally have to be removed and replaced by the Crossover pavement typical section. However, some of the later-constructed interstates and APD highways have full-depth shoulders. The designer should consult the Information Section of the Engineering Division for as-built or record construction plans of the area in question for this determination. District Maintenance or Design personnel may have information on the shoulders' construction, also.

Glare Barrier shall be placed on all Temporary Concrete Barrier utilized for separation of opposing traffic throughout the full length of the Crossovers. The Traffic Engineering Division has special details for this Glare Barrier. These Special Details are required in the project plans.

Quantities for all items, such as embankment (to include removal of the embankment at the end of the work), aggregate, pavement, seeding and mulching, and shoulder restoration required to construct and remove the Crossover shall be computed and placed in the Summary of Estimated Quantities and Quantity Tables. These quantities should be tabulated separately in a row (or rows) labeled Temporary Median Crossover in the respective Quantity Table.

C. LOCATION OF MEDIAN CROSSOVER:

Crossovers should be located in as near to level sections of roadway where adequate stopping sight distance for the roadway's posted speed limit exists. A Crossover should not be located at the crest of a vertical curve, nor at the end of a horizontal curve, for sight distance reasons. Also, as stated hereinafter, for drainage reasons a Crossover should not be located at the bottom of a sag vertical curve. It is preferred that Crossovers be located in a tangent (both horizontal and vertical) section of roadway. The Crossover should be completed with a buffer zone 500 feet in length before the beginning of the work area. Location of Temporary Median Crossovers should be coordinated with the Traffic Engineering Division of the West Virginia Department of Transportation, Division of Highways.

Temporary Median Crossovers in a curved, superelevated section of roadway shall have superelevation applied based on the operating speed of the roadway, and should match the existing superelevation of the horizontal curve. Superelevation runoff and runout, if required, shall be based on the latest officially adopted edition of "A Policy on Geometric Design of Highways and Streets". Two separate Crossovers may need to be constructed, one for each phase of construction.

If the profile of the roadway and location of available drainage structures is such that the flow in the median ditch upstream of the Crossover will not be picked up by an existing inlet just before it reaches the Crossover, a pipe is to be placed under the full length of the Crossover. This will prevent ponding of stormwater at the upstream end of the Crossover. The pipe is to be minimum 12 inches in diameter and have sufficient strength to support the embankment and traffic loadings placed upon it. Crossovers should not be located at the bottom of a sag vertical curve section of roadway due to drainage considerations.

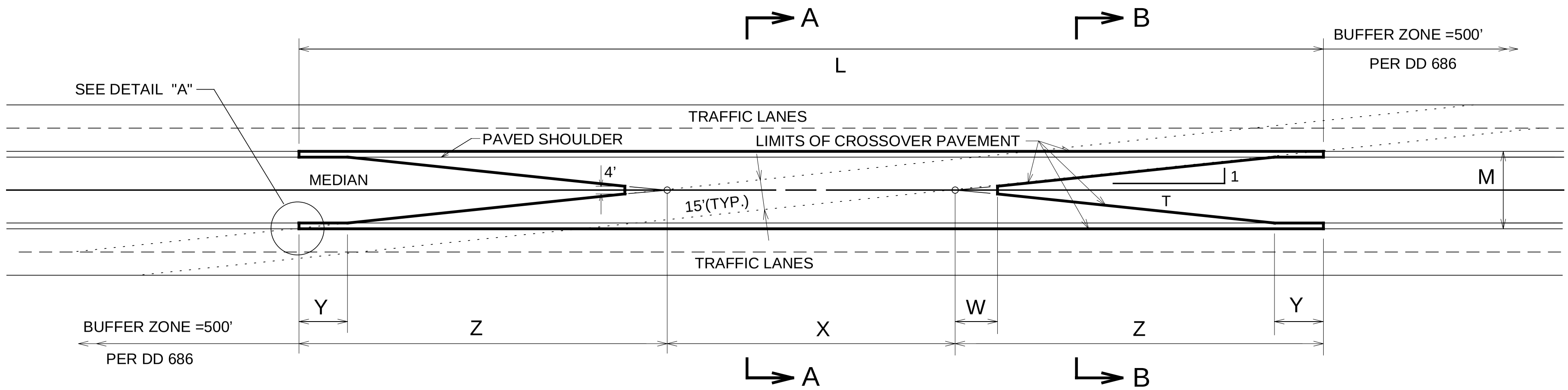
D. TEMPORARY LIGHTING:

Temporary lighting should be used on any Crossover placed on an Interstate or APD highway. The design shall be either 240V – 250W HPS Cobra Head (preferred) with 40 foot or 35 foot mounting height or 240V – 400W HPS Vector-Turnpike luminaire with 40 foot or 35 foot mounting height. The designer is responsible for arranging power services. Special details for temporary lighting shall be included in the project plans.

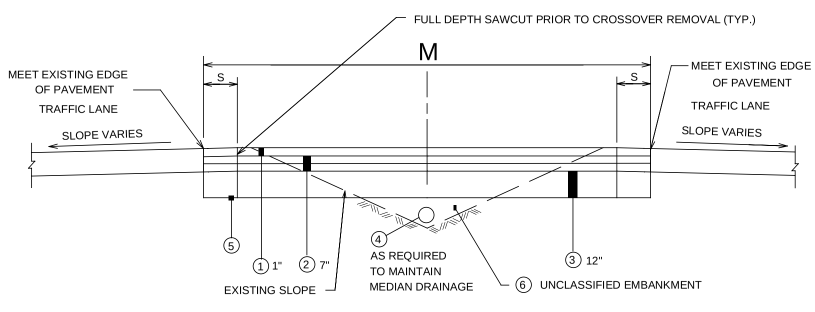
E. TRAFFIC CONTROL:

Traffic control, including temporary signing and pavement markings, for Temporary Median crossovers shall be as set forth in the latest issue of the manual "Traffic Control for

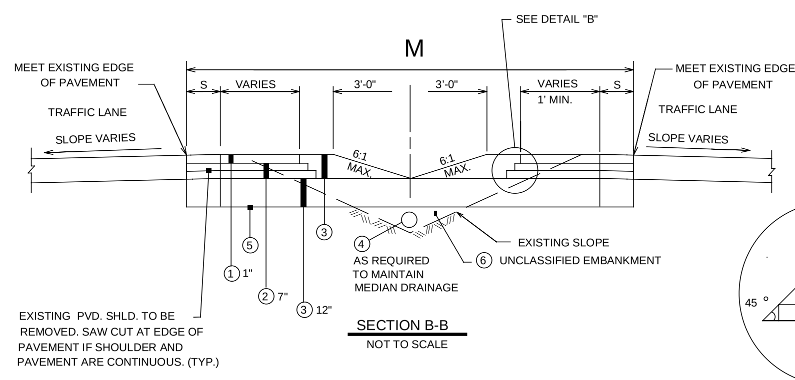
Street and Highway Construction and Maintenance Operations" using Case E9. Quantities for all traffic control devices and temporary pavement markings shall be included in the project plans.



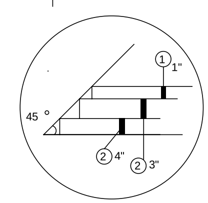
TEMPORARY TANGENT DOUBLE CROSSOVER LAYOUT DETAILS
NOT TO SCALE



SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE



DETAIL "B"

LEGEND

1. ITEM 402001-001 MARSHALL HOT-MIX ASPHALT SKID RESISTANT PAVEMENT, STONE OR GRAVAL, TYPE 1, TON
   ITEM 402001-002 MARSHALL HOT-MIX ASPHALT SKID RESISTANT PAVEMENT, SLAG, TYPE 1, TON
2. ITEM 401001-001 MARSHALL HOT-MIX ASPHALT BASE COURSE, STONE OR GRAVEL, CLASS 1, TON
   ITEM 401001-001 MARSHALL HOT-MIX ASPHALT BASE COURSE, SLAG, CLASS 1, TON
3. ITEM 307001-000 CLASS I AGGREGATE BASE COURSE, C.Y.
4. ITEM 636024-001 TEMPORARY PIPE FOR MAINTAINING TRAFFIC, LF
5. ITEM 207034-000 FABRIC FOR SEPARATION, SY
6. ITEM 207001-001 UNCLASSIFIED EXCAVATION, CY

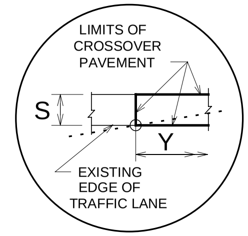
NOTES

THE CONTRACTOR SHALL REMOVE THE CROSSOVER UPON COMPLETION OF THE WORK AND THE MEDIAN SHALL BE RESTORED TO ITS ORIGINAL CONDITION AND SEEDED AND MULCHED. THIS WORK TO RESTORE MEDIAN SHALL BE PAID FOR UNDER ITEM 207001* UNCLASSIFIED EXCAVATION. THE CONTRACTOR SHALL SAWCUT FULL DEPTH OF THE CROSSOVER PAVEMENT AS SHOWN ON SECTIONS A-A AND B-B.

INLETS AND UNDERDRAIN SLOPE WALLS UNDERNEATH THE CROSSOVER EMBANKMENT SHALL BE COVERED. THE COST SHALL BE INCLUDED IN THE UNIT BID PRICE OF ITEM 207001-* UNCLASSIFIED EXCAVATION.

THIS DETAIL IS LIMITED TO TANGENT SECTIONS OF ROADWAY WHERE THE INSIDE EDGES OF PAVEMENT ARE RELATIVELY THE SAME. MINOR FIELD ADJUSTMENTS MAY BE REQUIRED IN TANGENT SECTIONS WHERE THIS CRITERIA DOES NOT EXIST.

M = MEDIAN WIDTH
T = TAPER RATE (PER DD-686)
S = PAVED SHOULDER WIDTH
$Z = \frac{TM}{2}$
$X = \sqrt{(15T)^2 + 225} \approx 15T$ USE
Y = ST
L = T(M+15)
W = 2T



DETAIL "A"

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DOUBLE CROSSOVER FOR TANGENT MEDIAN ONLY

PREFFERED

DIMENSIONAL DATA FOR 30 TO 1 TAPER RATE

M	T	S	W	X	Y	Z	L
18’	30	3’	60’	450’	90’	270’	990’
40’	30	3’	60’	450’	90’	600’	1650’
46’	30	3’	60’	450’	90’	690’	1830’
60’	30	3’	60’	450’	90’	900’	2250’

DIMENSIONAL DATA FOR 20 TO 1 TAPER RATE

M	T	S	W	X	Y	Z	L
18’	20	3’	40’	300’	60’	180’	660’
40’	20	3’	40’	300’	60’	400’	1100’
46’	20	3’	40’	300’	60’	460’	1200’
60’	20	3’	40’	300’	60’	600’	1500’

DIMENSIONAL DATA FOR 25 TO 1 TAPER RATE

M	T	S	W	X	Y	Z	L
18’	25	3’	50’	375’	75’	225’	825’
40’	25	3’	50’	375’	75’	500’	1375’
46’	25	3’	50’	375’	75’	575’	1525’
60’	25	3’	50’	375’	75’	750’	1875’

DIMENSIONAL DATA FOR 15 TO 1 TAPER RATE

M	T	S	W	X	Y	Z	L
18’	15	3’	30’	225’	45’	135’	495’
40’	15	3’	30’	225’	45’	300’	825’
46’	15	3’	30’	225’	45’	345’	915’
60’	15	3’	30’	225’	45’	450’	1125’

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DOUBLE CROSSOVER
FOR TANGENT
MEDIAN ONLY

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-687
EXISTING ROADS USED AS DETOURS OR HAUL ROADS
December 23, 2005

Attached is the West Virginia Department of Transportation, Division of Highways policy on designating existing roads as haul roads or detours in the contract plans.

This directive contains guidance on when to designate an existing road as a haul road or detour and the contract requirements associated with this designation.

Attachment

EXISTING ROADS USED AS DETOURS OR HAUL ROADS

10 - GENERAL:

When developing the contract plans on a project the designer must consider methods to maintain existing traffic and methods the Contractor may use to access or construct the project. These considerations may cause the designer to designate an existing road as a detour route for traffic and/or as a haul road for the Contractor. If an existing road is designated as a detour and/or haul road, the designer must determine the impact of any additional traffic on the road and make provisions in the plans to mitigate these impacts. Because of the variations in conditions affecting different construction projects, each individual project must be evaluated on a case by case basis. Designers will use the following guidelines in determining the impact and mitigation of designated detours and/or haul roads on existing roads.

Since this work is normally performed prior to construction beginning or after the major construction has been completed the quantities required for the haul road should be a separate category in the bidding documents.

20 – DESIGNATED DETOURS OR HAUL ROADS:

20.1 – Detours: The designer must provide an acceptable means to maintain traffic in all construction project documents. Many times the most advantageous method to maintain traffic will necessitate detouring traffic onto existing roads. If the designer designates an existing road as a detour route in the contract documents, an evaluation of the existing condition of the road must be performed per Section 30 of this directive.

20.2 – Haul Roads: The designer must investigate the access methods and locations by which the Contractor is most likely to utilize in constructing the project. Some project situations may dictate the designation of an existing road as a construction haul road in the contract documents. When the designer determines that an existing road must be designated as a haul road, an evaluation of the existing condition of the road must be performed per Section 30 of this directive.

Some project situations may provide multiple ways to access the construction site. The designer may, therefore, choose to not designate a particular existing road as the haul road. However, it may be necessary to provide pavement quantities in the contract documents to be used at the direction of the Engineer to repair existing roads. The Engineer will be required to evaluate the existing road condition and then document the repairs as incidental to the haul road construction activity.

When projects require the use of a haul road the following note should be used:

> "A haul road has been included in this project and route ________ from ________ to _________ has been used to as a basis to calculate the quantities and to provide the typical that is shown in the plans. If the contractor elects to use an alternate route he

shall provide to the engineer for his review and approval the haul road that is to be used and the method and quantities required for the roads restoration."

Projects which require the Contractor to haul across an existing road with off road vehicles require special consideration by the designer. The contract provisions should require the submittal of a proposed crossing by the Contractor. If the crossing is only required for a short duration, heavy steel plates may be adequate. Longer duration crossings, however, should require the Contractor to install a permanent concrete crossing. The designer should indicate the type of crossing required in the contract plans. The following plan note shall be used on projects requiring a crossing for off road vehicles:

> "The Contractor is responsible for all damage to existing roads as a result of using off road/non-legal vehicles for hauling on/or across any existing road. Repairs shall be made to the satisfaction of the Engineer. No additional payment will be made for these repairs."

30 – EXISTING ROAD EVALUATION:

30.1 – Introduction: If an existing road is designated as a detour and/or haul road in the contract documents as described above, an evaluation of the existing condition of the road must be performed by the designer. This evaluation will consider the existing condition including pavement section, bridge capacity, roadway width based on expected traffic during construction, etc. The evaluating will include any required improvements in order to utilize the existing road as a designated detour and/or haul road.

30.2 – Pavement Section: The designer shall evaluate the existing pavement structure on the designated route and determine if paving is required due to the loading that is anticipated to be incidental to construction. This loading may include detoured traffic or construction related traffic. Quantities shall be included in the contract documents to mitigate any anticipated damage due to increased loading incidental to construction. Quantities and procedures shall also be included in the contract documents for maintenance of the designated route during construction due to the increased loading. The designer shall evaluate, based on the existing pavement condition and the anticipated loading incidental to construction, whether the existing road will need paved after construction in order to return it to its original condition. Since this evaluation widely varies from project to project by the nature or scope of the projected traffic requirements it is recommended that the designer coordinate with the district resurfacing coordinator, regional engineer, district construction engineer, district maintenance engineer or others involved in the resurfacing program to assist in developing the required repair typical and to determine the access requirements. If paving is required, quantities shall be provided in the contract documents.

No quantities are to be provided in the contract documents for routine maintenance of the existing road that is not determined to be incidental to construction by the designer during the pavement section evaluation.

30.3 – Bridges: The designer shall evaluate all bridges on designated routes for adequacy to handle detoured traffic and/or legal construction loads. Any required improvements shall be included in the contract plans. These improvements must be shown to be a direct result of anticipated traffic incidental to construction.

Existing bridges on multi-lane roads where crossovers are utilized shall be evaluated to determine if paving or repairing the existing bridge carrying traffic is warranted. This evaluation will include the existing deck condition, increased traffic volume, and available detours if a deck failure occurs. The contract plans shall include quantities if the evaluation determines that paving the bridge is advisable. The paving shall be performed prior to detouring traffic onto the bridge.

30.4 – Existing Road Evaluation Documentation: The designer shall document in the project file the evaluation and determination of needed repair or improvements of a designated existing road. The quantities, procedures, and details necessary to repair or improve the designated existing road shall be included in the contract documents.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-688
TEMPORARY BARRIER
July 28, 2011

This Design Directive provides all designers, In-House, District, and consultant, with the West Virginia Department of Transportation (WVDOT), Division of Highways' (DOH) policy and guidance for use of Temporary Longitudinal Barrier when required on construction projects.

10. General

Work zones on construction projects will be designed to provide maximum protection for workers and equipment necessary to do the work prescribed by the Contract Documents. The WVDOH “Manual on Temporary Traffic Control for Streets and Highways” establishes principles to be observed in the design, installation, and maintenance of traffic control devices and prescribes standards where appropriate. These principles and standards are aimed at promoting the safe and efficient movement of traffic through the work zone and the safety of the workers in the work zone. Work zones should also be developed to provide maximum protection to pedestrians and bicyclists by providing safe pathways through the work zone whereby adjacent excavations or any other unsafe areas are shielded.

The July 1987 AASHTO *Summary Report on Work Zone Accidents* contains several conclusions related to crashes in work zones: 1) Crashes in work zones are generally more severe producing more injuries and fatalities than the national average for all crashes; 2) Crashes involving fixed objects occur more frequently and result in more injuries and fatalities than vehicle to vehicle crashes; and 3) About half of all work zone, fixed object crashes occur at night. Also, tractor-trailer injury and fatality crashes in work zones are higher than the national average for other types of crashes involving these vehicles.

The work area “recovery zone” is the unobstructed relatively flat area impacted by construction that extends outward laterally from the edge of the traveled way. Due to the reduced horizontal clearance available and the heightened awareness of motorists through the work area, the “recovery zone” lateral requirements are less than those required if the work zone was not in place. The amount of available lateral “recovery zone” affects the decision to delineate or shield exposed hazards. These hazards include, but are not limited to, approach ends of any temporary barrier placed, fixed objects, steep slopes, or pavement-edge drop-offs.

Good engineering judgment must be used when applying the lateral “recovery zone” concept to work zones. The lateral “recovery zone” distance is also known as the “buffer zone”. The term “buffer zone” will be used hereinafter in this Design Directive. The width of these buffer zones will help determine the deflection range of temporary traffic barrier required. Test Levels may be found in NCHRP Report 350 in Table 3.1, “Test Matrix for Longitudinal Barriers”, an excerpt of which is shown below. This table shows the combinations for different vehicles, speeds and impact angles for each test for a better understanding of their applicability.

Test Matrix for Longitudinal Barriers

Test Level	Test Designation	Impact Conditions		
		Vehicle	Nominal Speed mph	Nominal Angle
1	1-10	820C	31	20
	S1-10	700C	31	20
	1-11	2000P	31	25
2	2-10	820C	43.5	20
	S2-10	700C	43.5	20
	2-11	2000P	43.5	25
3	3-10	820C	62	20
	S3-10	700C	62	20
	3-11	2000P	62	25
4	4-10	820C	62	20
	S4-10	700C	62	20
	4-11	2000P	62	25
	4-12	8000S	50	15
5	5-10	820C	62	20
	S5-10	700C	62	20
	5-11	2000P	62	25
	5-12	36000V	50	15
6	6-10	820C	62	20
	S6-10	700C	62	20
	6-11	2000P	62	25
	6-12	36000V	50	15

Excerpted from NCHRP 350 Table 3.1

820C is a passenger car weighing 820 kg
700C is a small passenger car weighing 700 kg
2000P is a pickup truck weighing 2000 kg
8000S is a standard unit truck weighing 8000 kg
36000V is a tractor trailer weighing 36000 kg

Traffic barriers are designed as either permanent or temporary barriers. Temporary barriers can be easily relocated if and when required by the project's construction sequence. Temporary barriers have the following functions, at minimum:

- Protect traffic from entering the work area;
- Provide positive protection for workers within the work area;
- Separate two-way traffic;
- Protect construction such as falsework and other exposed objects; and 5) Separate pedestrians from vehicular traffic.

20. Factors to Consider and References

Use of temporary longitudinal barriers will be based on an engineering analysis of each work zone situation. The need for and location of temporary longitudinal barriers should be based on engineering judgment and consider the posted speed limit through the work zone and the proximity of vehicles to workers/pedestrians, construction equipment and any material stockpiles, etc. Other factors to consider are the type and duration of the proposed work, and the volume and characteristics of the traffic stream impacted by the proposed work. **A false sense of security can be imparted to both the motorists and the workers if temporary longitudinal barrier is improperly located**.

The designer is hereby directed to Design Directive (DD) 681, "Work Zone Safety and Mobility"; DD-685, "Drop-Off Guidance"; Traffic Engineering Directive (TED) 601-4, "Preparation of Maintenance of Traffic Plans"; the latest edition of the "Manual on Temporary Traffic Control for Streets and Highways"; and the latest edition of the "Roadside Design Guide" for further and more detailed information regarding the need for and placement of temporary longitudinal barriers. All of these publications are available on the Division's website.

30. Design and Plan Requirements

As described in DD-681, "Work Zone Safety and Mobility", the designer (In-house, District, or Consultant) is required to determine the need for and location of any temporary barrier, which would include temporary longitudinal barrier. The designer must also determine the available buffer zone behind the barrier in each construction phase. The available buffer distance and deflection characteristics may be different for each phase of construction. The designer need not specify the material to be used for the temporary barrier. The Traffic Engineering Division or District Traffic Engineer (for District-designed projects) will review and recommend the locations, Test Levels, and deflection characteristics of temporary longitudinal barriers provided by the designers. Temporary traffic control barriers, which include temporary longitudinal barriers, should only be used when the barrier itself offers the least hazard potential.

The following guidelines should be used to determine if anchoring of temporary barrier is appropriate:

- If the barrier is placed within 2 ft of a trench or drop off with a depth of 4 ft or greater.
- On bridge decks, unless another barrier is present between the drop off.
- Anytime barrier is used as a bridge parapet.
- When equipment, materials, or other hazards exist or are stored in the unanchored barrier buffer area.
- When workers are in the unanchored barrier buffer area for a significant amount of time.

From the Roadside Design Guide, ends of runs of temporary barrier will be flared away from traffic at rates ranging from 4:1 (lower speed roadways) to 8:1 (high-speed roadways such as the interstate system). Consult the Roadside Design Guide for more information.

40. Criteria For Use and Item Number

Test Levels are based on NCHRP Report 350 Table 3.1, “Test Matrix for Longitudinal Barriers”. Test Level determination shall not be site or project-specific, but be based on and consistent with the overall roadway system. Temporary Barrier should meet or exceed the following criteria:

1. TL-3, when any of the following conditions apply:

   a. Roadway or bridge is on the National Highway System
   b. Design Speed is greater than 45 MPH
   c. Design ADT is greater than 3500 vehicles per day

   (Note: TL-3 is the standard test level for the majority of roadways and bridges in the State of West Virginia.)

2. TL-2, for all other roadways and bridges (The higher of design speed and posted speed must be less than 45 MPH to use a TL-2 barrier)

Deflection characteristics for the Item Supplemental Description shall be determined from the table below and are based on the width of the available buffer zone with consideration being given to factors listed in Section 20. The designer is hereby cautioned that deflections shown in the table are approximate and for comparison only to aid the designer in choosing appropriate temporary barrier for individual situations. Because of a multitude of variables including vehicle type, speed, impact angle, point of measurement, anchorages, etc., deflections can and do vary from values listed below.

Supplemental Description	**Deflection Criteria (Buffer Zone available)**
I	< 6”
II	< 24”
III	< 60”
IV	< 96”

The pay item is to be based on the Test Level and deflection characteristics required, i.e. 636017 Temporary Barrier, TL-3, IV. (Note: TL – 3 is considered the minimum Test Level for use on expressways and interstate highways).

Temporary Barrier
Product Guideline

Test	Standard Test	Minimum Deflection Range I				Low Deflection Range II			
		Concrete Barriers Anchored	Concrete Barriers Unanchored	Steel Barriers Anchored	Steel Barriers Unanchored	Concrete Barriers Anchored	Concrete Barriers Unanchored	Steel Barriers Anchored	Steel Barriers Unanchored
TL-2	NCHRP 350 or Mash	636017-***, TL-2, I	Not Available	636017-***, TL-2, I	Not Available	636017-***, TL-2, II	Not Available	636017-***, TL-2, II	Not Available
TL-3 Basic Level	NCHRP 350 or Mash	636017-***, TL-3, I	Not Available	636017-***, TL-3, I	Not Available	636017-***, TL-3, II	Not Available	636017-***, TL-3, II	Not Available

Test	Standard Test	Medium Deflection Range III				High Deflection Range IV			
		Concrete Barriers Anchored	Concrete Barriers Unanchored	Steel Barriers Anchored	Steel Barriers Unanchored	Concrete Barriers Anchored	Concrete Barriers Unanchored	Steel Barriers Anchored	Steel Barriers Unanchored
TL-2	NCHRP 350 or Mash	636017-***, TL-2, III				636017-***, TL-2, IV			
TL-3 Basic Level	NCHRP 350 or Mash	636017-***, TL-3, III			Not Available	636017-***, TL-3, IV			

Products available

Item number 636017-***, Test Level, Deflection Range

S:\Standards Unit\Publications\Standard Detail Volumes\V1 Standard Details\Working\Temporary Barrier\Proposed temp barrier tables.xlsx

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 701 **CONTRACT PLAN PRESENTATION** *October 1, 2020* *Supersedes June 30, 2010*

This Design Directive describes the make-up and presentation of a complete set of contract plans to standardize the production of such plans throughout the Division of Highways. All directions contained herein will apply to contract plans developed by all Central Office Divisions, including plans developed by consultants, and all Districts. It should be noted that other Design Directives, the Drainage Manual, the Bridge Design Manual, and Traffic Engineering Directives are referenced in this document that pertain to similar subject matter and are more precise than these guidelines. Those manuals provide clearer understanding of what should be included in each set of contract plans.

This Design Directive prescribes the order that the different types of sheets required within the contract plans are to be placed, and generally prescribes the content of each type of sheet.

Not all sheets discussed herein are required for all projects. This determination will be made by the Division's Designer or Project Manager, and is dependent on the type, size, and complexity of the project.

All of the referenced publications are available on the Division's web site, at this URL: www.transportation.wv.gov/highways/engineering/Pages/publications.aspx. Other links are given for CADD Standards and plan presentation information described in this document.

I. GENERAL

The submission of digital plans meeting the below criteria is strongly encouraged and in many cases is required by the consultant agreement.

Contract plans are sheets or drawings which show the locations, character, and dimensions of the prescribed work, including layouts, profiles, cross sections, and other details.

Contract plan sheet originals shall be 22" x 34" including borders of 1" on the left and ½" for the other three. Preliminary submissions of Design Reports shall be assembled and bound into sets not to exceed 36" x 48". Roll plans or profiles will not be accepted.

When only a few sheets for a special purpose are submitted, they shall be folded to 8½" x 11" or 8½" x 14". Small paving projects may be submitted on 8½"x 11"

All plans including review plans shall be prepared in such a manner that they can be reduced to quarter size (¼ area and ½ scale – commonly referred to as “half-sizes”) by the Division. Quarter-size prints may be submitted for review. When quarter-size prints are submitted, they are to be accompanied by at least one full-size set, unless waived by the Division of Highways.

The use of contract plan sheets with existing contours and topography 60% screened is required unless waived by the Division of Highways. This also applies to Right of Way Plans.

CADD standards developed by the Engineering Division shall be used in the development of all contract plans. These standards are available on the Division’s website at: www.transportation.wv.gov/highways/engineering/cadd/Pages/default.aspx.

II. ORDER OF SHEETS WITHIN THE CONTRACT PLANS

The order of the sheets within the contract plans will be as follows. A general description of information that is required on each type of sheet follows in Section IV of this Design Directive. Note that not all types of sheets shown and described below are required in each set of contract plans, dependent on the type, size, and complexity of each project. Also, some of the different types of sheets may be combined; for instance the Survey Reference Points sheet may be combined with the Geometric Layout sheet on smaller projects.

1. Title Sheet
2. Typical Sections and Details
3. Summary of Estimated Quantities
4. Quantity Tables
5. General Notes
6. Special Details and Approved Special Details
7. Mass Haul Diagram
8. Survey Reference Points
9. Geometric Layout
10. Superelevation Tables and Diagrams
11. Interchange Grading Plans
12. Intersection Details
13. Temporary Traffic Control Plans
14. Plan and Profile Sheets
15. Drainage Detail Sheets
16. Utility Relocation Plans
17. Erosion And Sediment Control Plans
18. Environmental Mitigation Plans
19. Traffic Sketch Maps
20. Pavement Marking Plans
21. Signing Plans
22. Lighting Plans
23. Traffic Signal Plans

24. Ownership Index
25. Property Maps
26. Soil and Geologic Information Plans
27. Structure Plans per Order Of Station
28. Cross Sections

III. DEFINITIONS

A. **Contract Plans.** Defined in Section IV. below.

B. **Standard Details.** Drawings approved for repetitive use showing details to be used where appropriate. Included are Revised Standard Details that are to be referenced by revision date as appropriate.

C. **Special Details.** Modifications to a Standard Detail drawing, or any detail drawing required to describe an item of work not covered by a Standard Detail drawing.

D. **Approved Special Details,** Drawings approved by the Publications Committee and any other committee with authority, e.g. the Roadway Departure Task Force, and concurred with by the FHWA. Approved Special Details must be individually inserted into the plans. Approved Special Details may be found here: https://transportation.wv.gov/highways/engineering/Pages/Approved-Special-Details.aspx.

E. **Standard Specifications.** A book of Specifications approved for general application and repetitive use. The base document upon which all contracts rely.

F **Supplemental Specifications.** Approved additions and revisions to the Standard Specifications.

G **Special Provisions.** Specifications for specific items or details applicable to the individual project and which are not covered in the Standard or Supplemental Specifications. All special provisions must be approved by the Specifications Committee of Contract Administration Division.

H. **Temporary Traffic Control Plan**. A plan for handling traffic through a specific highway or street work zone or project.

IV. CONTRACT PLANS

A. **General.** Contract plans (hereinafter referred to as "plans" or "contract plans") are instructions using drawings containing engineering data and details pertaining to geometrics, drainage, structures, soils and pavements, and other appurtenances.

1. Plans should not encompass material that is properly a part of the Standard or Supplemental Specifications, Special Provisions, or Standard Details.

2. The original drawings should be on standard sheets conforming to modern, accepted drafting practices, current DOH CADD Standards, aerial photograph base maps, or other DOH accepted practices. See the description under the "GENERAL" heading above for more information.

3. Straight-line plans may be used provided they give sufficient information to properly complete the project.

   a. Straight-line plans are particularly adaptable to special types of projects such as those for minor emergency relief, safety improvements, resurfacing, restoration, and rehabilitation and pavement marking.

   b. A typical set of straight-line plans consists of only that information necessary to describe the type of work and its limits, such as:

      1) General plan, sketch, or line drawing;

      2) Cross section, if appropriate;

      3) Estimate of quantities;

      4) Tabulation of construction items, providing station and offset, and elevation (if needed);

      5) General notes; and/or

      6) Special details.

B. **Standard Details.** Standard details are used to reduce the number of drawings required to be supplied for each project and provide uniformity of design and construction where the details are the same from project to project. When modifications to standard details are made and intended for use on most projects, Revised Standard Details will be issued by Engineering Division. When modifications to standard details are necessary for a specific project, special details should be prepared, properly describing the work, and included in the project plans.

C. Contract Plans. Contract plans show the details, dimensions, and other information that are necessary to construct a specific project and should be tailored to provide all information necessary to accomplish the work in an orderly manner.

1. Title Sheet. The Title Sheet should show in a convenient arrangement:

   a. Project Name and Construction Project Number(s);

   b. A location sketch with sufficient identifying information so that the project may be easily located on a county or state map;

   c. Project Length, split into roadway and bridge(s) lengths, and then totaled. Note that projects which do not contain any paving, such as Grading and Drainage projects, will have a zero Project Length, however mainline Begin and End Work stationing shall be tabulated;

   d. A project layout, showing the proposed centerlines, Begin and End Project and Work stationing, all Station Equations, and numerical designations of all roadways to be constructed in the project. The Project Length will be that of the mainline only, sideroads and ramps are not to be included in the Project Length;

   e. A detail or group index of the sheets in the set of plans;

   f. The conventional symbols employed;

   g. Design designation (average daily traffic for the year that the project is to be constructed and the design year (usually 20 years after the construction year); design hour volume, directional distribution, and percent trucks in the design year; and design speed);

   h. Federal-aid project designation, if applicable;

   i. A provision for the dates and signatures of the appropriate approving officials (See DD-702 for examples);

   j. All approved design exceptions shall be noted on the title sheet.

2. Typical Sections and Details. Typical Sections are to be placed on the sheet(s) immediately following the Title Sheet, except that on combined roadway and bridge projects the cross section for the bridges may be shown with other bridge plan information.

   a. Typical Sections should be included in plans for all projects. Typical Sections shall be provided for all roadways to be constructed in the project, including the mainline roadway, all sideroads, ramps, and driveways.

   b. All functional elements should be shown to a convenient scale including:

      1) All different slopes of cut and fill with references to the cross sections for slopes not shown;

      2) The width of the roadway traveled way, shoulders, and median;

      3) The shape of the finished surface and shoulders (cross slopes including breakovers, and ditch foreslopes and backslopes, according to DD-601);

      4) Curb and gutter, if part of the design;

      5) All integral parts of the surfacing and shoulders including, as appropriate, subbase, base course, and surface course.;

      6) Limiting locations where each Typical Section is to be used;

      7) Ultimate Typical Section for stage construction project;

      8) Thickness of each lift for each element of the surfacing system;

         a) Where variations in surfacing or base thickness are proposed because of differing soil conditions or other reasons, such variations should be in tabular form, including station limits for each thickness,

         b) In instances in Subparagraph a) above, the typical section need show only that varying thicknesses are to be employed,

c) See DD-644 for appropriate asphalt layer thicknesses.

9) Relation between either proposed or ultimate status and a control survey line and profile grade line;

10) Lateral location of profile grade line (grade point);

11) Typical Details required to properly describe any work that cannot be clearly depicted on the Typical Sections, such as HMA edge stepping details, median barrier details, shoulder breakover and pavement layer thinning details, etc.

3. Summary of Estimated Quantities

a. The Summary of Estimated Quantities for the entire project is to appear on separate sheets following the Typical Sections.

b. If more than one category of funds is required for a project, the quantity of each item required for each category should be identified separately and then combined for bidding purposes.

1) See DD-805 for guidance on quantities for projects which cross boundaries between municipal and non-municipal areas.

2) A state-by-state breakdown is to be provided where a project crosses state lines using a manner similar to municipal boundaries as described in DD-805.

3) Non-Federal-aid work included as part of a Federal-aid contract should be identified separately.

4. Quantity Tables

a. These sheets will tabulate all construction items such as drainage, signing, guardrail, earthwork, pavement, underdrain, and all other items in a table format showing station and offset for the location of the item. This is desirable on projects to assist in identifying locations where the specific item is to be installed. The municipal/non-municipal, county-by-county, and state-by-state station locations are to be indicated in these Tabulation of Quantities tables, and quantities computed using these station as breakpoints. See DD-805. Earthwork will be computed by the cross sectioning method.

5. General Notes

   a. A table referencing Revised Standard Details will be included when necessary.

   b. See DD-704 for information concerning General Notes to be included in the contract plans.

6. Special Details

   a. Details not incorporated into the current approved Standard Details or Revised Standard Details are to be added to the contract plan assembly as Special Details.

   b. Special Details should be prepared and included, as necessary, to properly describe any items of the work not covered by an applicable Standard Detail or Revised Standard Detail.

7. Mass Haul Diagram

   See DD-705 for information concerning the preparation of the Mass Haul Diagram.

8. Survey Reference Points

   a. Aerial Photography Control: This sheet will show all Survey Reference Points which were set and utilized by the Designer to survey and set up the aerial photography control for the project. See DD-810 and the description in 8.b. below for more information concerning Survey Reference Points for aerial photography control.

   b. Conventional Surveys: This sheet will show all Survey Reference Points utilized for conventional surveys and aerial photography surveys. These Reference Points shall be shown individually, with a description of the point shown (hub and tack, ¾” rebar with cap, etc.). Each Survey Reference Point is to be referenced from at least three other points for future recovery or resetting of the point. Distances to the references are to be obtained and shown, and the references described (RR spike in power pole, “X” cut on sidewalk, etc.). Also, coordinates in the North (N), East (E), and Elevation (Z) format are to be indicated for each Survey Reference

Point. The West Virginia State Plane Coordinates System is to be utilized, when this information is available.

9. Geometric Layout

a. A separate Geometric Layout sheet(s) shall be provided depicting the following:

1) Construction centerline of the mainline roadway, intersecting roads, side roads, and interchanges.

2) Description blocks coinciding with the project description.

3) Equalities with symbols similar to plan sheet symbols.

4) Horizontal curve data for all curves, to include PI station, delta angle, radius (note that degree of curvature is not necessary), length of curve, length of tangent, and superelevation on circular curves; and on spiraled curves, spiral angle and spiral length, tangent offset and tangent distance, spiral offset from tangent and spiral distance on tangent, long spiral tangent and short spiral tangent, and spiral length of chord.

5) Stationing and bearings. Typically, centerlines and bearings are to be shown running south to north and west to east. However there are some existing roads in the State that run opposite from that convention as shown on the Straight Line Diagrams. In this case, the direction of the centerline stationing and bearings shall match that shown on these Diagrams.

6) Coordinates for all horizontal control points, such as Begin and End Project/Work stations; horizontal curve TS, SC, CS, ST, PC, PT, etc. points; intersecting centerlines and/or baselines points; or other pertinent points required to properly lay out the project by survey, shall be given, with North (N), East (E), and Elevation (Z) format. The West Virginia State Plane Coordinates System is to be utilized, when this information is available. This information can be shown in table format, if necessary.

10. Superelevation Tables and Diagrams

See DD-603 for information concerning superelevation tables and diagrams.

11. Interchange Grading Plans

See DD-623 for information concerning interchange grading plans.

12. Intersection Details

See DD-622 for information concerning the requirements for intersection details.

13. Temporary Traffic Control Plans

See DD-681 for guidance concerning the preparation of Temporary Traffic Control Plans.

14. Plan and Profile Sheets

a. General. Plan and profile sheets should be prepared at a scale adequate to show the necessary details as governed by the topography and the complexity of the work.

1) Plans should be drawn to one of the following horizontal scales: small - 1"=100', medium - 1"=50', large - 1"=20' or 1"=10', depending on the density of information to be shown on the plan sheets. The small scale of 1”=100’ is only to be used for design studies, and not for contract plans.

2) Profiles should be drawn to the same horizontal scale as the plan, but the vertical scale may be 10% or 20% of the horizontal scale.

b. Plans

1) The general highway plan should include:

a) The base line of the survey which, if practicable, should also be the centerline of the proposed roadway;

   i) When the centerline and the base line are not coincident, their relationship should be indicated,

   ii) Divided highways, where independent base lines are used, may be treated as separate roadways indicating only the general relationship between the two,

   iii) Special areas such as interchanges and safety rest areas should be shown with separate survey control lines, as necessary**.** Control lines on ramps are to run in the same direction as the centerline of the proposed roadway regardless of the direction of traffic flow,

   iv) Bearings on all tangents based on the West Virginia Coordinates System, when this information is available.

b) Stationing reading from left to right including equations of stationing;

c) Design data of curves, to include PI station, delta angle, radius (note that degree of curvature is not necessary), length of curve, length of tangent, and superelevation on circular curves; and on spiraled curves, spiral angle and spiral length, tangent offset and tangent distance, spiral offset from tangent and spiral distance on tangent, long spiral tangent and short spiral tangent, and spiral length of chord;

d) Proposed and existing rights of way and access control lines, easements, and special-use areas;

e) North arrow and bar scale;

f) Proposed and existing edges of pavement and shoulders;

g) Proposed and existing drainage features such as pipes, culverts, headwalls, manholes, inlets, etc., with the elevations of the top and all inverts shown;

h) Topography, existing streams with direction of flow indicated, railroads with the valuation baseline and stations shown, and other features such as existing roads, streets, and airports on or near the right of way when these items influence the proposed construction. Adjacent roadway shall be shown for 1000' - 1500' on major projects and for 500' - 1000' on minor projects at both the beginning and end of the project. Existing roadways and streets shall have a centerline with stationing established and shown on the plans, and the relationship of this centerline to any proposed centerlines is to be shown;

i) Incidental construction items such as erosion control provisions, guardrail, and retaining walls;

j) Amount and volume of materials available at known sources;

k) Existence of and disposition of all public utilities, buildings and appurtenant items, and any other obstruction or encroachment within the right of way or adjacent thereto if affecting the proposed construction. See DD-709 for information concerning buildings and appurtenant items disposition, DD-303 and DD-310 for information concerning railroad involvement and utility relocations, and DD-305 concerning water and sanitary sewer relocations;

  i) If not part of the project, their disposition should be included in the project records,

  ii) If part of the project, the plan should show the present and, if applicable, the proposed location including both horizontal and vertical positions and such additional details as may be needed to indicate the scope of work to be performed.

l) It is to be noted that on complex projects, a reference sheet showing the layout of the plan sheets and/or cross section sheets is desirable to facilitate the use of the plans.

c. Profiles

1) Profile grade represents the trace of the vertical plane intersecting the top surface of the wearing course, base course, or other surface along the designated profile grade line.

2) The existing ground line should represent the trace of a vertical plane intersecting the present traveled way or ground line along the designated centerline.

3) Profiles should show:

a) Proposed grade and existing ground lines;

i) When standard plan and profile sheets are used, surface elevations may be omitted and grade elevations shown at changes or gradient only,

ii) When plan sheets are used, grade and existing ground elevations should be shown,

b) Datum line;

c) Station ordinate lines;

d) Percentage of gradient;

e) Vertical and horizontal clearances and the cross section of the roadbed for railroads, highways, and stream beds under proposed and existing structures;

f) Identification of type and clearance under and over utility lines within the right of way;

g) Culverts, storm sewers, and underdrains.

h) Vertical curve data, to include the vertical PI station and elevation, vertical curve length, k value, and stopping sight distance available on crest vertical curves.

i) Cut/fill grading transition details. See DD-405, “Grading Transition Detail”.

15. Drainage Detail Sheets

a. Minor Drainage Facilities - Minor drainage facilities shall be defined as straight culverts less than 36" in diameter, erosion control structures, headwalls, inlets, and manholes. Detail plans for minor drainage facilities shall include the following (refer to the most current edition of the WVDOH Drainage Manual for more guidance concerning information to be shown on the contract plans):

1) Sufficient stationing and offsets to show the location and orientation to centerline.

2) All necessary elevations.

3) The intersection of straight culverts less than 36" in diameter with the centerline and each station shall be shown on the profile sheets and each affected roadway cross section.

4) Separate cross sections for structures such as sediment dams or sediment ponds.

b. Major Drainage Facilities - Major drainage facilities shall be defined as any culvert which has bends, culverts 36" in diameter or greater, and channel changes. Detail plans for major drainage facilities shall include the following (refer to the most current approved edition of the WVDOH Drainage Manual for more guidance concerning information to be shown on the contract plans):

1) Sufficient stationing and offsets to show the location and orientation to centerline.

2) All necessary elevations.

3) A profile along the centerline of the culvert or drainage structure showing the relationship between the existing ground line, proposed template, and the culvert or drainage structure, total length of the culvert or drainage structure, all necessary elevations, and utility locations.

4) The intersection of culverts or drainage structures with the centerline and each station shall be shown on the profile sheets and each affected roadway cross section.

5) Separate cross sections for culverts or drainage structures when the cost of excavation is not included in the cost of the culvert or drainage structure.

If all of the information listed above is shown elsewhere in the plans (plan sheets, profile sheets, standard details, etc.), separate detail plan sheets will not be required.

c. Storm Sewers – storm sewers are defined as a composite system of one or more sections of pipe or box culvert, or a combination thereof, generally connecting a series of inlets or manholes. Storm sewers are different from culverts in that they are usually longer and pick up additional water from inlets and intersecting storm sewers along its length. Refer to the most current edition of the WVDOH Drainage Manual for more information.

1) A profile of each storm sewer is required to be shown. This profile can be shown on its own profile sheet, or can be combined with the roadway profile sheets when the sewer runs along the centerline of the roadway (usually multilane divided roadways).

2) The hydraulic grade line developed in the drainage calculations should be shown on each storm sewer's profile.

16. Utility Relocation Plans

See DD-303, DD-305, and DD-310 for information concerning Utility Relocation Plans.

17. Erosion And Sediment Control Plans

See DD-250, "Dust Palliative" and DD-251, "Temporary Erosion Control".

18. Environmental Mitigation Plans

    Commitments for environmental mitigation features which are contained in the environmental documentation should be detailed as necessary and included in the project plans as special details and/or shown at the appropriate location in the plans. These plans will also include any necessary stream relocation plans, special planting plans, and any other plans deemed necessary to adhere to the environmental commitments made for the project. Also see DD-252, "Environmental Mitigation Items".

19. Traffic Sketch Maps

    See DD-802, "Traffic Sketch Maps" for information.

20. Pavement Marking Plans

    See the 300 series Traffic Engineering Directives for guidance concerning the preparation of Pavement Marking Plans.

21. Signing Plans

    See Traffic Engineering Directive 103-3, "Preparation of Contract Sign Plans".

22. Lighting Plans

    See Traffic Engineering Directives 101, "Guidelines for Highway Lighting" and 102-3, "Roadway Lighting Design".

23. Traffic Signal Plans.

    See the 400 series Traffic Engineering Directives for guidance concerning the preparation of Traffic Signal Plans.

24. Ownership Index

    See DD-301 for information concerning the preparation of the Ownership Index.

25. Property Maps

    See DD-301 for information concerning the preparation of Property Maps.

26. Soil And Geologic Information Plans

a. Location of borings, test pits, or other sites where subsurface investigations have been made are to be shown on the Soil and Geologic Information Plans; and

b. Location and depth of subsurface borings or test pits shall be shown (actual log or test results need not be shown, but a reference should be included indicating where this material may be viewed).

Also see DD-402 for more information concerning the preparation of Soil and Geologic Plans, and their inclusion into the contract plans.

27. Structure Plans per Order Of Station

Reference is made to Section 4, General Plan Presentation, of the latest approved edition of the West Virginia Division of Highways Bridge Design Manual and all addendums thereto, for guidance concerning information required on each sheet of each set of structure plans.

The structure detail plans are to be placed in the contract plans in the order of stationing, with the structure at the lowest station first, and so on. Structure plans shall be placed in the following order: bridge(s) first, followed by retaining wall(s), with box culvert(s) last.

28. Cross Sections

a. Cross sections shall be at a natural scale, i.e. the vertical scale will equal the horizontal scale.

b. Cross sections should be taken every 50' for rural projects, every 20' for urban projects, and at major changes in the existing ground line to determine accurately the character and extent of the proposed work.

c. Intersecting road cross sections, side road cross sections, and ramp cross sections shall be shown on mainline cross section sheets where possible. Where cross sections are provided on separate sheets, designers must check with mainline cross sections for accuracy. A quantity match line is to be placed on such cross sections to ensure quantity estimates are not duplicated or omitted.

d. Cross sections shall be placed in the following order: mainline cross sections first, followed by ramp cross sections (if applicable), with side road cross sections last.

e. See DD-705 for general information to be shown on the cross sections. Earthwork shall be computed by the average end area method. Additional information to be shown on the cross sections is as follows, but is not an all-inclusive listing: top and bottom of proposed surface (paved or otherwise) to include shoulders, free-draining base layer (if applicable), aggregate base layer (if applicable), bottom of subgrade layer (if applicable), drainage items such as culverts, wingwalls, ditches/linings, free-draining base trench if applicable, utility crossings and clearances, existing and proposed right-of-way limits, water bodies with edges of water shown, existing roadways with edges of pavement shown, existing structures within the proposed right-of-way, etc.

D. Contiguous Projects

A general plan or layout of contiguous construction projects that are to be constructed with either a different class of funds or by another agency should be included to show the location and effect of the work. (Such details and information necessary to establish their relationship to the project should be shown.) Also, smaller projects "broken out" of a larger design project should show enough information from the adjoining projects or any future project which will incorporate the work of the smaller project to establish their relationship with the work of the smaller project.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 702
SIGNING AND SEALING OF PROFESSIONAL WORK,
TITLE SHEET SIGNATURE BLOCK
October 1, 2020
Supersedes September 24, 2010

The intent of this directive to establish the Division of Highways (Division) procedures regarding signing and sealing engineering documents. Any person signing and sealing engineering work shall be a registered professional engineer in the State of West Virginia and fully knowledgeable of the publications noted below.

The designer and the responsible charge engineer are both referred to the West Virginia State Board of Registration for Professional Engineers publications "*WV Engineering Law Booklet* – April 2020*;*" *"WV Engineering Law (State Code – Chapter 30, article 13)* – As of March 2015*;" WV Engineering Law (State Rules – title 17, Series 1 – Examination, Licensure and Practice)* – As of April 2020*;"* and *"WV Engineering Law (State Rules – Title 7, Series 2 – Administrative Hearing Procedures)* – As of July 2004.*"* These publications are available at https://wvpebd.org/West-Virginia-Engineering-Law/West-Virginia-Engineering-Law .

Engineering work for and by the Division will adhere to these laws and legislative rules regarding the practice of engineering and the signing and sealing of documents.

Responsible Charge

In State Code §30-13-3(g) responsible charge is defined as:

> *"Responsible charge" means direct control and personal supervision of engineering work.*

Division Directors or District Engineer/Managers, when those individuals are a West Virginia Registered Professional Engineer, shall be the responsible charge engineer for work performed in their division/district. In the event a Division Director or District Engineer/Manager is not a West Virginia Registered Professional Engineer, then the duty shall fall to the next lower ranking person who is a West Virginia Registered Professional Engineer in the Section/Unit/Group where the engineering work is occurring. Consultants shall sign and seal professional engineering work submitted to the Division.

As standard practice, the person(s) who will have responsible charge of the engineering work shall be identified in the early stages of the project. In the event the person(s) having responsible charge cannot sign and seal their work, such work may be sealed by another professional, but only after a thorough review of the work to verify that the work has been accomplished to the same extent that would have been exercised if the work had been done under the direct control and personal supervision of the professional affixing the seal.

Documents

Generally, the final original document shall be signed and sealed. Contract plans shall be signed and sealed at the PS&E submission.

State Code §30-13-16 states the following about the types of documents that require signature and signing:

> *Whenever presented to a client or any public or governmental agency, the seal, signature and date shall be placed on all specifications, reports, drawings, plans, design information and calculations in accordance with rules promulgated by the board. The seal and signature shall be used by registrants only when the work being stamped was under the registrant's complete direction and control.*

Engineering work that has been produced over long periods by the Division, with no clear person(s) having responsible charge will not require signing and sealing. Examples include, but are not limited to, The Standard Specifications Roads and Bridges and supplements thereto and the Standard Details Volumes I thru III. Revisions to these documents will require signing and sealing.

Revisions

A revision of engineering work after documents have been signed and sealed is addressed in §7-1-7.3.c of the Legislative Rule:

> *Revisions shall be numbered, dated, initialed, and sealed by the registrant responsible for the revision.*

Revisions to engineering work during the construction phase shall be signed and sealed when the revisions change the design or impact previous engineering work or calculations. The engineer in responsible charge of the revisions shall sign and seal the changes. That person shall have direct control and personal supervision of the work and be responsible for engineering decisions regarding the change(s).

Value Engineering Change Proposals (VECP) and Practical Design Change Proposals (PDCP) are revisions to the plans. Such engineering revisions performed by the contractor or the contractor's agent require signing and sealing by the engineer responsible for the proposal.

It is highly recommended that the initial engineer in responsible charge be consulted for any significant change in scope. Not doing so places additional risk on the registrant signing and sealing revisions.

Right of Way Plans

Right of Way Plans are considered an engineering representation of the existing, proposed, or acquired right of way, depending on the submission. Right of Way plans prepared by or for the Division shall be sealed by the engineer in responsible charge of the RW-3 or RW-4 submission, as appropriate.

Title Sheet Signature Block

The attached title sheet signature blocks shall be used for all right of way plans and construction plans regardless if the construction is performed under contract or Division of Highways' Forces. The professional engineer signature and seal block on the consultant title sheets will be applied by the consultant.

All signatures, as per the attachments, will be by Division of Highways' personnel.

Occasionally there may be exceptions which will be handled on a project-by-project basis when approved by the appropriate Deputy State Highway Engineer.

Attachments

CENTRAL OFFICE and DISTRICT PROJECTS (INTERNAL DESIGN)
FULL-SIZE CONSTRUCTION and R/W TITLE SHEET

SIGNED: ______________________________
RESPONSIBLE CHARGE ENGINEER

DATE: ______________________________

RECOMMENDED: ______________________________
PROJECT ENGINEER

RECOMMENDED FOR APPROVAL: ______________________________
STATE HIGHWAY ENGINEER

APPROVED: ______________________________
COMMISSIONER OF HIGHWAYS

I HEREBY CERTIFY THAT THIS IS A CORRECT COPY OF THE PLANS OF PROJECT______________________________

____
EXECUTIVE SECRETARY

__________ **DAY OF** ________________, **20**______

CENTRAL OFFICE and DISTRICT PROJECTS (CONSULTANT DESIGN)
FULL-SIZE CONSTRUCTION and R/W TITLE SHEETS

RECOMMENDED: ____
PROJECT MANAGER

RECOMMENDED FOR APPROVAL: ____________________________
STATE HIGHWAY ENGINEER

APPROVED: ____
COMMISSIONER OF HIGHWAYS

I HEREBY CERTIFY THAT THIS IS A CORRECT COPY OF THE PLANS OF PROJECT____________________________.

____
EXECUTIVE SECRETARY

__________ **DAY OF** ________________, **20______**

CENTRAL OFFICE and DISTRICT PROJECTS (INTERNAL DESIGN)
8 1/2" X 11" TITLE SHEETS

WV DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PLAN OF PROPOSED IMPROVEMENTS OF
STATE HIGHWAY

PROJECT NAME: ____________________________ STATE PROJECT NO.: ____________________

FEDERAL PROJECT NO.: ____________________ COUNTY: _______________________________

LENGTH (mi): __________ COORDINATES: x = _____*DEG.*____*MIN.* y =____*DEG.*____*MIN.*

BEGIN TERMINI: _______________________ END TERMINI: ____________________________

TYPE OF IMPROVEMENT: __________________________________ EXISTING ADT: __________

"TRAFFIC CONTROL FOR STREETS AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS DATED ________________________________ SHALL APPLY TO THIS PROJECT."

SIGNED: _______________________________________
RESPONSIBLE CHARGE ENGINEER

DATE: _______________________________________

RECOMMENDED: ____
PROJECT ENGINEER

RECOMMENDED FOR APPROVAL: _______________________________________
STATE HIGHWAY ENGINEER

APPROVED: ____
COMMISSIONER OF HIGHWAYS

I HEREBY CERTIFY THAT THIS IS A CORRECT COPY OF THE PLANS OF PROJECT___________________________.

____
EXECUTIVE SECRETARY

____ DAY OF ________, 20______

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

703
PLAN REVISION BLOCKS
November 1, 1994

Plan revision blocks are to be shown on all sheets in the contract plans other than the cross sections. The block shall show the following information and conform to the dimensions of the example shown on the attached sheet.

1. Revision number.

2. Sheet number (all sheet numbers affected).

3. Revision (description).

4. Date.

5. By (person authorizing revision).

The block shall be located in the lower right corner of the sheet or as close as possible thereto.

The purpose of the "block" is to indicate revisions made to the plans after they have been approved for advertising. Any changes to the plans prior to that time will be considered as part of plan development and not noted as revisions.

All roadway plan revisions shall be listed in numerical sequence in the revision block beginning at the bottom for the complete set of roadway plans rather than for each sheet separately. The revision number and information shall be shown only on those sheets which are directly affected. The column identified as "sheet number" will show all sheets of the plans which are revised as a result of the change.

For ready reference and an aid to maintaining sequential numbering of the revisions, a summary sheet shall be kept for each set of roadway or bridge plans. This summary sheet could consist of an 8½" x 11" sheet on which all revisions are to be listed. A copy of the summary sheet will be utilized when submitting revised plan sheets to the Federal Highway Administration.

All bridge plan revisions shall be listed in numerical sequence in the revision block beginning at the bottom of the block for each sheet separately. The revision number and information shall be shown only on the sheet revised. The column identified as sheet number will be left blank.

Attachment

PLAN REVISION BLOCK

REVISION NUMBER	**SHEET NUMBER**	**REVISIONS**	**DATE**	**BY**

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

704
GENERAL NOTES
November 1, 1994

There have been many problems with the use of "Standard" General Notes. There is only one Standard General Note, which is as follows:

GENERAL NOTES

GOVERNING SPECIFICATIONS

The West Virginia Department of Transportation, Division of Highways, Standard Specifications Roads and Bridges, adopted _____, as amended by [the West Virginia Department of Transportation, Division of Highways, Supplemental Specifications, dated __________________, ______, ***NOTE: Use this only if applicable*** **the Contract Documents and the Contract Plans are the governing provisions applicable to this project.**

All other notes included in the plans under this heading must be specific to the project.

Notes are clarifications or revisions of Standard Specifications and specific interpretations for and directions to the contractor necessary for the construction and administration of a specific project.

Notes approved for prior projects shall not be used indiscriminately, because there may be conflicts between those notes and specific requirements, special provisions, plan details or notes shown elsewhere in the plans.

Each General Note must be revised by the project manager for its applicability to a specific project and carefully analyzed to determine its effect in the required construction and contract administration.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

705 **QUANTITIES** *July 10, 1995*

All items of work shall be summarized into schedules or tables and presented as such in the plans. Similar items should appear together, i.e. pipe with end sections, wingwalls or inlets; guardrail with guardrail end treatments; pavement with base and subbase, etc.

The Designer is instructed to follow the format of Attachment Number 1 for presenting earthwork quantities. This format is to be incorporated into the plans prior to submission of the plans at the final field review stage.

The format of the table can be readily adapted to all projects that have balanced or excess earthwork and sufficient material to meet the requirements for select embankment within the limits of the project.

An analysis of the Grading Summary Table in conjunction with the table showing the "Probable Source of Select Embankment" will readily reveal whether a borrow condition exists and, if so, whether the borrow must be "Unclassified Borrow Excavation," "Rock Borrow Excavation," or both. In either event, a second tabular computation will be required in the format shown on Attachment Number 2 and this computation is to be included in the plan.

The Designer is cautioned that the mass diagram for the project is to reflect the information shown in the Grading Summary only. No attempt shall be made to anticipate when or where the borrow quantities will be provided since this is the sole responsibility of the Contractor.

Quantities shall be shown on the cross-sections in the following manner:

1. Clearing and Grubbing - The limits of clearing and grubbing shall be shown on each cross-section. In cut sections where the existing ground slope adjacent to the clearing and grubbing limit is 2:1 or steeper and a substantial tree growth exists, an additional 10-foot wide strip shall be specified for "clearing only." These widths shall be shown on the cross-section sheets, along with the computed area between sections. The quantities shall be summarized on the plans in a table of quantities with a quantity shown for each 1,000 feet on the mainline and for individual segments of crossroads, ramps, etc. The area designated as "clearing only" shall be included in the calculations of clearing and grubbing. The limits of clearing and grubbing or "clearing only" shall be noted in the table whether to the construction limits or to the right of way line.

2. Seeding and Mulching - The width to be seeded shall be shown on each cross-section with the area shown between sections. The areas shall be summarized on the plans in the same manner as for Clearing and Grubbing in Item 1 above.

3. Earthwork - The earthwork areas shall be shown on each cross-section for excavation and embankment. The excavation and embankment shall show make-up of end area such as amount of unsuitable material, select embankment, etc. Items such as Special Rock Fill, Rock Borrow, etc., shall also be shown. The volume between stations shall be indicated.

Attachments

GRADING SUMMARY									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LOCATION	TOTAL UNCLASSIFIED EXCAVATION ITEM 207-1	UNSUITABLE EXCAVATION	SUITABLE EXCAVATION	SHRINK OR SWELL FACTOR	ADJUSTED EXCAVATION	UNCLAS-SIFIED EMBANKMENT	SELECT EMBANK-MENT	TOTAL EMBANK-MENT	EXCESS (+) OR BORROW (-)
STATION TO STATION	CY	CY	CY		CY	CY	CY	CY	CY
255+00-260+00	40,539	2,349	38,190	1.08	41,245	4,341	6,511	10,852	+30,393
260+00-265+00	36,182	871	35,311	1.08	38,136	10,507	7,493	18,000	+20,136
265+00-270+00	4,887	0	4,887	0.85	4,154	20,632	9,924	30,556	-26,402
270+00-275+00	5,388	0	5,388	0.85	4,580	35,506	2,709	38,215	-33,635
Conn. Rd. 274+10 Rt.	385	0	385	0.85	327	180	0	180	+147
275+00-280+00	1,324	0	1,324	0.85	1,125	34,493	5,698	40,191	-39,066
280+00-285+00	6,640	0	6,640	1.08	7,171	20,244	2,174	22,418	-15,247
285+00-290+00	11,878	0	11,878	1.08	12,828	12,248	1,681	13,929	-1,101
290+00-295+00	2,866	0	2,866	1.08	3,095	4,830	4,637	9,467	-6,372
295+00-300+00	16,830	542	16,288	1.08	17,591	15,552	9,552	25,104	-7,513
TOTAL	126,919	3,762	123,157		130,252	158,533	50,379	208,912	-78,660

See Attached Sheet for Explanation of Columns

ATTACHMENT NUMBER 1

EXPLANATORY NOTES FOR COLUMNS NUMBERED ( ) ON GRADING SUMMARY

Column (1)	This quantity is measured from the cross-sections. Quantity includes, but is not limited to, excavation of unsuitable material, excavation for fill benching and the excavation required for the placement of select embankment for channel linings. This column indicates the ultimate estimated pay quantity for Item 207-1, "Unclassified Excavation," per cubic yard.
Column (2)	This quantity is delineated on and measured from the cross-sections.
Column (3)	Total obtained by subtracting Column (2) from Column (1).
Column (4)	This factor is 1 plus or minus the decimal equivalent of the percentage that is shown in the soils report for the project. Plus will be for swell and minus for shrink. This value may influence the station limit selection used in the table.
Column (5)	This total is the product of Column (3) multiplied by Column (4).
Column (6)	Measured from cross-sections.
Column (7)	Measured from cross-sections.
Column (8)	This quantity obtained by adding Columns (6) and (7).
Column (9)	This quantity is the difference between Columns (5) and (8), giving proper attention to and indicating the sign.

TOTALS for Columns (1), (2), (3), (5), (6), (7) and (8) are forthright summations; however, the total for Column (9) is an algebraic summation.

BORROW COMPUTATIONS

Select Embankment Required (From Grading Summary) =	50,379 CY
Select Embankment Available (From Table "Probable Source of Select Embankment") =	25,000 CY
Select Embankment Needed =	25,379 CY
Rock Borrow Excavation Required To Meet Select Embankment Requirements with *15% Swell Factor:	
Item 211-2, Rock Borrow Excavation = $\frac{\text{Select Embankment Needed}}{1+0.15}$ =	22,069 CY
Unclassified Embankment Required (From Grading Summary) =	158,533 CY
Adjusted Excavation (From Grading Summary) =	130,252 CY
Select Embankment Available (From Table "Probable Source of Select Embankment") =	25,000 CY
Embankment Needed =	53,281 CY
Excavation Required to Meet Embankment Requirements with *10% Shrink Factor:	
Item 211-1, Unclassified Borrow Excavation = $\frac{\text{Embankment Needed}}{1-0.1}$ =	59,201 CY

ATTACHMENT NUMBER 2

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-706
GUIDELINES FOR PREPARATION OF PROJECT PLANS, SPECIFICATIONS, AND ESTIMATES (PS&E) SUBMITTALS
February 19, 2016

The following are guidelines for the preparation and assembling of PS&E (Plans, Specifications and Estimate) submittals for projects developed or processed by Divisions (including all Districts projects) under the **State Highway Engineer**. It should be noted that other Design Directives are referenced to and hereby considered a part of this DD that pertain to similar subject matter and are more precise than these guidelines. They are referenced for clearer understanding of the preparation of items required to be submitted.

A checklist for developing the PS&E submittal package is attached to and made a part of this Design Directive. This checklist shall be used for all projects.

Attachment

I. DEFINITIONS

A. Engineers Estimate. The predicted project cost at the time of receipt of bids developed from a knowledge of the costs for materials, labor, and equipment required to perform the necessary items of work.

B. Contract Plans. The contract drawings which show the locations, character, and dimension of the prescribed work, including layouts, profiles, cross sections, and other details.

C. Required Contract Provisions. Those provisions required by law or regulation of the various jurisdictions involved in funding projects and administering contracts for construction projects.

D. Special Provisions. Specifications for specific items or details applicable to the individual project and which are not covered in the Standard or Supplemental Specifications.

E. Pre-PS&E Submission. A submission made to the FHWA on Full Oversight projects to allow for their informal review and comment. This submission will include the completed contract plans and any project-specific Special Provisions and is intended to make the subsequent official submission to the FHWA as complete as possible.

F. Specifications. The compilation of provisions and requirements for the performance of prescribed work.

G. Standard Details. Drawings approved for repetitive use showing details to be used where appropriate. Included are Revised Standard Details that are to be referenced by revision date as appropriate.

H Special Details. Modifications to a Standard Detail drawing, or any detail drawing required to describe an item of work not covered by a Standard Detail drawing.

I. Standard Specifications. A book of Specifications approved for general application and repetitive use.

J. Supplemental Specifications. Approved additions and revisions to the Standard Specifications.

K. Working Time Calendar. A bar chart completed by the designer showing the estimated time required for a contractor to complete a construction contract. See DD-803.

II. PLANS

A. **Contract Plans**. Contract Plans are instructions using drawings containing engineering data or details pertaining to geometrics, drainage, structures, soils and pavements, and other appurtenances. See DD-701, Contract Plan Presentation, for further information concerning the preparation of Contract Plans.

1. Plans should not encompass material that is properly a part of the Standard or Supplemental Specifications, Special Provisions, or Standard Details.

2. The original drawings should be on standard sheets conforming to modern, accepted drafting practices or aerial photograph base maps. (See DD-701)

3. Straight-line plans may be used provided they give sufficient information to properly complete the project. (See DD-701)

B. Right of Way Plans

See DD-301 for information on preparation of right of way plans.

III. SPECIFICATIONS

Specifications contain the written instructions for constructing highway projects, outlining in detail a description of the work, materials, construction methods, method of measurement, and the basis of payment for each item of work involved in the contract.

A. Standard Specifications

Since every construction project involves subjects or items that occur repeatedly, standard specifications setting forth provisions and requirements applicable to the construction of highway projects have been prepared.

B. Supplemental Specifications

1. Supplemental Specifications are specifications developed subsequent to the publication of the Standard Specifications to cover new or additional construction items or substantial changes regarding items included in the Standard Specifications.

2. Supplemental Specifications will be printed and bound from time to time depending upon when the Standard Specifications are updated.

C. Special Provisions

1. Special Provisions are specifications for governing all matters applicable to the individual project and, therefore, are not covered in the Standard or Supplemental Specifications.

2. Special Provisions should be held to a minimum and, as much as possible, applicable Standard or Supplemental Specifications should be utilized.

3. Commitments for environmental mitigation which are contained in the environmental documentation should be incorporated into the project as Special Provisions.

4. Special Provisions should be in printed, copied or other acceptably reproducible form. Each Special Provision to be utilized in the project is to be listed in the appropriate place on the PS&E Checklist.

IV. ESTIMATES

A. The Engineer's Estimate shall be prepared and reviewed carefully to reflect as realistically and accurately as possible the expected costs of the work at the time of receipt of bids. (Also see DD-707.)

B. Consistent and compatible procedures for the preparation, review, and updating of estimates shall be followed.

1. The unit prices used for estimates, and corresponding actual unit bid prices when available, for the preceding 12 months should be reviewed to determine if changes in estimated unit prices are needed to reflect any trends that have occurred.

2. The estimate should reflect prices that are realistic for the areas, times, and characteristics of the work to be done (regional adjustment and seasonal adjustment are especially important, as is size of the project).

3. Incentive/disincentive or escalation clauses should be considered in determining the estimated unit costs since such clauses may affect the estimate considerably. (See DD-708)

4. Other factors that can affect the estimated cost of a project, such as labor rates, equipment rates, interest rates, time to complete, competition levels, and material shortages, should be considered and estimated costs adjusted as necessary.

5. Bid price data bases should be current at the time of estimate preparation and at the time of advertisement.

C. Estimates should include an item number, description of the item, estimated quantity, unit, and price for each proposed item of work.

D. For accounting purposes, the Engineer's Estimate should identify separately:

1. Municipal and Non-Municipal quantities are <u>not to be shown</u>, but are to be broken down by the contractor in accordance with DD-805.

2. State-by-state breakdown;

3. Tabulations of items coded on the basis of the predominant Improvement and Construction Type Code. For applicable code numbers, see the most recent code numbers provided in the AASHTO Trnsport software, to be used when preparing the Engineer's Estimate.

E. Engineering and Contingencies (E & C) will be shown for each category of work, and then summed.

V. REQUIRED CONTRACT PROVISIONS

A. Federal, state, and local agencies have certain required contract provisions covering employment, records of materials and supplies, subletting or assigning the contract, safety, false statements, termination, nonsegregated facilities, and environmental requirements among others that are to be included in contracts for construction projects.

B. Because requirements may change on short notice, required contract provisions should not be included in bound books of general specifications.

VI. PS&E CONTENT

PS&E assemblies should include:

A. Complete sets of plans;

B. Special Provisions;

C. Engineer's Estimate;

D. Right-of-Way Certificate and Status of Utilities Report from the Engineering Division;

E. Approved agreements with railroads, utilities, and municipalities, if not previously submitted;

F. Applicable permits;

G. For projects which include outside funding, written documentation from the outside agency confirming the authorization to advertise. (i.e. other states, boards of education, private developers, etc.);

H. The completed current PS&E Checklist as maintained by the Engineering Division and attached to and made a part of this DD; and

I. Working time calendar.

VII. PS&E ASSEMBLY AND PROCESSING

The Project Manager or Designer shall assemble and submit the material listed in Section VI to the Contract Administration Division's PS&E Section for processing of the PS&E package.

The processing of the PS&E package will vary based on whether the project is Full FHWA Oversight or Delegated.

The steps to be followed and the estimated time required in working days for processing the PS&E package for each type of project are shown in the following tables:

PS&E ASSEMBLY AND PROCESSING

FULL FHWA OVERSIGHT FEDERAL-AID PROJECTS

	REQUIRED ACTIVITY	Estimated Number of Working Days
*a.	Completed contract plans and project specific Special Provisions are reviewed by the Project Manager or Designer. A "pre-PS&E" submission of completed contract plans and project specific Special Provisions will be made to the Federal Highway Administration (FHWA) at this time for their informal review and comment. The number of sets of plans and Special Provisions is to correspond with the number required for the "Half-Size PS&E Plans" submission in the Plan Distribution Schedule in DD-202.	20 days
*b.	The "pre-PS&E" comments from the FHWA are reviewed by the Project Manager or Designer. Any necessary revisions are made at this stage by the consultant and resubmitted to the Project Manager, or the revisions to the contract plans and project specific Special Provisions are made by the Designer if the project is In-House or District-designed.	
*c.	The PS&E Package is submitted to the Contract Administration Division's PS&E Section for the preparation of the official submission of the proposal, plans, and estimates to FHWA for approval of authorization to advertise for receipt of bids. If construction cost is more than $250,000.00, Equal Employment Opportunity Division reviews the project for possible DBE goal.	
*d.	Programming Division prepares and submits to FHWA all required financial data to complete the Funding Authorization Request.	
*e.	Contract Administration Division's PS&E Section assembles the Contractor's Bidding Proposal. The appropriate number of copies of bidding proposals and sets of plans are prepared.	
f.	The Contractor's Bidding Proposal, Contract Plans, Right of Way Certificate, Signed Detailed Estimates, and Chart for Estimating Contract Time are formally submitted to the FHWA.	1 day
g.	FHWA reviews PS&E and gives written comments to Project Manager or Designer.	10 days
h.	Comments are reviewed by Project Manager or Designer. All responses to comments and necessary revisions are returned to FHWA for approval of PS&E.	10 days

i.	FHWA will authorize funding and give approval to Programming Division to advertise the project for the next available letting once the PS&E package is complete and ready to advertise.	2 days
j.	Programming Division contacts Contract Administration Division to advertise for receipt of bids for the next available letting.	2 days
**k.	An amendment for an advertised project: The Project Manager or Designer revises the plans, specifications, and detailed estimate of cost as required. These revisions are then given to Contract Administration Division's PS&E Section for the assembling of the amendment and the preparation the amendment directive that incorporates all proposal and plan revisions. **These revisions must be submitted to Contract Administration Division's PS&E Section a minimum of 14 calendar days prior to the letting to allow for the preparation and submission of the amendment to FHWA for approval 12 calendar days prior to the advertised letting date.** Amendment revisions must be printed and given to Contract Administration Division to mail to all contract plan holders a minimum of 7 calendar days prior to the advertised letting date.	14 days (Not included in the Total Time below)
**l.	Time between advertisement and letting (28 calendar days has been assumed to be 20 working days for the purpose of this table)	20 days (Minimum)

*, ** Performed simultaneously TOTAL 65 DAYS

STATE FUNDED AND DELEGATED FEDERAL-AID PROJECTS

	REQUIRED ACTIVITY	Estimated Number of Working Days
*a.	Completed contract plans and project specific Special Provisions are reviewed by the Project Manager or Designer. Any necessary revisions are made at this stage.	15 days
*b.	PS&E package is submitted to Contract Administration Division's PS&E Section for advertising for receipt of bids. If construction cost is more than $250,000.00, the project is reviewed by Equal Employment Opportunity Division for a possible DBE Goal (Federal Aid Projects Only).	
*c.	Programming Division reviews the project's financial data in this submission to ensure it is complete and in accordance with the Federal Aid Funding Requirements. For State Funded Projects the submission is reviewed to ensure it is in accordance with the State Funded Program Requirements.	
d.	When the Right of Way Certificate is available, the PS&E package and the Contractor's Bidding Proposal are assembled.	3 days
e.	Programming Division prepares and submits to FHWA all required financial data to complete the Funding Authorization Request, for an exempt Federal-Aid project.	2 days
f.	The advertising memo and signed BF-98 are prepared for Contract Administration to advertise for receipt of bids for the next available letting. The signed detailed estimate is given to the Deputy State Highway Engineer/Development for final approval of cost.	1 day
g.	Programming Division verifies project cost to be in accordance with the funding request. The package is hand carried to the Deputy State Highway Engineer/Development for approval to advertise for receipt of bids.	3 days
h.	When funding is approved by FHWA or the State itself, Programming Division contacts Contract Administration Division to advertise the project for receipt of bids in the next available letting once the PS&E package is complete and ready to advertise.	3 days

**i.	An amendment for an advertised project: The Project Manager or Designer revises the plans, specifications, and detailed estimate of cost as required. These revisions are then given to Contract Administration Division PS&E Section for the assembling of the amendment and the preparation the amendment directive that incorporates all proposal and plan revisions. **These revisions must be submitted to Contract Administration Division's PS&E Section a minimum of 12 calendar days prior to the letting to allow for preparation and printing of the amendment.** Amendment revisions must be printed and given to Contract Administration Division to mail to all contract plan holders a minimum of 7 calendar days prior to the advertised letting date.	12 days (Not included in the Total Time below)
**j.	Time between advertisement and letting (21 calendar days has been assumed to be 15 working days for the purpose of this table)	15 days (Minimum)

*, ** Performed simultaneously TOTAL 42 DAYS

VIII. DATE OF PS&E SUBMISSION

Federal regulations [23 CFR 635.112(b)] require that all Federal-aid contracts be advertised for a minimum 3-week advertisement period prior to a scheduled letting and the contract documents are available for distribution at least 3 weeks prior to the letting.

The Division of Highways policy is to advertise Federal-aid projects at least 4 weeks, and preferably 5 weeks, prior to letting with contract documents available at least 4 weeks prior to the letting.

State law requires that State projects be advertised for a minimum 2-week advertisement period prior to a scheduled letting and the contract documents are available for distribution at least 2 weeks prior to the letting.

The Division of Highways policy is to advertise 100% State funded projects at least 3 weeks, and preferably 4 weeks, prior to the letting with contract documents available at least 2 weeks, and preferably 3 weeks, prior to the letting.

When pre-bid conferences are necessary, these time limits should be increased by 2 weeks to allow adequate time for review by interested contractors prior to the pre-bid meeting and to allow adequate time for issuance of amendments prior to the letting. See DD-104 for more information concerning pre-bid conferences.

To conform with this policy, the Project Manager or Designer shall submit the material listed in Section VI to the Contract Administration Division's PS&E Section to allow adequate time for assembly and processing of the PS&E package as shown in Section VII and to allow adequate time for printing (3 working days).

The material listed in Section VI shall be submitted as indicated below:

Full FHWA Oversight Federal-aid Projects - minimum 65 days prior to the letting.

Full FHWA Oversight Federal-aid Projects - minimum 75 days prior to the letting (With pre-bid conference).

State Funded and Delegated Federal-aid Projects - minimum 42 days prior to the letting.

State Funded and Delegated Federal-aid Projects - minimum 52 days prior to the letting (With pre-bid conference).

All days are working days unless otherwise indicated.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PS&E DOCUMENTATION CHECKLIST
February 19, 2016

State Project Number: ____________________

Federal Project Number: ____________________

Project Name: ____________________

County: ____________________

Project Manager: ____________ PS&E'd By: ____________

Telephone Number: ____________ Telephone Number: ____________

DD (DDR or DDI) Section Head Signature: ____________________
(Applicable to DD Projects)

Type of Funding with Percentage: FHWA: ____________ State: ____________

Engineering Authorization Number: ____________________

Is project on the latest approved STIP? ______ Yes ______ No

Geotechnical Report CD Required: ______ Yes ______ No

MATERIAL TO BE FURNISHED TO CONTRACT ADMINISTRATION DIVISION'S PS&E SECTION
(Note: All material is to be submitted in .PDF format

All Projects	BY	DATE
1. One set of Plans in .PDF format.		
2. For All Projects - One copy of the detailed estimate, in .PDF format, to be signed by the Responsible Charge Engineer or Project Manager, and Estimate Preparer - for review by FHWA, Contract Administration Division, and DBE.		
3. One copy of the Project Specific Special Provisions, in .PDF format.		
4. One set of working day calculations, and if applicable, one set of the I/D Special Contract Provision and backup data, in .PDF format.		
5. One copy of the executed project agreement, if applicable, in .PDF format.		
6. All applicable Permits, in .PDF format.		
7. Completed Americans With Disabilities Act Exceptions Justification Report (if applicable, in .PDF format).		
8. Completed PS&E Checklist in .PDF format.		

PLANS	BY	DATE
1. Title Sheet signed by all parties.		
2. Design Exceptions shown on Title Sheet.		
3. Revised Standard Drawings Used are listed on General Notes Sheet.		
4. Necessary Special Detail Sheets included in Plans or listed.		
5. Summary of Quantities in plans agrees with Proposal Quantities.		
6. Summary of Quantities has been carried from Plan Tables, including the Bridge Quantity table.		
7. Design Designation is current and agrees with Program Information.		
8. General Notes Sheet is in Plans; the notes have been reviewed and are applicable to the project.		
9. The proper Standard Detail Books are shown in the Standard Details General Note.		
10. Bench Marks and Survey Reference Points are shown on the Plans.		
11. The length of the project is shown on the Title Sheet, (separated into bridge and roadway, and total length).		
12. Typical Sections are shown for every roadway and situation encountered in the project.		
13. Typical Sections agree with pavement design.		
14. Current specifications called for.		
15. Grading Quantities as per DD-705.		
16. Line, grade, typical section, and waterway opening included for a temporary bridge.		
17. North Arrow shown on Plan Sheets.		
18. Bar Scale shown.		

MAINTENANCE OF TRAFFIC	BY	DATE
1. Temporary Traffic Control Plan included.		
2. Temporary Traffic Control Plan has been approved by Traffic Engineering.		

RIGHT OF WAY	BY	DATE
1. Right of way shown on the Construction Plans agrees with the Right-Of-Way Plans.		
2. Right of Way Plans submitted to the Right of Way Division (DR), requesting Right of Way Certificate, Staus of Utilities Certificate, and Hazardous Waste Certificate. If Right of Way is not required, a memo to DR stating no Right of Way is required along with a copy of the Title Sheet.		
3. Right of Way Certification received.		
4. Status of Utilities Certification received.		
5. Hazardous Waste Certification received.		

UTILITIES	BY	DATE
1. Encountered utilities are shown on the Title Sheet.		
2. All utility relocations and other dispositions are shown on the Plans.		
3. Division of Health and owner(s) have approved water and/or sewer lines to be relocated by the project.		

LIST OF UTILITIES TO BE RELOCATED	RELOCATIONS SHOWN ON PLANS (Yes or No, Date if Yes)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

ESTIMATES	BY	DATE
1. Quantities are the same as in the Summary of Quantities Table in the Plans.		
2. On Job Training item and quantity included in accordance with DD-814 for Non 3R projects with a cost estimate over $2,000,000 and contract time greater than 12 months.		
3. Appropriate Type Codes from the AASHTOWare Project Estimation/Preconstruction software are shown.		
4. The length of the project agrees with the length shown on the Title Sheet.		

PROPOSAL	BY	DATE
1. Schedule of Prices agrees with plans and the Engineer's Estimate.		
2. Final Working Day calculations in accordance with DD-803.		
3. List of Project-Specific Special Provisions is included (See below). See DD-820 for guidance.		

PROJECT-SPECIFIC SPECIAL PROVISIONS TO BE INCLUDED IN THE PROPOSAL

NO.	NAME	SPECIAL PROVISION APPROVAL DATE

ENVIRONMENTAL	REQUIRED?		BY	DATE
	Y	N		
1. Categorical Exclusion.				
2. Environmental Asessment (FONSI).				
3. Final EIS/Record of Decision.				
4. Reevaluation (for Final EIS only).				
5. Section 4(f).				
6. *Section 106 (Cultural Resources) clear.				
7. *Endangered Species (plant or animal) clear.				
8. Wetlands clear.				
9. Hazardous Waste clear.				
10. ** Construction noise restrictions (10:00pm to 6:00am).				
11. Farmland impacts.				
12. Floodplain impacts.				
13. Residential or business relocation impacts.				

* - These items must be clear in order to obtain the USACOE's 404 Permit.
** - If yes, then indicate on the General Notes sheet.

PERMITS APPROVED (If Required)	REQUIRED?		BY	DATE
	Y	N		
1. Corps of Engineers' 404 Permit				
2. Bureau of Public Health				
3. Coast Guard				
4. *NPDES permit				
5. Flood Plain Coordination Letter				

* Required if project will have more than 1 (one) acre (0.42 hectares) of land disturbing activities. The project's Clearing and Grubbing area may be used for this determination.

REVIEW HISTORY										
REVIEW	BY	DATE	COMMENTS RECEIVED (DATE)				COMMENTS ADDRESSED (DATE)			
			DC	DIST.	FHWA		DC	DIST.	FHWA	
Preliminary Field										
Final Field										
Final Office										

Copies of all written comments and written responses shall be included in the PS&E Package.

District-designed projects shall be submitted to the Engineering Division with a cover memorandum stating that the project plans have been reviewed by the District Construction and Maintenance Sections and all comments have been resolved. This memorandum shall be signed by the Assistant District Engineer - Construction, Assistant District Engineer - Maintenance, and the District Engineer.

AMOUNT TO BE USED FOR ENGINEERING AND CONTINGENCIES IN COST ESTIMATING	
Federal-Aid Projects	
Projects greater than $5 million	9% + 4% = 13%
Projects less than $5 million	
Bridge Construction	15% + 4% = 19%
Roadway Construction	9% + 4% = 13%
Resurfacing (3R and 4R)	9% + 4% = 13%
Other types of projects	15% + 4% = 19%
ER Projects	
FEMA Projects	
Signing Projects	
Lighting Projects	
Guardrail Projects	
Traffic Signal Projects	
APL Projects	
Piling Projects	
State-Funded Projects	
Bridge and Roadway Construction	9% + 4% = 13%
Resurfacing	6% + 4% = 10%

NOTE: The First % is for Construction Engineering.
The Second % is for Contingencies.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-707
DEVELOPMENT OF ENGINEER'S ESTIMATE
February 19, 2016

Attached for your use is the Division of Highways Procedure for Development of Engineer's Estimates for Highway Construction Projects. It shall be used for all construction projects.

Attachment

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PROCEDURE FOR

DEVELOPMENT OF ENGINEER'S ESTIMATES FOR HIGHWAY CONSTRUCTION PROJECTS

Purpose

To establish and document a procedure for the development of an Engineer's Estimate (EE) of the anticipated cost of a highway construction project.

Application

This procedure will be used on all projects, including federally funded and non-federally funded, that are developed and advertised for construction.

Definitions

1. Engineer's Estimate (EE) – A detailed estimate of cost including engineering and contingencies prepared by the PS&E Unit using the software described in #4 below, based on the facility to be constructed, which should reflect the anticipated cost of the construction project and which can be used to evaluate the acceptability of bids received.

2. Engineering and Contingency (E&C) – An amount included in each Engineer's Estimate to reflect the cost of construction engineering and nominal cost of unforeseen contingencies that might occur during construction.

3. Bid Items – Contract construction bid items identified and specified in the contract documents for the contractor to assign bid unit costs in submitting his bid for construction of the project.

4. AASHTOWare Project Estimation/Preconstruction – The Divisions' computer software program for developing Engineer's Estimates and analyzing bids received for all highway construction projects.

5. Historical Unit Bid Prices – Historical data of bid prices received. The Division of Highways' Contract Administration Division publishes annually a publication entitled *Average Unit Bid Prices* which provides historical data for unit bid prices received for all highway construction items.

Process Steps

1. Upon completion of the construction drawings and specifications, the division or district responsible for development of the project will prepare the Engineer’s Estimate. Where more than one division is involved in developing the project, each division will provide assistance to the responsible division in preparing the Engineer’s Estimate by providing estimated quantities and unit prices for each Bid Item used in their portion of the project.

2. The Engineer’s Estimate will be prepared using the AASHTOWare Project Estimation/Preconstruction software system.

3. The Engineer’s Estimate will be prepared using unit costs based on the historical unit bid prices from Contract Administration Division’s publication entitled *Average Unit Bid Prices* as the basis for estimating costs, modified as appropriate based on the following:

    A. Location – The geographic location within the State can present problems that can increase the unit bid prices for some items. For example, a project located a great distance from a concrete supplier might be expected to command a higher unit bid price for concrete than would a project located near a supplier. Projects located in remote areas away from available lodging facilities might command generally higher unit bid prices than projects located near adequate lodging facilities.

    B. Access – The size and type of highways and the availability of rail access to the site may affect the unit bid price.

    C. Complexity – The complexity of a project will affect unit bid prices and must be considered in assigning unit prices.

    D. Time of Year – The time of year that construction must be performed can have a significant impact on unit bid prices. For example, it would be expected that unit bid prices for concrete required to be placed in winter months would be higher than for concrete placed in summer months.

    E. Contractor Availability – The availability of contractors in the bidding area to perform the proposed type of construction work must be considered. There are a limited number of contractors equipped to do some specialty type construction such as deck overlays and if there are more projects advanced to construction than there are available contractors, the unit bid prices can be expected to be higher than normal.

    F. Completion Date – The amount of time allowed in the contract for completion of the project will have a significant effect on unit bid prices and must be considered in assigning unit bid prices. When the project contains an incentive/disincentive clause the unit bid prices will need to be adjusted.

G. New Bid Items – New bid items may be encountered for which there are no historical unit cost data. In this case the designer will have to seek advice from other available sources in regard to costs and/or prepare independent unit bid prices from estimates of labor, equipment, materials and profit costs.

H. Estimate Update – The project manager shall review the Engineer's Estimate within the two-week period prior to the scheduled bid opening date and determine if any of the unit bid prices need to be adjusted. If any changes are made then a revised EE should be printed and submitted.

The above items should be carefully considered using good judgment in assigning unit bid prices. The resultant Engineer's Estimate should be the expected fair market price for performing the specified work within the time allotted and under the conditions expected during the life of the construction project. The estimate should provide a satisfactory basis for comparison with the bid prices received and for making a decision on the suitability for award of the contract.

4. Upon completion of the Engineer's Estimate the estimate will be printed, processed for signatures and confidentially filed in accordance with current procedures for processing estimates.

5. Upon opening of bids, the bids will be tabulated and compared to the estimate for Management's use in making a decision on award of the contract.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-708
GUIDELINES FOR DEVELOPMENT OF THE
INCENTIVE/DISINCENTIVE (I/D) CONTRACT PROVISION
October 1, 2003

The above procedure is a guideline to follow for determining I/D payments and is subject to change during preparation of the I/D Special Provision. The designer preparing the special provision shall use this guideline to prepare a logical document that includes all assumptions and calculations that can be reproduced.

This material becomes the backup information to support the I/D Special Provision and becomes part of the project file maintained in the Engineering Division. For Federal-aid exempt projects, the Deputy State Highways Engineer-Development will review and approve the time and amount calculation. On non-exempt Federal-aid projects, the time and amount calculations must be submitted to FHWA for review and approval.

Attachment

GUIDELINES FOR DEVELOPMENT OF THE
INCENTIVE/DISINCENTIVE (I/D) CONTRACT PROVISION

An incentive/disincentive (I/D) contract provision used in a project is a method to compensate a contractor a fixed amount of money for each day identified critical work is completed ahead of schedule. Also, it assesses a deduction for each day the contractor overruns the time allotted for the completion of identified critical work.

An I/D provision is an effective method to motivate the contractor to complete projects or portions of a project faster than normal. Typically, their use should be limited to those projects whose construction will severely disrupt highway traffic resulting in significantly increased road user costs. These increased road user costs can be determined by the prediction of higher travel time and vehicle operating costs through the work zone or along a detour route. If an I/D provision is used, the minimum increase in road user costs should be approximately $5,000 per day and ideally should be more than $10,000 per day. This minimum increase in road user costs will usually occur on projects with four or more lanes, an average daily traffic (ADT) of 25,000 vehicles or more per day, and continuous lane closures during the 12 peak volume hours. The minimum increase in road user costs may also occur on projects that have a minimum ADT of 15,000 vehicles per day and require all traffic to be detoured due to the closure of the roadway or a bridge.

There may be other projects that warrant inclusion of an I/D provision in the contract which do not meet the requirements stated above. Examples of these projects would be projects whose construction would affect access to critical facilities such as schools, hospitals, or major businesses. This type of project would require special methods to calculate the I/D time and the I/D amount, which would vary with each project. These calculations will not be addressed in this directive. Should the designer encounter a project with these special conditions, the inclusion of an I/D provision will be determined by the Deputy State Highway Engineer-Development and the Traffic Engineering Division.

During the preliminary field review on a project that involves a four-lane highway that has an ADT of 25,000 or more, a determination will be made by the Project Manager whether a continuous lane closure for the 12 peak hours will be required. This determination will be made by review of the interrelation of physically constructing the project and maintaining traffic. If the continuous lane closure appears to be unavoidable, the Project Manager shall make a recommendation for further review by Traffic Engineering Division for a preliminary determination of road user costs. A recommendation to include an I/D provision in the contract will be made by Traffic Engineering Division to the Deputy State Highway Engineer-Development and, if applicable, to the Federal Highway Administration (FHWA) on non-exempt projects. If the recommendation for inclusion of an I/D provision is approved, then an I/D task force for the project shall be formed. This I/D task force will have the duty of writing the I/D Special Provision with all associated backup data. The task force will also review the plan development to assure that the critical work to which the I/D provision will be applied is clear and can be managed. The task force will be composed of representatives from Engineering Division (usually Project Manager), Contract Administration Division (Central Office or District Office), Traffic Engineering Division, and if applicable, FHWA.

The same procedure as above will be followed starting at the preliminary field review for projects on highways with an ADT of 15,000 or more that involve the closure of a bridge or road with a resulting one-lane detour or a detour of more than two miles in length, projects that complete a gap in the highway system, or projects which replace major bridges that are out of service.

The I/D task force will write the I/D Special Provision using the following as a general guide:

1. Definitions of Incentive Payment and Disincentive Assessment

    a. When work is completed in fewer calendar days than are scheduled for traffic restricted operation, the contractor shall earn as an incentive a certain amount of money for each calendar day the work is completed ahead of the allowed number of calendar days.

    b. When work is not completed within the scheduled number of calendar days for restricted traffic operation, the contractor shall be assessed as a disincentive a certain amount of money for each calendar day the work exceeds the scheduled number of calendar days. The disincentive assessment is separate from the contract liquidated damage clause; consequently, in addition to the disincentive assessment, the contractor is still governed by the Standard Specifications in regard to liquidated damages for completion of the project.

2. Determination of Incentive/Disincentive Time

    a. A time analysis for each construction operation is developed by either Engineering Division following the guidelines in DD-803, Determination of Contract Completion Date.

    b. Non-critical construction operations that do not have significant impact on traffic are eliminated and not considered in the I/D time calculation. Examples of such operations are guardrail installation, cleaning and painting of structure, removal of median crossovers, seeding and mulching, and installation and removal of traffic control devices.

        The time estimated for the completion of critical operations is increased by 20% to allow for inclement weather. This working time is expressed in hours.

    c. An aggressive pace of work is calculated by dividing the total working time in hours by a selected aggressive number of working hours, such as 10 working hours per day times five working days per week. The result is then multiplied by seven days per week.

d. This is the total number of days the contractor is allowed to restrict traffic. The purpose of this computation is to convert the normal working time of an average contractor to the working time required by an above average contractor. Say this aggressive schedule is A1.

e. An accelerated pace of work is calculated by dividing the total working time in hours by a selected accelerated number of working hours, such as 12, 14, or 16 working hours per day times 6 working days per week. The result is then multiplied by 7 days per week. Say this accelerated schedule is A2.

f. A1 minus A2 is the maximum number of days the contractor can save by expediting the project. This is called the *possible time savings*.

3. Determination of Incentive/Disincentive Amount

a. Daily road user costs are determined by using QUEWZ software with the guidelines in the *Interim Report QUEWZ - 85 (1982)* or by manual calculation using such data as traffic volumes, vehicle mix, length of closure, and additional time and operating costs due to increase in travel time and distance (if detour is involved). Actual hourly counts should be used as traffic volumes.

The total maximum incentive amount payable to the contractor will be 5% of the total contract amount. Under special circumstances, the total incentive amount may exceed the 5% cap as determined and approved during the I/D Special Provision development.

b. There will be no maximum disincentive amount.

c. The daily I/D amount is determined by dividing 5% of the total contract amount by the number of days the contractor can possibly save as calculated in the determination of I/D time discussed above.

The daily cost to the contractor to expedite completion of the project is the addition of (a) overtime payments and (b) rent for extra equipment.

1) Overtime payments by the contractor need to be estimated. An example is as follows:

Number of overtime hours per week per worker = total working hours per week under accelerated schedule minus total working hours per week under aggressive schedule = (12 hours per day times 6 days per week) - (10 hours per day times 5 days per week) = 22 hours per week

Assuming a crew of 8 workers, total number of overtime hours per week = 22 hours per week per worker times eight workers = 176 hours per week

Average hourly wage per worker (including fringe benefits) = $30 per hour
Average hourly overtime wage per worker (including fringe benefits) = 1.5 times regular wage = $45 per hour

Total cost of overtime to contractor per 6 working days per week = 176 hours per week times $45 per hour = $7,920 per 6 working days per week

Daily cost of overtime to contractor = $7,920 per week, 6 working days per week = $1,320 per day

2) Rent for Extra Equipment

Daily cost for renting equipment is estimated based on type and number of equipment needed. This daily rental rate is obtainable from local equipment rental companies.

4. Justification of the Daily Incentive Payment to the Contractor

a. In order that the contract may be worthy of I/D provision, the daily road user costs should be greater than the daily cost to the contractor.

b. In order for the contractor to be motivated to bid on the I/D contract and actively work to expedite completion of this project, the daily amount paid the contractor should be greater than the extra costs that are incurred to expedite.

c. To justify the use of I/D provision, the daily road user costs should be greater than the daily incentive payment to the contractor.

d. For the daily I/D amount to be justified:

Extra costs to contractor < Daily I/D payment < Daily road user costs

5. Additional I/D Checklist Items for Consideration in Preparing the Contract Special Provision

a. Clearly define the beginning and ending dates for the critical work elements that are to be accomplished. The use of calendar days or specific completion date in the contract has proven most effective in controlling contract times.

b. State the time the contractor is permitted to work, such as multiple shifts, weekends, holidays, etc., or conversely, when work should not be permitted. Describe what working operations the contractor may or may not perform during nighttime hours.

c. Include the pay schedule for I/D.

 1) The pay schedule should relate money and time.

 2) Incentive payments should have a specified maximum time.

 3) Disincentive payments should be charged continuously until the critical elements have been completed.

d. Address underruns and overruns. This may be accomplished by requiring a limited or extensive CPM as part of the contract. Whatever method is used, consideration should still be given to:

 1) Contractor time adjustments should be limited to only major work items.

 2) The percent underrun or overrun should be substantial enough to warrant contract time changes.

 3) Values and formulas can be specified that advise the contractor of the relationship between underruns and time extensions or time deletions.

e. Identify what work is considered preparation, fabrication, and cleanup that may be outside the critical time path for fully opening a project to traffic.

a. Contracts involving bridge construction should take into account the time factor associated with shop drawing and erection procedure reviews and approvals. These two items can be an important factor in measuring and assessing contract time.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD – 709
NUMBERING BUILDINGS, SEPTIC TANKS, WELLS OR OTHER STRUCTURES
February 19, 2016

Attached is the West Virginia Department of Transportation, Division of Highways policy on "Numbering Buildings, Wells, Septic Tanks or Other Structures".

This Design Directive provides guidance on how to assign an identification number to buildings, wells, septic tanks and other structures and has an example of the information that is required on the plans.

Attachment

NUMBERING BUILDINGS, SEPTIC TANKS, WELLS OR OTHER STRUCTURES

The designer shall assign an "Identification Number" to all Buildings, Septic Tanks, Wells and other Structures on each parcel that is within the proposed right-of-way limits. Identification Numbers shall also be assigned to all structures that are within the existing right-of-way that are within the proposed construction area. Identification Numbers shall also be assigned to any structure or item that requires an asbestos inspection as defined in DD-313.

The identification number shall be shown on the plan sheet(s). Once an identification number has been assigned, it shall not be reused or reassigned. If the right-of-way limits change and require less affected items, then the identification numbers do not need to be deleted from the plan sheet(s). The **Pay Item Number(s)** for their abandonment, asbestos abatement or demolition, however, must be deleted from the summary of quantity sheet(s).

The identification number is an abbreviation prefix followed by the parcel number over an assigned number such as the following:

(Abbreviation) (Parcel number)/(Assigned number)

The **Abbreviation** is a description of the structure. The following is a list of abbreviations to be used for identification of the commonly used items:

Bld	–	Building
Sep	–	Septic
Well	–	Water well
Gas	–	Gas Well
Oil	–	Oil well
Brg	–	Bridge
Sign	–	Billboard or Large Sign Structure
UST	–	Underground Storage Tank
AST	–	Aboveground Storage Tank
POL	–	Swimming Pool
STR	–	Other Structures

The **Parcel Number** is the number that is assigned to that parcel of property for the right-of-way plans. If the item being numbered is within the existing right-of-way and owned by the division then the letters "DOH" is to be used as the parcel number. If the item being numbered is owned by a utility company and is not assigned a parcel number then a three letter abbreviation of their name shall be used and a note will be added to the structure demolition table to indicate the entire company name.

The **Assigned Number** is a number that is assigned to all Structures on each parcel or within the existing right-of-way and shall be consecutively numbered such as 1, 2, 3, 4, etc. The numbers shall be assigned in the order shown in the abbreviation list above.

The Building Demolition, Asbestos Abatement, Septic Tank Abandonment, Water Well Abandonment, Gas Well Abandonment, Oil Well Abandonment and Dismantling Structure pay item numbers shall **not** be shown on the plan sheet(s), but must be shown on the summary of quantities sheet(s). Only the identification number(s) shall be shown on the plan sheet(s). Asbestos Abatement items are only to be shown on the Building Demolition Table and the summary of quantities sheet(s) if a positive Asbestos Report has been received.

A structure demolition table shall be shown in the quantity tables. The following example table is to be used:

BUILDING DEMOLITION, ASBESTOS ABATEMENT AND ABANDONMENT								
LOCATION		TYPE OF IMPROVEMENT	BUILDING DEMOLISTION NUMBER	SEPTIC ABANDONMENT NUMBER	WATER WELL ABANDONMENT NUMBER	ASBESTOS ABATEMENT NUMBER	OTHER	OTHER
Station	Offset							

EXAMPLE 1

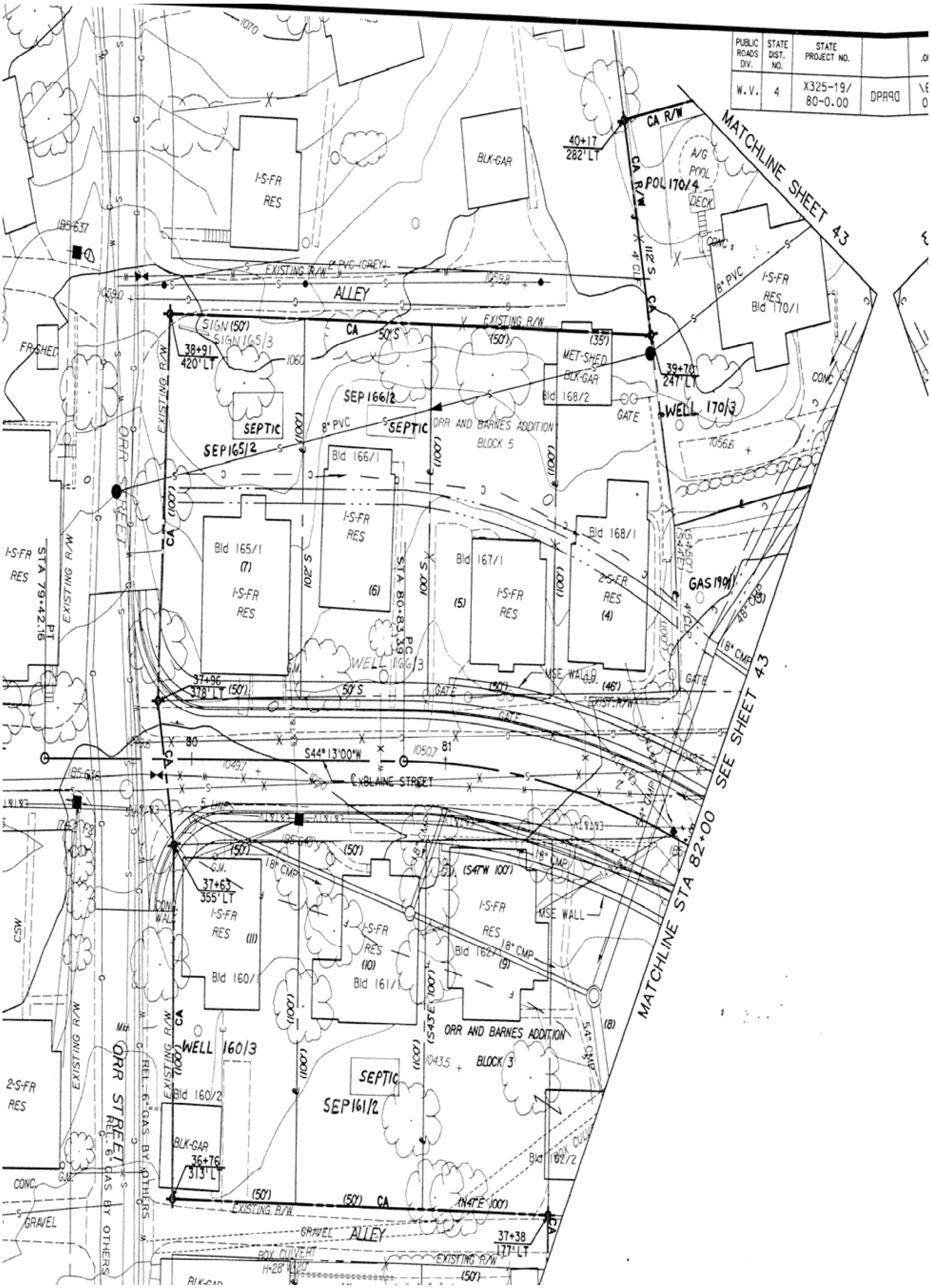
If parcel 67 has a house, garage, shed, septic tank and two water wells and a gas well (the property owner and not a separate company own the gas well) involved in the project, then the numbers are to be shown on the plans as follows:

Bld 67/1	house is building 1 on parcel 67
Bld 67/2	garage is building 2 on parcel 67
Bld 67/3	shed is building 3 on parcel 67
Sep 67/4	septic tank shall be numbered as 4 on parcel 67
Well 67/5	first water well shall be numbered as 5 on parcel 67
Well 67/6	second water well shall be numbered as 6 on parcel 67
Gas 67/7	first gas well shall be numbered as 7 on parcel 67

EXAMPLE 2

The following table and plan shall be used as an example.

BUILDING DEMOLITION, ASBESTOS ABATEMENT AND ABANDONMENT									
LOCATION		TYPE OF IMPROVEMENT	BUILDING DEMOLITION NUMBER	SEPTIC ABANDONMENT NUMBER	WATER WELL ABANDONMENT NUMBER	GAS WELL ABANDONMENT NUMBER	DEMOLITION NUMBER	DEMOLITION NUMBER	ASBESTOS ABATEMENT NUMBER
Station	Offset								
80+12	28’ RT	1 STORY FRAME HOUSE	BLD 160/1						BLD 160/1
80+00	94’ RT	BLOCK GARAGE	BLD 160/2						BLD 160/2
80+04	73’ RT	WATER WELL			WELL 160/3				
80+70	31’ RT	1 STORY FRAME HOUSE	BLD 161/1						NONE
80+72	82’ RT	SEPTIC		SEP 161/2					
81+20	22’ RT	1 STORY FRAME HOUSE	BLD 162/1						BLD 162/1
81+80	78’ RT	FRAME GARAGE	BLD 162/2						BLD 162/2
82+05	20’ RT	SEPTIC		SEP 162/3					
82+20	70’ RT	WATER WELL			WELL 162/4				
80+20	24’ LT	1 STORY FRAME HOUSE	BLD 165/1						BLD 165/1
80+25	88’ LT	SEPTIC		SEP 165/2					
80+00	116’ LT	BILLBOARD					SIGN 165/3		SIGN 165/3
80+60	40’ LT	1 STORY FRAME HOUSE	BLD 166/1						BLD 166/1
80+75	88’ LT	SEPTIC		SEP 166/2					
80+76	22’ LT	WATER WELL			WELL 166/3				
81+25	28’ LT	1 STORY FRAME HOUSE	BLD 167/1						BLD 167/1
81+62	36’ LT	2 STORY FRAME HOUSE	BLD 167/2						BLD 167/2
81+50	105’ LT	SHED	BLD 168/2						NONE
81+85	130’ LT	1 STORY FRAME HOUSE	BLD 170/1						BLD 170/1
82+00	150’LT	SEPTIC		SEP 170/2					
81+70	106’ LT	WATER WELL			WELL 170/3				
81+65	172’ LT	POOL						POL 170/4	NONE
81+80	65’ LT	GAS WELL				GAS 190/1			



PUBLIC ROADS DIV.
STATE DIST. NO.
STATE PROJECT NO.
W.V.
4
X325-19/ 80-0.00
MATCHLINE SHEET 43
SEE SHEET 43
MATCHLINE STA 82+00
ALLEY
EXISTING R/W
CA R/W
40+17 282' LT
39+70 247' LT
38+91 420' LT
37+96 378' LT
37+63 355' LT
36+76 313' LT
37+38 177' LT
BLK-GAR
I-S-FR RES
A/G POOL
DECK
POL 170/4
Bld 170/1
8" PVC
MET-SHED
BLK-GAR
Bld 168/2
WELL 170/3
SEP 166/2
SEPTIC
SEP165/2
ORR AND BARNES ADDITION
BLOCK 5
Bld 166/1
Bld 165/1
Bld 167/1
Bld 168/1
2-S-FR RES
GAS 190/1
18" CMP
48" CMP
WELL 166/3
MSE WALL
STA 80+83.39 PC
STA 79+42.16 PT
EXISTING R/W
ORR STREET
S44° 13'00"W
BLAINE STREET
(S47°W 100')
18" CMP
Bld 160/1
Bld 161/1
Bld 162/1
ORR AND BARNES ADDITION
BLOCK 3
WELL 160/3
Bld 160/2
SEPTIC
SEP161/2
BOX CULVERT
Bld 162/2
REL. 6" GAS BY OTHERS
CONC.
GRAVEL
(N47°E 100')
BOX CULVERT H-28" W120"

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-710
ROAD USER DELAY REDUCTION METHODS
August 1, 2004

Attached are guidelines to aid the Project Manager in developing contract documents which minimize road user delays in high traffic volume areas.

These guidelines include methods that may be incorporated into the contract documents utilizing conventional bidding. There is also guidance on utilizing “Innovative Contracting” methods to provide Contractor incentives and thus reduce road user delays. Most of these methods are intended for use in the high traffic volume areas and will require the preparation of special provisions for the contract.

Attachment

ROAD USER DELAY REDUCTION METHODS

10 - GENERAL:

The West Virginia Division of Highways routinely performs projects on its existing highway system. These projects involve activities which impact the existing movement of traffic. These impacts, no matter how small in nature, can cause delays to the road user. Projects on highways with large daily traffic volumes or highways which provide the only means of access to large facilities may cause road user delays resulting in significant costs to the public.

The Division of Highways is committed to evaluating the road user delay impacts on projects during contract plan development, and determining if special measures are warranted due to the existing traffic volumes or existing access issues. This directive provides guidance to designers on various methods to reduce road user delays on projects where existing traffic conditions warrant special considerations.

The methods to be considered are divided into two broad categories. The first category includes methods which can be incorporated into the contract documents or conducted during contract document development. The second category involves contracting method other than conventional bidding and award which may encourage a minimization of disruption to existing traffic movement.

20 – CONVENTIONAL CONTRACTING:

The road user delay reduction methods described in this section pertain to contracts awarded to the lowest responsible bidder based on the total of the normal bid items. These methods are primarily tools used during contract development to plan and coordinate the work and contract provisions that will enhance traffic movement during construction.

20.1 – Contract Document Development Phase: Described below are methods that have been successfully utilized on projects to minimize the impacts to the road user. These methods involve steps the Project Manager may take during contract development that will facilitate the project execution during construction.

1. Consideration should be given to other Division of Highways projects in the same corridor. These may be projects that are under development or are already under construction. They may be central office or district projects.

2. Consideration should be given to combining projects to minimize the number of times the road users are affected.

3. Consideration of special events in an area which may result in a large temporary increase in traffic volumes.

4. Projects conducted by parties outside the Division of Highways which may have an additional impact on traffic movement. These may include highway projects by municipalities, construction by commercial or industrial developers, or large utility contracts.

5. Consideration should be given to corridor management traffic plans on high volume corridors where two or more projects are in close proximity to each other to allow the projects to be combined or bid within the same time frame to reduce the impact to motorists and even reduce the amount of traffic control that is required.

The Project Manager should consider all of the above items when developing both the schedule and the traffic control methods on projects in high traffic volume areas. Efforts should be made to coordinate with district and central office personnel concerning any known planned activities. The district utility supervisor should be consulted to determine if any utility permitting activities are underway in the area.

20.1.1 – Local Coordination: Many traffic control delays can be minimized through coordination with local officials. This may involve meeting with local governmental officials, but may also involve coordinating with school administrators. Projects where peak traffic volumes are affected by large commercial or industrial installations may require coordination with private company administrators and adjusting daily project work schedules to accommodate large peak traffic volumes.

20.1.2 – Public Information Activities: Projects involving high traffic volumes may require the Project Manager to hold public informational meetings to acclimate the general public to the potential delays. These advance meetings may also serve to allow some of the road users to adjust their driving routes thus effectively reducing the traffic volume during construction. Public informational activities also allow entities such as delivery companies and emergency entities to plan alternate routes thus reducing road user impacts.

20.2 – Contract Provision Considerations: Projects in high traffic volume areas may be facilitated by the inclusion of certain requirements in the contract documents. These contract provision methods serve in various ways to minimize the overall affect of the project activities on the road user.

20.2.1 – Night Time Construction: One of the most effective means of reducing road user delays is to require project activities to be conducted by the Contractor during low traffic volume hours. These low volume hours will typically be during the night. Many projects such as HMA paving work are especially suited to this type of contract provision. Some projects may be aided by requiring night construction only during certain phases of the work. It is recommended that night time construction be used whenever possible on four lane highways with traffic volumes in excess of 25,000 ADT and on two-lane highways when traffic volumes are in excess of 15,000 ADT. When this type of construction is used the designer should consider the need for the use of Incentive/Disincentive contract provisions.

20.2.2 – Motorist Services: On projects involving long lane closures in high traffic volume area the plans should include areas for motorists to pull-off without disrupting the remaining open lanes. This will minimize the affect of a disabled vehicle or accident in the work zone. The designer should consider the need for a Traffic Director per TED–604 and for a Roadside Assistance Service to be present during construction to aid in the resumption of traffic flow when an emergency situation occurs.

20.2.3 – Incentive/Disincentive (I/D) Provisions: Many project schedules may be accelerated by the insertion of an I/D clause in the contract documents. The use of an I/D provision tends to motivate the Contractor and provides a means to compensate for the extra cost involved in accelerating the contract. This provision is many times used in combination with the other methods described in this design directive. The designer should refer to DD-708 for specific information on developing I/D payment amounts and provisions.

20.2.4 – Public Information Activities: This activity differs from public information during design in that the focus of this contract provision is to provide up to date status information to the public concerning actual construction activities and progress. The Contractor may be required to provide advance warning of traffic pattern changes and to keep all local agencies informed concerning the project's schedule.

20.2.5 – Partnering: Some projects that not only involve high traffic volumes but also involve coordination with a number of stakeholders, may warrant the use of a formal "Partnering" agreement in the contract provisions. This method provides a formal avenue for concerns and problems to be addressed by all parties. It may be particularly useful in urban areas where traffic patterns are being substantially altered by the project activities. A special provision for this process is available from the State Specification Engineer for inclusion in the contract documents. The Project Manager must obtain approval from the Deputy State Highway Engineer Development for all projects and FHWA for non-exempt or concurrence projects prior to utilizing "Partnering" in the contract provisions.

20.2.6 – Lane Restrictions: Some projects which involve high volumes of traffic on holidays, sporting events or other times when a high peak of traffic is likely to occur lane restrictions may be warranted. The designer may require that the contractor to open multiple lanes to traffic during these times in order minimize the disruption to traffic.

20.2.7 – Blasting Restrictions: Projects that have blasting in close proximity to the traffic may require lane restriction. In order to not interrupt traffic during peak traffic time it is recommended that the blasting not be performed during peak traffic periods. It is also recommended that the designer require that the practical velocity of the blasting be reduced in the vicinity of the traffic in order not to cover the roadway with debris.

20.2.8 – Interim Completion Dates: On projects where a high volume of traffic is involved and only part of the project effects the traffic the use of Interim Completion Dates may be warranted. When Interim Completion dates are used the amount used as the Liquidated Damages is the dollar amount calculated as the Road User Delay Cost. A special provision for this process is available from the State Specification Engineer for inclusion in the contract documents. The Project Manager must obtain approval from the Deputy State Highway Engineer-Development for all projects and FHWA for non-exempt or concurrence projects prior to utilizing “Partnering” in the contract provisions.

30 – INNOVATIVE CONTRACTING:

30.1 – Introduction: As described in Section 10 above, there are two broad categories of road user delay reduction methods. Section 20 describes methods incorporated into projects that utilize conventional bidding techniques. This section describes alternative contracting methods which may be utilized by the Project Manager to encourage the Contractor to be innovative and expeditious on projects in high traffic volume areas.

Conventional bidding referred to in this directive is the process used normally by the WVDOH to award contracts. This process involves all prospective Contractors submitting unit prices for each item of work. The contract is then awarded to the lowest responsible bidder for the total of all items of work. The “Innovative Contracting” methods described in this section involves the Contractors submitting unit prices for the conventional items of work plus prices for a second component that involves time. The contract is then awarded to the lowest responsible bidder determined by the sum of the two components. “WV Code § 17-4-19 paragraph (e)” requires that the commissioner award all construction contracts to the lowest responsible bidder. Therefore, any contract which utilizes an innovative contracting technique must reduce each component of the bid to a unit bid price and must require the awarding of the contract to the lowest responsible total bid. Therefore, the time component of the bid must be set-up in the contract documents in a manner that allows the Contractor to submit time units. These time units are then multiplied by unit costs of time to establish the low bidder as the sum of the total time cost plus total conventional bid item cost.

30.2 – Innovative Contracting Techniques: There are a number of innovative contracting techniques which may be utilized by the WVDOH to award a contract and encourage the completion of work in an expeditious manner. The currently accepted methods are described in this section; however the Project Manager must obtain approval per Section 30.3 of this directive prior to utilizing these techniques. Additional information concerning these techniques may be acquired from the Federal Highway Administration Contract

Administration Core Curriculum Manual Section V.A. Non-traditional Contracting Practices for discussion on A+B biding and Lane Rental.

30.2.1 – A+B Bidding: This method involves the combining of traditional cost (A) plus time cost (B) to determine the low bidder for purposes of awarding the contract. Under the A+B method each bid has two components.

- The "A" component is the total bid for all traditional bid items on the project.
- The "B" component is the total number of calendar days required to complete the project, as estimated by the bidder, multiplied by the road user cost per day, as established by the Project Manager in the contract documents.

The award of the contract is based on the lowest of the following formula:

(A) + (B x Road User Cost/Day)

The Project Manager shall consider the following requirements when utilizing the A+B method:

- Road User Cost/Day shall be determined by Traffic Engineering Division and approved by the Deputy State Highway Engineer Development prior to inclusion in contract documents.
- A maximum allowable number of calendar days required to complete the project must be established by the Project Manager in the contract documents. This will set the maximum number of days that the contractor may bid but does not restrict the contractor from bidding a lower number of days.
- The formula for awarding the contract is not used to determine payment to the contractor. Payment is based on unit prices established in the "A" component of the bid.
- The contract completion date is established based on the number of calendar days in the "B" component of the bid as supplied by the successful bidder.
- The scope of work and conditions encountered in the field on the project must be well defined by the contract documents.
- A disincentive equal to the Road User Cost/Day is used to ensure the contractor meets the "B" component of the bid.

30.2.2 – Lane Rental: The lane rental method, like A+B bidding, involves the combining of traditional cost (A) plus time cost (B) to determine the low bidder for purposes of awarding the contract. The time portion of the bid consists of the total units of lane closure multiplied by the lane closure cost per unit, called lane rental cost. The units for the lane rental may be established based on the project requirements (i.e. minutes, hours, days, etc.). Different lane rental cost may be established in the lanes based on varying times of the day. For example, a lane may have one cost per hour between 6:00 am to 6:00 pm and a lower cost per hour between 6:00 pm to 6:00 am.

The lane rental cost for each lane and the maximum number of allowable lane rental units for each lane is established in the special provisions by the Project Manager. The Contractor then prepares the bid by combining the total unit cost for conventional bid items and the time component of each lane rental unit. The contract is awarded on the lowest bid from the following formula:

A + (B x LRC)

A = Total cost for conventional bid items

B = Number of Lane Rental Units

LRC = Lane Rental Cost / Unit

The following shall be considered by the Project Manager when Lane Rental is utilized on a project:

- Lane Rental Cost/Unit shall be determined by Traffic Engineering Division and approved by the Deputy State Highway Engineer Development prior to inclusion in contract documents.
- The number of allowable lane rental units for each lane shall be established based on the "B" component of the bid as supplied by the successful bidder.
- The formula for awarding the contract is not used to determine payment to the Contractor. Payment is based on unit prices established in the "A" component of the bid.
- Lane rental units utilized by the Contractor greater than those established in the bid shall be deducted from pay estimates at the lane rental cost per unit in the contract provisions.
- The Project Manager may choose to include provisions in the contract document that provide payments at the lane rental cost per unit rate, for lane rental units not utilized by the Contractor based on the bid number of units.
- The scope of work and field conditions of the project must be well defined by the contract documents.

30.2.3 – Warranties: This method of contracting requires the bidder to submit a conventional bid price which includes the cost of a warranty for the work for a specific period of time. The required period of the warranty shall be established by the Project Manager in the contract documents. The warranty shall be only for items which the Contractor has full control and not for long-term maintenance.

30.2.4 – Incentive/Disincentive (I/D)'s: I/D's are a contracting method used to motivate the Contractor to complete the project ahead of a schedule. DD-708 provides the WVDOH's guidelines for I/D clauses in contracts. I/D's are used frequently in conjunction with the other contracting methods described in this directive.

30.3 – Approval of Innovative Contracting Techniques: All contracting techniques described in Section 30 of this directive require approval from the Deputy State Highway Engineer Development prior to being considered on projects. Non-exempt and concurrence projects require approval by FHWA.

A special provision must be prepared for any proposed "Innovative Contracting" method with all bidding parameters defined and reduced to a bid item. The special provision must include a Contractor's proposal which provides time unit costs established by the WVDOH. The Contractor then submits a bid of time for each appropriate bid item. The low bid is then established as the sum of the total conventional bid item cost plus the total cost of the time bid items. As stated in Section 30.1 above the proposal must clearly establish the means to determine the "lowest responsible bidder" as the lowest total cost bid that is complete and regular. The special provision must be reviewed and approved by Legal Division, Contract Administration Division, Technical Section of Engineering Division, Deputy State Highway Engineer Development and Federal Highway Administration.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-711
GUIDANCE FOR EVALUATION OF CONTRACTOR'S BIDS
February 19, 2016

This Design Directive will give guidance and instruction, along with examples, on how to evaluate the contractors' bids received on all advertised projects. The Project Manager of each project that is advertised and bids received, will be responsible for evaluating the bids based on the analysis described herein. Based on the completed analysis, the Designer will recommend awarding the project, or holding or rejecting the bids.

If the bids are rejected, readvertisement will only occur after careful review and/or revision of the PS&E package. The procedure described herein will also apply to the readvertised project.

Attachment

10. General

10.1 Introduction: All bids received from contractors on each advertised project must be evaluated prior to award to verify that the bids are competitive, are within a specified range of the lowest bidder versus the Engineer's Estimate (Estimate), and do not show any signs of unbalancing, bidding errors, plan errors, etc. This will apply to District designed projects as well as In-House, Consultant designed, and Alternative Delivery Methods (such as Design-Build) projects.

10.2 References: 23 CFR 635.114 United States Department of Transportation, Federal Highway Administration entitled "Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation", dated January 20, 2004 (hereinafter referred to as The FHWA Guidelines). This document is available on the FHWA website at the following address: http://www.fhwa.dot.gov/programadmin/contracts/ta508046.pdf.

20. Bid Evaluation

20.1 General: All aspects of every bid received on a project should be evaluated for determination of whether a project should be awarded, or all bids rejected and the project re-advertised. Concurrence in the award from the Federal Highway Administration is required on concurrence and full-oversight projects by the 2015 Stewardship Agreement between the West Virginia Division of Highways and the Federal Highway Administration.

Items to be considered in evaluating the bids are as follows.

20.1.1 Comparison of the bids in relation to the last Estimate approved before the bid opening. The Estimate should be prepared according to the latest edition of DD-707, "Development Of Engineers Estimate". The basis used to prepare the Estimate, such as the Statewide Unit Bid prices, bids received on similar projects in the area, etc. should be indicated. Anything that may have been overlooked in preparing the Estimate should be noted also.

20.1.2 Competition consisting of the total number of bids and price ranges of the various items in the bids. In Section 30.1 of this Design Directive a table is given from The FHWA Guidelines which describes how to establish the number of competitive bidders on a project, and whether there is adequate competition when compared to the Estimate. Four examples are also given in Section 50.

20.1.3 The bids are not irregular or contain identifiable, major errors. Also, the Estimate should be reviewed to verify that the Designer has not made any major mathematical errors.

20.1.4 The advertising period has given contractors time to adequately familiarize themselves with the work to be performed in the contract and to get solid quotes from suppliers and subcontractors.

20.1.5 Adequate time has been allowed for completion of the proposed work described in the Contract Documents.

20.1.6 Combining the work with another project, or breaking out some of the work into different projects. An example of this would be splitting a project into a grading and drainage contract, followed by a paving, lighting, signing, guardrail, and pavement marking contract.

20.1.7 Design or specification changes which could reduce the cost of the work, or clarification of ambiguities which may be misinterpreted by a contractor, so all contractors are working with exactly the same information.

30. Bid Evaluation Process

30.1 Determination of Competition: From The FHWA Guidelines, competition may be considered excellent when there are more than 6 bidders on a project that fall within 20% of the lowest bidder, including the low bid. If this case does not exist, or there are fewer than 6 bids on a project, then any apparently excessive bids must be evaluated and justified according to the following table.

Number of Competitive Bids* (*Range = Low Bid + 20%)	Competition May Be Considered Adequate When The Low Bid Does Not Exceed**
5	120% of the Engineers Estimate
4	115% of the Engineers Estimate
3	110% of the Engineers Estimate
2	105% of the Engineers Estimate
1	The Engineers Estimate

** Special projects should be noted where competition has historically been poor. These projects should be reviewed independent of the requirements of this Design Directive.

Single bids on a project require special investigation to determine the adequacy of the bid and the Estimate, as described below under Section 30.2, Single Bids on a Project.

30.2 Single Bids on a Project: When only a single bid is received on a project, this bid should be the Estimate or less. Single bids can be received as a result of many factors, which include the time of year the project was advertised, not enough time allotted for contractors to formulate a bid, a bid opening that has many projects in it, specialized character, complexity, and/or location of the work, etc.

The Division has the right to reject any and all bids without opening them , and then readvertise for new bids.

A single bid exceeding the Estimate on a project must be carefully examined by the procedures described in this Design Directive to justify an award. Bid prices on similar projects in the bid project area may be examined to see if the single bid unit prices are in accord with these other projects' unit bid prices.

Single bids may be concurred with and awarded for the following reasons. These projects may consist of safety improvement projects which correct hazardous conditions placing the traveling public in danger, emergency repairs or replacements, projects which close gaps in completed facilities, and projects which are critical in phased or staged construction with multiple contracts to be awarded to complete the entire project.

40. Concurrence In Award

40.1 Justification of the Bid: Once the contractors' bids have been analyzed and the number of competitive bids has been established by The FHWA Guidelines using the table in Section 30.1 of this DD, then the low bid is compared to the final Estimate. If the low bid is <u>outside</u> of The FHWA Guidelines for competitiveness and higher than the Estimate, then the Estimate is to be carefully examined. This examination will consist of comparison of the Engineer's unit bid prices to those on similar projects. Any single items which seem to be out of line with their unit cost on similar projects, should be investigated and revised to more closely align with other contracts and the going market unit price for that item. A number of items may have to be investigated and adjusted. As a side note, do NOT use any unit bid prices from any of the contractors' bids during this investigation.

As the results of these investigations are compiled, the previously given table from The FHWA Guidelines in Section 30.1 is then utilized to determine a Revised Engineer's Estimate.

If the low bid is <u>within</u> The FHWA Guidelines for competitiveness based on the table in Section 30.1, then if there are no other considerations the Project Manager will recommend the project be awarded to the low bidder.

40.2 Justification Correspondence When Required: On all projects, a memo is to be prepared noting the items in the Estimate that need a unit price adjustment, including the justification for any adjustments. This memo is sent to the Award Committee through the Contract Administration Division for approval prior to the Award Meeting.

Each memo is to describe the analysis for one project only. There may be multiple projects outside the FHWA Guideline's ranges for competition in any letting; each project will have it's own justification memo. Multiple projects on one memo are NOT allowed.

The Subject Line of these memos will give the State and Federal Project Numbers, Project Name, County the Project is in, and the Call Number and date of that particular Letting.

An example of the aforementioned memo is included as Exhibit A to this Design Directive.

Note that no correspondence is sent to the FHWA concerning competitiveness of the contractors' bids, rather the FHWA does their own analysis on the bid tabulations which they receive via electronic means from the Contract Administration Division. The FHWA is invited to all award meetings. On Full Oversight projects, Contract Administration Division will obtain concurrence for all bids, including any revised bids from the FHWA before the Award Meeting. This concurrence is obtained by e-mail and the financial services used as of the date of this DD.

50. Examples

The following examples are given to illustrate the use of the Table given in this Design Directive from The FHWA Guidelines.

50.1 Example Number 1:

This project has six bidders, of which all are greater than the Engineers Estimate. The Estimate and bids are as follows:

Engineers Estimate	$10,068,079.55
Anderson Construction	$14,571,407.59
Beta Builders	$15,775,908.53
Council, Incorporated	$17,680,165.78
Davis and Daughters, LLC	$18,920,945.34
Embryo Construction Company	$20,735,985.00
Floyd Rockbreakers	$21,356,069.26

Utilizing the heretofore given Table under Section 30.1 of this Design Directive, first, determine the number of competitive bids. The number of competitive bids is the number of bids that fall within the range of the low bid plus 20 percent. On this letting, the low bid was $14,571,407.59. The low bid plus 20 percent is then $14,571,407.59 x 1.20, equaling $17,485,689.11. Examining the contractors' bids above, there are only two bids that are considered competitive. Since only two bids are competitive, then the low bid must not exceed the Estimate by more than 5 percent. Comparing the low bid to the Estimate, it is seen that the low bid is 44.7 percent over the Estimate. Therefore, to award this contract, the Estimate must be adjusted by the analyses and procedures heretofore described in this Directive to justify the low bid no greater than 5 percent higher than the Estimate.

50.2 Example Number 2:

This project has four bidders, all of which are greater than the Engineers Estimate. The Estimate and bids are as follows:

Engineers Estimate	$6,669,777.00
Animal Constructors	$7,856,932.32
Bob's Builders	$7,967,000.00
Charlie Company	$8,375,979.18
Dawn's Construction Concern	$8,599,628.23

Utilizing the heretofore given Table under Section 30.1 of this Design Directive, first, determine the number of competitive bids. Again, the number of competitive bids is the number of bids that fall within the range of the low bid plus 20 percent. On this letting, the low bid was $7,856,932.32. The low bid plus 20 percent is then $7,856,932.32 x 1.20, equaling $9,428,318.78. Examining the contractors' bids above, all four of the bids are within this range, and are therefore considered competitive. In this case, the low bid must not exceed the Estimate by more than 15 percent. Comparing the low bid to the Estimate, it is seen that the low bid is 17.8 percent over the estimate. Therefore, to award this contract, the Estimate must be adjusted by the analyses and procedures heretofore described in this Directive to justify the low bid no greater than 15 percent higher than the Estimate.

50.3 Example Number 3:

This project has four bidders, none of which are greater than the Engineers Estimate. The Estimate and bids are as follows:

Engineers Estimate	$9,601,182.50
Emily Bridge and Steel	$7,326,381.40
Fenton, Incorporated	$8,071,329.00
Green Colour Erectors	$8,172,563.80
Herd Construction Company	$8,599,628.23

Utilizing the heretofore given Table under Section 30.1 of this Design Directive, first, determine the number of competitive bids. Again, the number of competitive bids is the number of bids that fall within the range of the low bid plus 20 percent. On this letting, the low bid was $7,326,381.40. The low bid plus 20 percent is then $7,326,381.40 x 1.20, equaling $8,791,657.68. Examining the contractors' bids above, it is seen that all four of the bids are within this range, and are therefore considered competitive. In this case, all bids are below the Estimate. If there are no obvious problems with the bids, after careful review as described previously in this Directive, then no justification is required and the project can be recommended for award.

50.4 Example Number 4:

This project has four bidders, all of which are greater than the Engineers Estimate. The Estimate and bids are as follows:

Engineers Estimate	$4,978,444.70
Carter and Sons Construction	$5,194,129.09
Whitehouse, Inc.	$5,328,721.70
Eclipse Building and Construction	$5,571,000.00
Piper Company, Incorporated	$5,598,276.80

Utilizing the heretofore given Table under Section 30.1 of this Design Directive, first, determine the number of competitive bids. Again, the number of competitive bids is the number of bids that fall within the range of the low bid plus 20 percent. On this letting, the low bid was $5,194,129.09. The low bid plus 20 percent is then $5,194,129.09 x 1.20, equaling $6,232,954.91. Examining the contractors' bids above, it is seen that all four of the bids are within this range, and are all considered competitive. It is seen that all four bids are above the Estimate. In this case, the low bid must not exceed the Estimate by more than 15 percent.

Comparing the low bid to the Estimate, it is seen that the low bid is 4.1 percent over the estimate, well within the range specified by the Table. If there are no obvious problems with the bids, after careful review as described previously in this Directive, then no adjustment of the estimate is required and the project can be recommended for award.

Exhibit "A"

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • (304) 558-3505

Earl Ray Tomblin
Governor

Paul A. Mattox, Jr., P. E.
Secretary of Transportation/
Commissioner of Highways

December 16, 2014

M E M O R A N D U M

TO: Award Committee

THRU: DC

FROM: DD

SUBJECT: State Project
Federal Project
Name of Project
Call #
Name of County

Reference is made to the bids received (Date bids received for the subject project). This project ____(state purpose of project. One competitive bid was received. The competitive bidder was 9.96% above the Engineer's Estimate of $6,126,569.00. A more detailed review of the Engineer's Estimate was felt to be warranted and the estimate was adjusted for the following items:

Item Number	Description	Previous Bid	New Bid
204001-000	Mobilization	$92,000.00/LS	$528,000.00/LS
497000-004	Micromilling	$2.50/SY	$3.43/SY

These are items that were bid above the Engineer's Estimate. This project is to be night time construction and is located where competition has historically been poor for this particular type of work. The unit price for these items is also affected by rising production and material costs; therefore we may have underestimated their actual cost. The Engineer's Estimate was increased by $611,570.30, resulting in a final estimate of $6,738,139.30. The revised estimate results in the low bid being under the Engineer's Estimate and it is now within award guidelines.

Rejecting the bid and re-advertising the project would not generate more competition or result in any appreciable cost reduction, nor would it be in the best interest of the public. Based on the above, it is recommended that the project be awarded to West Virginia Paving, Inc., the low bidder for the December 9, 2014 letting.

RJS:Tjd

R E P L Y

Approved: ___________________ Not Approved: _____________________ Date:___________________

bcc: DDR/I( ), DDI(AM), DDM( ), DD(MF), DT, DC(LL), DE/M-___, HD, CH, PP, PR

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

712 **URBAN DESIGN CONSIDERATIONS** *May 12, 2010*

This Design Directive will give guidance and instruction for special urban design considerations that must be evaluated when a project is in an urban area. The Designer of each project will be responsible for evaluating such items as extra Temporary Traffic Control Stone (Aggregate For Maintaining Traffic - Item 636002) required for the Temporary Traffic Control plan, grading, seeding and mulching, topsoiling, urban drainage, geometrics, accommodation of pedestrians, bicyclists, and transit (buses), conformance with the Americans With Disabilities Act, and any other design item that may be necessary by the nature of the design, such as environmental considerations, local laws and zoning regulations, roadside safety, or "Context Sensitive Solutions" requirements. References to other publications for use by the Designer will also be given.

Attachment

10. Introduction

There are many special design considerations that must be evaluated by the Designer when a project is in an urban area. The Temporary Traffic Control Plan itself must be carefully analyzed and designed to allow for uninterrupted access to residential units and businesses, and to keep through traffic flowing as smoothly and safely as possible through the project area. Items such as topsoiling, seeding and mulching (both temporary and permanent), urban drainage requirements, accommodation of pedestrians, bicyclists, transit (buses – including school buses), Americans with Disabilities Act requirements, and geometrics (especially at intersections) also must be carefully evaluated and designed. Roadside conditions must be identified and action taken to mitigate any potential hazard to the traveling public. These are just some examples of special urban design considerations. Any other design item that may be necessary by the nature of the design, such as environmental considerations, local laws and zoning regulations, or "Context Sensitive Solutions" requirements must also be evaluated.

The latest editions of *"A Policy on Geometric Design of Highways and Streets"* (G*reen Book)* and "*Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT<=400)"* are referenced here to supplement the information given in this Design Directive and the various other publications mentioned for the Designer to utilize.

For urban projects (or projects in rural areas that are urban in character), the Designer may be working closely with a person or persons from a local municipality, a zoning regulation board, City Council, planning commission, or any other local entity that may have jurisdiction or interest in the design of the project. It is imperative that the Designer consider all comments from these entities, and while all requests may not be feasible for inclusion in the project design, the Designer should fully document the comments, who made them, and reasons why or why not they were incorporated into the design.

20. Temporary Traffic Control

The plans for all urban projects shall contain a construction sequence phasing plan (Temporary Traffic Control Plan) that allows access to all residential units and businesses at all times. Of course, the contractor may change this plan at his discretion and cost, but each set of construction plans must have a workable sequence of construction shown for bidding purposes. All items of construction such as utility relocations, drainage, grading, curb/gutter/sidewalks, timing or re-timing of traffic signals, signing, and paving, etc. must be considered when developing this plan.

The Designer should note that some businesses, and on rare occasions some residences, have more than one access, and, after the public involvement process (see Design Directive (DD) 201) or the right-of-way negotiations are complete, one or more of these accesses may be closed during the construction phase(s) in that area. Access to residents and businesses may also be provided via other properties, as long as the proper procedures for purchase of rights-of-way are followed. The Designer is hereby directed to the latest edition of the Division of Highway's "Manual on Rules and Regulations for Constructing Driveways on State Highways Rights-of-Way" for more information.

At times during construction, access to certain facilities may be closed for short durations (such as 2 or so hours) by a special agreement between the contractor and the business owner, or negotiated during the right-of-way process. An access may also be closed so work can proceed during times that access to that facility is not required, such as weekends or nighttime. This of course will vary from business to business. School bus routes and entities with special vehicle types, such as builders/deliverers of manufactured homes, etc. should be considered also. Special agreements can be reached between the contractor and any facility or entity for closing and using alternate accesses/routes used by that facility or entity at any time. Any special arrangements concerning closing accesses/routes made during Right-of-Way negotiations by the Division are to be shown in the plans on the Property Ownership Index sheet in the "Comments" section, and passed along to the District Construction personnel at the project's Pre-Construction Conference.

Emergency responders such as hospitals, fire stations, police stations, etc., must have access available at all times during construction. A General Note should be placed in the Temporary Traffic Control Plans alerting the contractor of local emergency information. This will allow the contractor to account for these accesses in his/her bids. The Designer and the Right-Of-Way agent will be responsible for working this out throughout the design and right-of-way process. Alternate access via a mutually agreeable detour may be considered. In addition, the Designer should consider making arrangements with emergency providers to have equipment placed on the far side of a railroad crossing, intersection, or any other roadway facility (when temporary closures of these facilities are considered as part of the Temporary Traffic Control plan) for the period(s) of time that the facility is to be out of service.

The Temporary Traffic Control Plan must also consider providing pedestrians an accessible route through or around the work zone. Information regarding this facet of the Temporary Traffic Control Plan can be found at the following web address: safety.fhwa.dot.gov/PED_BIK/docs/designsafety.pdf. Also, DD-681, Work Zone Safety and Mobility, and the latest edition of the "Manual on Temporary Traffic Control for Streets and Highways" are hereby referenced for more detailed guidance for the designer in designing a safe and efficient Temporary Traffic Control Plan.

30. Temporary Traffic Control (Aggregate For Maintaining Traffic) Stone

Enough Temporary Traffic Control (TTC) (Aggregate for Maintaining Traffic) stone - Item 636002, shall be quantified in the plans to cover all phases of construction. It is entirely possible that accesses and detours may have to constructed and removed more than once during the duration of the project. A properly analyzed and prepared Phasing of Construction Plan will indicate this to the designer. The purpose of this Section of this DD is make sure a good, workable Phasing of Construction Plan has been developed, and then utilized to compute the TTC stone quantity. This item should be overestimated in urban areas to prevent an insufficient bid quantity.

The number of times an access will have to be placed and removed can be approximated. This number should then be multiplied by the length, width, and thickness to compute the quantity of TTC stone for each access to be maintained. Some businesses may have more than one access, or require only one be kept open during business hours. It is also possible that full night closures, which result in the complete removal of the stone, and subsequent reconstruction before the need for the access the next day, will be required. In this situation, the same TTC stone could be reused, reducing the amount of TTC stone required to be bid.

This same process as used for accesses could be applied to temporary traffic detours. The number of times any detour would have to be constructed and removed, and reconstructed in different locations would be used multiplied by the length, width, and thickness of the detour to arrive at the TTC stone quantity. Consideration should be given to placing Fabric for Separation under temporary traffic detours when the detour is to remain in place for a long time period, or for easier recovery when these detours are to be removed and the TTC stone reused.

40. Topsoiling/Seeding and Mulching

40.1 General

Items for furnishing and placing topsoil (Item 651001), and Temporary/Permanent Seeding and Mulching (Specification Sections 642/652 respectively) will be placed in the plans for all urban area design projects.

40.2 Grading

Mowable areas within the Division’s Right-Of-Way or Temporary Construction Easement (TCE) lines should be blended in with the existing slope of the ground tied into, to leave an area that the property owner can mow without undue difficulty. Extra TCE should be taken to ensure that the graded slope can be blended with the existing slope.

40.3 Topsoil

Topsoil shall be in accordance with Section 651 of the latest issue of the Standard Specifications, and/or the latest issue of the Supplemental Specifications, or as specified in the plans. There may be instances where special topsoil is required for environmental commitments, or to repair existing landscapes or yards damaged by construction. Occasionally, enough topsoil can be obtained from the project area itself and stockpiled; if so a General Note indicating such will be included in the General Notes. Areas where topsoil is to be placed will be indicated on the plans. Unless otherwise specified, thickness of topsoil will be 6 inches on all areas to receive Permanent Seed. Topsoil should always be placed after any construction work is completed in that area. If any previously placed topsoil is disturbed, it must be replaced with the same or very similar mixture. After all work in an area has been completed and the area topsoiled, then Permanent Seeding and Mulching is applied.

A special condition exists when there are mowable areas within the Division's Right-Of-Way or Temporary Construction Easement lines. Residential or business lawns or other areas as noted during field reviews require special consideration. Topsoil used on mowable areas within the Right-of-Way and any Easement should be free of rocks. The Designer should indicate this in a General Note, and the areas shown on the Plan Sheets.

For projects with an amount of topsoil less than 5 tons, a General Note may be placed in the plans indicating that payment for the topsoil will be included in the unit bid price for another item, such as Unclassified Excavation or Borrow Excavation.

40.4 Seeding and Mulching

40.4.1 Temporary Seeding and Mulching

Temporary Seeding and Mulching (Section 642 of the latest issue of the Standard Specifications, and/or the latest issue of the Supplemental Specifications) is required by the terms of the November 5, 2007 State of West Virginia, Department of Environmental Protection's (DEP) National Pollution Discharge Elimination System's Water Pollution Control Permit, (NPDES Permit) that will be applied for and approved for the project. This permit is required for all projects having a disturbed area of greater than one-half an acre. The Technical Section of the Engineering Division prepares and handles all NPDES permits for the Division of Highways.

This permit states that by the seventh day after construction activities cease, whether permanently **OR** temporarily, stabilization measures must be applied. However, if any construction activities will resume within 21 days after they cease in the aforementioned area(s), stabilization measures need not be initiated. These stabilization measures may include Temporary Seeding and Mulching, and if so should be reflected in the approved NPDES permit for the project. The Designer must maintain coordination with the Permit Analyst during the preparation of the project plans, so the Analyst may amend the permit as needed, and not delay the approval times required by the DEP for the NPDES permit.

Quantities for Temporary Seeding and Mulching will be computed in conjunction with the construction phasing plan and shown in a separate Quantity Table, and in the Summary of Estimated Quantities. Seed mixture "B" as described in Section 642 of the latest issue of the Standard Specifications and/or the latest issue of the Supplemental Specifications will be used for Temporary Seeding, with the temporary seed mulched and fertilized at the rates given therein. Note that rates are not given in this DD. The purpose of this Section is to make sure that the Designer has a good, workable Temporary Traffic Control Plan, and uses it to compute the quantities.

Projects with less than 1 (one) acre of proposed disturbed area are not required to have these items quantified separately in a Table. Rather, a General Note may be placed on the General Notes sheet stating that payment for this work will be included in the unit bid price for some other item of work, usually Unclassified Excavation, and the materials used must conform to the latest issues of the Standard and/or Supplemental Specifications.

40.4.2 Permanent Seeding and Mulching

Permanent Seeding and Mulching (Section 652 of the latest issue of the Standard Specifications and/or the latest issue of the Supplemental Specifications) shall be applied to topsoiled areas after construction is complete in the subject area.

Quantities for Permanent Seeding and Mulching will be computed in conjunction with the construction phasing plan and shown in a separate Quantity Table, and in the Summary of Estimated Quantities**.** Seed mixture "Type C-2" as described in Section 652 of the latest issue of the Standard Specifications, and/or the latest issue of the Supplemental Specifications will be used for Permanent Seeding in urban lawn areas, with the permanent seed mulched and fertilized at the rates given therein. “Type C-1” seed can be used in all other areas, as determined by the designer during field reviews. Note, as in Temporary Seeding and Mulching above, no rates are given here; the purpose of this Section of this Design Directive is to make sure that the Designer has a good, workable Phasing of Construction Plan, and uses it to compute the quantities, therefore attempting to eliminate an overrun of the actual quantity applied in the field.

Projects with less than 1 (one) acre of proposed disturbed area are not required to have these items quantified separately in a Table. Rather, a General Note may be placed on the General Notes sheet stating that the work will be paid incidental to some other item of work, usually Unclassified Excavation, and the materials used must conform to the latest issues of the Standard and/or Supplemental Specifications.

50. Geometrics

One of the most important considerations in the design of intersections is capacity and level-of-service analysis. This is true for urban intersections as well as rural intersections. Auxiliary lanes, channelization, and traffic control devices (signs/signals) are used to obtain optimum intersection performance.

Intersections are also points of conflict between all types of traffic: vehicles (including buses), pedestrians, and bicycles. See Sections 70 and 80 below concerning, respectively, Americans With Disabilities Acts requirements, and Other Design Considerations. All of these road users must be considered when designing an urban intersection. To provide the greatest safety to these users while still maintaining a properly functioning intersection, the horizontal alignment should be as straight and the vertical alignment should be as flat as possible. The angle between the centerlines of the intersecting roadways should be at or as close to 90 degrees (no less than 75 degrees) as possible. These factors will usually provide the greatest sight distance possible. Intersection sight distances should at least meet, if not exceed, those given in the latest edition of *“A Policy on Geometric Design of Highways and Streets”* (G*reen Book)*.

Intersection sight distances are to be based on information given in the latest issue of *“A Policy on Geometric Design of Highways and Streets” (Green Book),* Criteria for Measuring Sight Distance. The driver’s eye height for passenger vehicles is assumed to be 3.5 feet above the roadway surface, and for large trucks 7.6 feet. Stopping sight distance is the most critical sight distance at an intersection, therefore the object height is 2.0 feet. Passing sight distance is not applicable at intersections. The intersection area should be kept as free from obstacles as possible within the existing right-of-way. If a new intersection is being constructed, enough right-of-way should be taken to assure that sight distances will be attained.

For intersections being reconstructed, the minimum edge of traveled way of the design of the radius returns should accommodate a passenger vehicle (P), but if a single-unit truck (SU) can be accommodated within the existing right-of-way, this design vehicle should be used. For new intersections, the character of the predicted traffic will dictate the design vehicle to be used to design the edge of pavement of the radius returns. Again, this will depend upon the right-of-way being available. The Designer is directed to the applicable chapter of the latest issue of *"A Policy on Geometric Design of Highways and Streets" (*Green Book*)* for more discussion, diagrams, and associated tables concerning the turning radii for the edges of pavement.

60. Drainage

The Designer is hereby directed to the 2007 issue of the West Virginia Division of Highway's Drainage Manual, 3rd Edition, dated December 2007 for information concerning drainage requirements on urban streets and highways. In particular in this Manual, Chapter 5 deals with Storm Drainage Systems; however the whole Manual must be carefully reviewed and followed for drainage design on any project.

70. Americans With Disabilities Act Requirements

Design Directive (DD) 811, "Curb Ramps and Sidewalks" should be utilized by the designer for compliance with the 1990 Americans With Disabilities Act (ADA) requirements. The Designer must consider factors such as crosswalk placement, items projecting into the path of the pedestrian way, proper colors of signs/striping required, etc. Guidance for design of ADA features can be found in DD-811 and at the following web address: www.ada.gov. All Divisions and Districts in the Division of Highways are responsible for ensuring that ADA requirements are met to the fullest extent possible. Additional information is also located at the following FHWA links: www.fhwa.dot.gov/environment/sidewalk2/index.htm and www.fhwa.dot.gov/civilrights/ada_qa.htm.

It is possible that site conditions will not allow full implementation of the design requirements of the ADA. In these cases, the Designer should strive to conform to the requirement as much as the site conditions allow. If full compliance cannot be obtained, the designer should document non-compliant areas and why compliance cannot be obtained to the project file.

80. Other Design Considerations

There are other design considerations that may have to be evaluated by the Designer due to the nature of the project. Environmental considerations from the project's approved environmental document, any local laws and zoning regulations which must be observed, or "Context Sensitive Solutions" requirements must be considered in the project design. Landscaping, for an example, may be part of a "Context Sensitive Solution" for a particular project, and may need to be evaluated for its affect on elements of the projects design.

Of particular concern, urban streets and highways can serve pedestrian/bicycle and bus traffic and as a utility corridor. Therefore, the Designer must consider pedestrian/bicycle and bus use and accommodation of utility relocations when designing an urban street or highway. Bus pull-off bays may need to be provided. Reference is made to the following documents for information regarding accommodation of these roadway users: *State of West Virginia* "Statewide Plan for Accommodation of Bicycle Transportation and Pedestrian Walkways", dated September 1997; "Accessible Rights-of-Way Design Guide: Sidewalk - Street Crossings - Other Pedestrian Facilities", dated November 1999 and are available on the Division's website at www.wvdot.com/engineering/Manuals/Traffic/PROWLguidel.pdf; "Guide for the Planning, Design, and Operation of Pedestrian Facilities", dated July 2004, *AASHTO*; and "Guide for the Development of Bicycle Facilities", dated 1999, *AASHTO*, at the following address: www.communitymobility.org/pdf/aashto.pdf.

Information concerning the integration of pedestrians into the planning and design of roadway projects is available on the FHWA's website at www.fhwa.dot.gov/environment/bikeped/publications.htm. This publication has detailed information concerning the design of sidewalks, driveway crossings, the design and placement of curb ramps (including detectable warnings) and pedestrian crossings, and also how to provide information to pedestrians using the facility. Research has shown that fatal pedestrian crashes are almost twice as likely to occur in the urban environment than in a rural environment, since pedestrian and bicycle activity is more common in the urban environment (see NCHRP Report 612, Safe and Aesthetic Design of Urban Roadway Treatments, as described below).

Also, information concerning proven safety countermeasures for the protection of pedestrians and bicyclists is available on the FHWA's website at safety.fhwa.dot.gov/per_bike/ped/index.htm. These countermeasures consist of studies, actions, and low-cost improvements that can be made to assure the safety of pedestrians/bicyclists on projects, and have been proven to be cost-effective by the FHWA.

The designer must also consider routing pedestrians/bicycles through the work zone safely just the same as vehicular traffic. Reference is hereby made to the latest edition of the Division's "Manual on Traffic Control for Streets and Highways", which is also available on the Division's website at this address: www.wvdot.com/engineering/Manuals/Traffic/TCM_06L.pdf, Chapter D. Pedestrian and Worker Safety in this Manual pertains solely to pedestrian and worker safety in the work zone, and is hereby referenced for use by the Designer to lay out a pedestrian traffic control plan through the work zone for the duration of the project. This plan should be integral with the Temporary Traffic Control Plan for vehicles, and include all phases of construction. Also, DD-681, Work Zone Safety And Mobility, is to be consulted in the development of the Temporary Traffic Control plan.

Design criteria for urban projects is dependent on the ultimate plan for development of the local area, and should be adjusted to meet these needs. See DD-610 for Geometric Design Criteria for Urban Highways. Any deviation from the criteria listed in DD-610 will require a Design Exception. See DD-605, Design Exception Policy, for information concerning what constitutes a Design Exception (the 13 Controlling Criteria) and how it is to be documented and approved.

Also, urban roadways are characterized by many potential roadside hazards. Part of DD-610 concerns Horizontal Clearance to Obstructions, and gives information concerning the minimum requirements for horizontal clearances to obstructions for the various classes of roadways within the roadway classifications system. NCHRP Report 612, Safe and Aesthetic

Design of Urban Roadway Treatments, which is available to the designer on the web at the following address: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_612.pdf, describes and details various strategies that should be considered for use in design of urban roadways. Many potential roadside hazards, such as curbs, mailboxes, street light and utility poles, landscaping, etc. must be left in place for various reasons and the above referenced publication gives the designer more detailed guidance in the treatment of these roadside hazards, to mitigate or prevent crashes with these hazards. Other hazards the designer must consider are driveway entrances, lane merges, and sidewalks. Appendix "C" of the aforementioned NCHRP Report 612 contains a "toolkit" for treatment of these, and other, roadside hazards in an urban area.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

801
UNIFORM TERMINOLOGY FOR ROUTE IDENTIFICATION
May 13, 1996

In order to insure uniformity throughout the Division of Highways with regard to Route Identification, the following terminology shall be used.

The basic route identification shall consist of the sign system name and number supplemented, where needed, by the State legal (functional) system name.

1. I - Interstate shield route marker.
2. US - US shield route marker.
3. WV - Rectangular route marker.
4. CR - Round route marker.

Any route segment can and shall be identified by:

1. A prefix indicating the sign system, I, US, WV, or CR
2. The route number.

Examples are:

I-77
US 119
US 52
WV 16
WV 3
Kanawha County Route 5/6 (followed by (CR 5/6), remainder of document may use CR 5/6); or
Cabell County Route 47 (remainder of document may use Route 47)

Note that County names must be used with County sign system routes since route numbers repeat among counties.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-802
TRAFFIC SKETCH MAP
June 30, 2014

All design reports and construction contract plans shall include a traffic sketch map. The following procedure is to be used for obtaining the necessary traffic information.

Attachments

TRAFFIC SKETCH MAP

Designers are to prepare sketch maps without traffic data as soon as practical. Reproducible thereof will be submitted to the Traffic Demand/Analysis Unit of the Planning Division for placement of the necessary traffic information thereon. Consultants will submit their maps through the Engineering Division.

The Designer shall show on the sketch map the general alignment of the proposed improvement, roads interchanging therewith or grade separated there from, relocated roads, ramps, intersections affecting or affected by the design, and arrows indicating the desired traffic data. The latter shall include the volume of all ramp movements at interchanges and turning movements at intersections as well as mainline and cross road volumes. Where placing all information on the sketch map will unduly clutter same or cause confusion, inserts showing blow-ups of individual interchanges and intersections will be used.

Immediately upon receipt of the traffic information, the Designer shall draft the information on the original tracing, indicate the date prepared or revised and submit three prints to the Director of the Engineering Division.

All requests for traffic information shall be accompanied by:

1. A reproducible of the Traffic Sketch Map.
2. Description of the project termini including county and route number.
3. Project number (engineering number when possible).
4. Location on county or city map (many schematics are difficult to locate).
5. Exact years for which traffic information is required.

Sketch Maps prepared in the Design Report phase will not be used in the construction contract plan phase. Separate maps will be prepared for each phase.

The Design Designation plus Traffic Index for all affected roads which would require a separate pavement design shall be requested during development of contract plans and shown on the Traffic Sketch Map.

To assure that traffic data indicated for structure plans is consistent with that presented on roadway plans, the Roadway Designer is to furnish a Traffic Sketch Map to the Structure Designer indicating the current and design year ADT on the structure itself and, if a grade separation, the facility being overpassed. The required traffic data must be included on all bridge plans, including the final plans.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-803
DETERMINATION OF CONTRACT COMPLETION DATE
September 18, 2013

Attached for your use is the Division's written procedure for Determination of Contract Completion Date.

This procedure is to be used for all projects unless otherwise directed.

Attachment

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

DETERMINATION OF CONTRACT COMPLETION DATE

A. General Considerations

The Division shall establish a contract time duration on each construction contract in order to determine the contract completion date. Several factors must be considered when establishing contract duration, such as:

- Provide a time for the contractor to complete the project consistent with historical records of Contractor performance on similar work.
- Emergency conditions.
- Minimize annoyances in residential areas.
- Minimize traffic disruption and delay in high traffic areas.
- Coordination with other activities and other projects to be performed in the same work area.
- Political sensitivity and public awareness.
- Coordination with adjoining projects to provide usable roadway sections.

Many of these factors can conflict with others and not all of them will have the same importance for each project.

The contract duration time as shown on a bar chart for Estimating Contract Time shall be established when the project is submitted for PS&E. If there are quantity changes or other revisions during the PS&E review, the contract duration may be revised. The bar chart as developed by the designer shall be submitted as part of the pre-PS&E plan review to the Contract Administration Division.

Contract Administration Division's PS&E unit will establish the contract completion date using the contract duration time by adding additional time based on considerations such as what the review process will be, status of utilities, authorization of funds, length of advertising period, bid review period, award, scheduling of preconstruction conference, and a conversion of the working day contract duration to a calendar time period that accounts for holidays, weekends, unsuitable weather conditions and anticipated winter shutdown time.

Some projects will be selected by Division's management for special handling by inclusion of either Incentive/Disincentive and/or other special concepts. When this occurs, the designer in cooperation with Division's management shall adjust production rates and other factors to reflect these special conditions. DD-708 contains guidelines for project selection and development of the Incentive/Disincentive Special Provisions.

Restrictive hours on contractor's operations may be necessary when considering various factors, such as high traffic volumes in lane closure situations and noise abatement in residential areas.

Specification limits as they relate to seasonal limitations must be observed when calculating contract time periods.

As part of this procedure for determining contract completion dates, the Division has established "Guidelines for Production Rates and Chart for Contract Duration." This document contains a set of production rates for many of the activities that occur in highway/bridge construction projects. Production rates for all possible activities are not included nor are all production rates used in each construction job. The production rates may have to be supplemented with information from other sources and should be tempered with good engineering judgement and past experience with similar work. The "Guidelines for Production Rates and Charts for Contract Duration" is divided into series of production rates for various categories. It also includes the Chart for Estimating Contract Time. The Engineering Division will update the "Guidelines..." as needed, but will at least do a complete update on a three-year cycle. Additionally, the Contract Administration Division will select appropriate projects every year on which the approved Project Primavera CPM Schedule will be utilized to keep detailed records on the various operations and compare those to the rates used to develop the contract time.

B. Steps for Establishing Contract Duration

In using this procedure, the designers in the respective design units will do Steps 1 through 6. This includes projects being done by Consultants who will submit the Chart for Estimating Contract Time to the Review Section of the applicable controlling Development Division. The designer in the controlling Division will perform Steps 7 and 8, and the applicable PS&E unit will perform Step 9.

Establishing a project's duration will be accomplished with the following steps:

1. Review the project plans and specifications. Analyze and determine special factors that are controls affecting completion or phasing of the work. If the project has more than one phase, determine what work can be done in each of the phases.

2. List the required activities for each phase. These are listed on the chart for Estimate of Contract Time. This list does not need to be exhaustive but does need to include all controlling items of work activities on the critical path.

3. List each quantity of the unit of work that will be used as a basis for estimating the duration of that activity, e.g. for storm sewers this would be the number of linear feet of pipe, etc.

   Each Division supplying a component of the project shall furnish a separate chart to the controlling Division for that component. This shall be integrated onto a chart for the project with only the major phases being shown or just simply shown as a single line activity with its appropriate duration.

   When multiple projects are combined into one contract for bidding purposes, the working day calculations for each project shall be integrated into a single chart which shall reflect the total number of working days necessary to complete both projects.

   On a project with more than one phase use only that quantity associated with that phase. If the list of pay items shows, for instance, 10,000 cubic yards of excavation for a project, that has two phases, that have approximately the same amount on each phase, put 5,000 cubic yards as the unit of work for excavation in Phase 1 and 5,000 cubic yards as the unit of work for excavation in Phase 1 and 5,000 cubic yards as the unit of work for excavation in Phase 2. Extreme accuracy is not required. It is only necessary that the parts of activities sum to the whole, but a percent or two of error on any phase will not affect the results.

4. Use the production rates to convert the units of work into work days. Do this for each activity in each phase.

5. Drawing the Bar Chart for Estimating Contract Time.

   a. Select a scale to draw the bar chart, i.e. if the project is about 200 days and fits on one form, make each block 10 days. More than one page may be used for long projects. Succeeding pages may be for later time periods.

   b. Put the first activity bar on the bar chart, beginning at day 1 and extending the line for the duration of that activity.

   c. Determine how many days after the beginning activity has started until the second can start. Use that contract day as the starting date of the second activity and extend the bar for the duration of the second activity.

For each succeeding activity, the designer must decide if its start is dependent or partially dependent on a preceding activity. If so, then the beginning of the activity is placed to reflect this dependence.

d. Repeat until all activities are completed on the chart. Use more than one form sheet if necessary.

6. On each form used, complete the federal and state project number, county name, preparation date for the chart, the name and phone number of the person who established the contract duration, and the contract time in working days.

7. This chart is now sent along with the pre-PS&E plans to the Contract Administration Division and/or Assistant District Engineer for Construction for review. This is generally done at the final office review (See DD-202). If the project does not have a final office review, the chart along with the pre-PS&E plans must be submitted to Contract Administration Division and/or ADEC by the project manager prior to submission to the Contract Administration Division's PS&E Unit.

8. The "Chart for Estimating Contract Time" shall be submitted by the designer to Contract Administration Division's PS&E unit and also will be maintained in the project file. The "Chart" maintained in the project file shall have attached all backup charts that were developed for various phases, such as individual bridges, and submissions from other design units, such as Traffic Engineering and Structures.

9. Contract Administration Division's PS&E unit will use the "Chart" which is in working days and convert it to a calendar period in order to establish a contract completion date. Factors to be considered by the PS&E unit include the following along with other applicable provisions:

a. Conversion from working days to calendar days will be made by use of the Scheduling Conversion Matrix which is updated every year by the PS&E unit. There are two matrices which can be used. One is based on a five-day work week and the other is based on a six-day work week. These matrices exclude the major holidays of Memorial Day, Independence Day, Labor Day, and the Thanksgiving Thursday/Friday holiday. The five-day matrix shall be used for most projects. The six-day matrix can be used when it is advantageous to the Division of Highways to accelerate the completion of the project.

b. Winter shut down due to seasonal limitations will be addressed if the contract duration requires the work to occur during two or more construction seasons. The matrix does not include any working days for the period of December 1st to March 31st.

c. Status of utility report from the Right of Way Division will be checked to determine if any time adjustments are needed before the project is advertised or the Contractor will be able to start work. Also a determination should be made for coordination with utilities for any concurrent utility relocation work required.

d. A time factor will be added to the date the PS&E package is projected to start through the Division's management approval process and, if appropriate, review and approval by the Federal Highway Administration. This time factor should reflect items such as:

   1) Authorization of funds - state and/or federal.

   2) Review time.

   3) Printing plans.

   4) Advertising period.

   5) Bid review period.

   6) Award time.

   7) Scheduling preconstruction conference.

   8) Start of work after notice to proceed.

e. Certain projects shall have seasonal completion dates that will provide the Contractor time flexibility in scheduling the actual work to reflect that a single Contractor may have several projects to complete. Projects with seasonal completion dates shall include a special provision that will limit the on-site time to minimize the disruption to traffic by specifying the number of allowed calendar days. If the number of allowed calendar days is exceeded, then contract liquidated damages or some other specified monetary amount shall be assessed. Projects with seasonal completion dates will generally have a construction cost of less than $500,000 and be of the following types:

1) Resurfacing.

2) Guardrail.

3) Bridge Deck Overlays.

The seasonal completion date for projects advertised in the early part of the year will generally be October 31st for resurfacing and November 15th for other project types, but the seasonal dates may vary based on particular conditions, such as the District locality or the current specifications related to weather and temperature limitations. For projects advertised late in the year where completion of the work is not critical to that construction season, the seasonal completion date shall be established as June 30th of the next year. If the Contractor undertakes the project work during winter shutdown, the above mentioned special provision shall include restrictions as to the on-site time that would disrupt traffic.

f. With all of the above time factors considered and totaled, a contract completion date will be entered in the Contractor's proposal at the appropriate location.

GUIDELINES FOR PRODUCTION

RATES AND CHART

FOR

CONTRACT DURATION

MARCH 1996

MAJOR GRADE AND DRAIN PROJECTS

OVER 1 MILLION CUBIC YARDS

Operation	Rate Per Working Day
■ Clearing and Grubbing	5-8 acres/day, not to exceed 15 days (overlap with grading).
■ Excavation	8,000 CY/8 hour shift (adjust down proportionally for percentage of rock or up for rural and terrain as appropriate).
■ Aggregate Base Course	2,500 tons/day on mainlines. 1,200 tons/day on ramps and side alignments.
■ Asphalt Pavement	1,500 tons/day on mainlines. 800 tons/day on ramps and side alignments.
■ Concrete Pavement	5,000 SY/day on mainlines. 1,500 SY/day for ramps and side alignments - add 2 days for throats, tapers, etc.
■ Pipes	Less than 60-inch 300-foot/day. 60-inch and greater 100-foot/day.
■ Curbs, Curbs and Gutters	1,000 LF/day on mainlines. 500 LF/day on non-mainline.
■ Guardrail	3,000 LF/day on new construction. 1,500 LF/day all others.
■ Fencing	2,000 LF/day (should overlap with excavation).
■ Seeding	3 acres/day (normally occurs with excavation - allow 3 days at end for closeup of project).

MINOR GRADE AND DRAIN PROJECTS

1 MILLION CUBIC YARDS OR LESS

Operation	Rate Per Working Day
Grading	8 AC/day rural high volume. 1 AC/day urban low volume.
Excavation	6,000 CY/day rural. 1,000 CY/day urban.
Aggregate Base	3,000 Tons/day rural. 1,000 Tons/day urban.
Asphalt Pavement	1,000 Tons/day mainline. 500 Tons/day other.
Concrete Pavement	5,000 SY/day new mainline. 1,500 SY/day other.
Pipe	Less than 60-inch - 300 LF/day. 60-inch and up - 100 LF/day.
Curbs, Curbs and Gutters	500 LF/day.
Guardrail	2,000 LF/day mainline. 500 LF/day urban and old alignments.
Fencing	1,000 LF/day (overlap with excavation).
Seeding	3 AC/day (not to exceed 10 days at end for closure of project - should proceed with excavation).

MAJOR PAVING PROJECTS

Roadway Operation	Rate Per Working Day
■ Fine Grade	2,500 LF per 24-foot lane.
■ Aggregate Base Course	3,000 to 3,500 tons/day mainline. 1,000 to 1,500 tons/day on ramps.
■ Chemical Stabilized	Show overlaps with paving except 12 working days for placement and curing.
■ Soil Type Base Course	2,000 to 3,000 tons/day.
■ Bituminous Surface Treatment	5,000 to 10,000 SY/day.
■ Asphalt Pavement	3,000 to 3,500 tons/day on mainline. 1,000 to 1,500 tons on ramps.
■ Concrete Pavement	2,500 LF per 24-foot lane. 3,500 LF per 12-foot lane. 1 ramp per day.
■ Shoulder Construction	800 to 1,200 CY/day.
■ Curbs and Curb and Gutter	1,500 to 2,000 LF/day.
■ Guardrail	2,000 to 2,500 LF/day.
■ Seeding and Mulching	8 to 10 acres/day not to exceed 16 working days.

SMALL RURAL PROJECTS

Roadway Operation	Rate Per Working Day
■ Clearing and Grubbing	2 acres/day.
■ Excavation (Unclassified, Draining Ditch, Undercut and Borrow)	400 to 600 CY/day.
■ Aggregate Base Course	400 to 600 tons/day.
■ Chemical Stabilized Subgrade and Base	Show overlaps with paving except 12 work days for placement and curing.
■ Soil Type Base Course	300 to 500 CY/day.
■ Bituminous Surface Treatment	5,000 to 10,000 SY/day.
■ Asphalt Pavement	800 to 1,000 tons/day.
■ Concrete Pavement	N/A.
■ Pipe	100 to 200 LF/day.
■ Inlets/Manholes	1 Ea/day.
■ Curbs and Curb and Gutter	500 to 700 LF/day.
■ Guardrail	1,500 to 2,000 LF/day.
■ Fencing	600 to 750 LF/day.
■ Seeding and Mulching	5 acres/day not to exceed 10 working days.

SMALL URBAN PROJECTS

Roadway Operation	Rate Per Working Day
Clearing and Grubbing	1 acre/day - must consider other incidentals, i.e. pipe removal, pavement removal, etc.
Excavation (Unclassified, Draining Ditch, Undercut, Borrow)	100 to 500 CY/day.
Aggregate Base Course	300 to 500 tons/day.
Chemical Stabilized Subgrade and Base	Show overlaps with paving except 12 working days for placement and curing.
Soil Type Base Course	200 to 500 CY/day.
Bituminous Surface Treatment	2,000 to 5,000 SY/day.
Asphalt Pavement	300 to 600 tons/day.
Concrete Pavement	N/A.
Pipe	50 to 200 LF/day.
Inlets/Manholes	1 Ea/day.
Curbs and Curb and Gutter	300 to 500 LF/day.
Guardrail	1,000 to 1,200 LF/day.
Fencing	300 to 500 LF/day.
Seeding and Mulching	3 to 5 acres/day.

RESURFACING

Roadway Operation	Rate Per Working Day
■ Asphalt Base Course	500 to 1,000 tons/day.
■ Asphalt Surface Course	0.6 to 1-inch - 500 to 800 tons/day. 1-inch - 500 to 1,000 tons/day.
■ Asphalt Patching and Leveling Course	300 to 600 tons/day.
■ Shoulders and Ditches	1 mile/day.

■ For other items see Small Rural or Small Urban Projects depending on type of resurfacing.

STRUCTURES, CULVERTS AND OVERLAYS

The following working days required for the various operations are based on using one crew. In many instances, more than one crew can be used to an advantage on a certain structure, or an entire project. However, reason and judgement must be used in reducing the required time, when using more than one crew, since some times it cannot be reduced regardless of the number of crews, e.g. curing time.

Structure Operation	Rate Per Working Day
■ Temporary Structure	20 days including construction and removal. (100-foot bridge with 2-lane roadway.) Additional time shall be given to structures requiring the contractor to submit design drawings for approval.
■ Dismantling Structures	
• Superstructure	3 to 5 days for overall span lengths of 20 to 100 feet. 5 to 10 days for overall span lengths of 100 to 400 feet. 10 to 25 days for spans over 400 feet.
• Substructure	Time for removal of substructure will vary widely, depending upon type, size, depth below grade, and the portion required to be removed.
■ Excavation	3 to 4 days for average bent where excavation can be done in the open. 5 to 8 days where blasting rock is anticipated. 12 to 14 days when cofferdam is required (will be greater for deep water).
■ Driven Piles	10 to 12 piles/day. Add one day/bent for steel piles with anticipated length over 40 feet.
■ Predrilled and Grouted Piles	4 to 5 piles/day. Add one day/bent for steel piles with anticipated length over 40 feet.

STRUCTURES, CULVERTS AND OVERLAYS

Structure Operation	Rate Per Working Day
■ Forming and Pouring Footings	1 to 2 days per bent, increase for complicated layouts (skewed, U-shaped wingwalls, etc.).
■ Forming and Pouring Columns	2 to 5 days per mid-span bent. 1 to 2 days per end bent, add 1 day to end bent for wingwalls.
■ Forming and Pouring Caps	5 days for average cap, will vary with size, length, and complexity of cap. Add 1 day to end bent when backwall is part of substructure.
■ Curing Time For Caps For Placing Superstructure	5 days (7 calendar days) unless unfavorable weather conditions require a longer period.
■ Placement of Select Embankment	Time for placement of select embankment will vary widely, depending upon length, height, difficulties due to proximity, and depth below water. Scour mat at piers - 4 days/bent. Slope protection - 100 CY/day.
■ Superstructure Fabrication	Additional time should be given if the fabrication time overruns the allotted time given to complete the work required prior to installing the superstructure. A conversion factor of 1.7 has been used to convert the calendar days to working days.
• Rolled Steel Beams	53 to 106 working days.
• Plate Girders	71 to 106 working days.
• Prestressed Concrete Beams	35 to 53 working days.
• Stressed Timber Decks	71 to 88 working days.
• Expansion Device	35 working days.

■ Setting Rolled Steel Beams	6 to 12 beams/day, depending upon length and accessibility, add one day/span for bolting diaphragms.

STRUCTURES, CULVERTS AND OVERLAYS

Structure Operation	Rate Per Working Day
■ Setting Plate Girders	3 to 4 girders/day depending on length and access with 1 day added for field splicing, and 2 to 3 days/span for bolting diaphragms.
■ Setting Prestressed Concrete Beams	4 beams/day minimum, depending upon length and site conditions (accessibility, method of erection required by conditions, etc.).
■ Setting Stressed Timber Deck	Based on a 40-foot - single lane bridge.
• Types A and C	1 day for setting modules. Add 2 days for attaching all hardware and stressing deck.
• Type B	1 day for setting modules. Add 4 days for attaching all hardware and stressing deck.
	Add 1 day for 2-lane bridge.
■ Installing Expansion Device	3 days/expansion device including installation and testing (if two expansion joints are on the same bridge then count 5 days for that bridge).
■ Forming, Pouring, Curing and Stripping Reinforced Concrete Deck	7 to 10 days/span with additional 5 days curing for last span only. (32 to 40-foot roadway width and 40-foot length.)
■ Grooving Bridge Deck	1 day/span.
■ Rails, Metal	3 to 4 spans/day.
■ Rails, Concrete Barrier	40 linear feet/day for bridges less than 200 feet in length.
	2 days for 200-foot bridge length (assuming slipform) and additional time for bridge lengths over 200 feet (includes placing reinforcing steel and concrete).

STRUCTURES, CULVERTS AND OVERLAYS

Structure Operation	Rate Per Working Day
■ Approach Slabs	5 days/each approach slab including temporary drainage. (Additional time required when special drainage is part of approach slab. Note that contractor must wait a certain number of days after placing the approach fill before he can construct the approach slab. If a portion of this waiting period is not taken up by overlapping project work, then the net waiting period time should be included in the determination of working days).
■ Culvert Excavation	Single barrel and maximum length of 70 feet. 5 days (wide variation depending upon method of excavation required, site conditions, amount of excavation required, need for cutting diversion channel, presence of rock in bed, etc.).
■ Concrete Culvert	Single barrel and maximum length of 70 feet with no transverse construction joints. 19 days total: 6 days forming. 2 days for wingwall footing and bottom slab. 2 days for walls. 2 days top slab assuming forms are constructed concurrent with excavation. 3 days casting. 1 day wingwall, footing and bottom slab 1 day walls, and 1 day top slab. 10 days curing, stripping forms and backfilling.
■ Overlays (LMC)	Special consideration should be given to traffic flow. In most cases traffic flow will dictate the construction process. Lead time for expansion dam fabrication should also be taken into consideration.

STRUCTURES, CULVERTS AND OVERLAYS

Structure Operation	Rate Per Working Day
■ Class 1 Bridge Deck Removal (Machine Work)	2,500 SF/day.
■ Class 2 Bridge Deck Removal (Hand Work)	250 SF/day.
■ LMC Placement	5,000 SF/day.
■ Concrete Curing Time	4 days/pour.

TRAFFIC ITEMS

Work Item	Rate Per Working Day
■ Signs, Signals, Pavement Marking and/or Highway Lighting	10 days added to end of project, if total project time exceeds 80 working days.

If Project Time is less than 80 Working Days, then Traffic Item Time will have to be calculated.

Traffic Signals	Rate Per Working Day
■ Ordering Signal Equipment	75 days for projects when ordering supports. 35 days for projects when ordering control equipment only.
■ Installing Signal	15 days for a single installation. 12 days per intersection for multiple installation.

Pavement Markings	Rate Per Working Day
■ Ordering Pavement Marking Material	30 days/project.
■ Long Lines	50,000 LF/day.
■ Specialty Markers	
• Stop Lines, etc.	500 LF/day.
• Arrows and Letters	50 units/day.
• RPM's	400 to 800 units/day.

Signing	Rate Per Working Day
■ Ordering Signing Material	60 days/project.
■ Ordering Overhead Sign Structures	80 days/project.
■ Erecting Overhead Signs	10 days/structure.

TRAFFIC ITEMS

Signing	Rate Per Working Day
■ Erecting Sign Supports	
• WF Supports	100 LF/day.
• U Channels • (Exclude Delineators)	300 LF/day.
■ Erecting Signs	1,000 SF/day.
■ Erecting Delineators	100 units/day.

Highway Lighting	Rate Per Working Day
■ Ordering Lighting Material	75 days/project.
■ Erecting Lighting	3 days/support.

Impact Attenuators	Rate Per Working Day
■ Ordering Material	30 days/project for permanent devices and 15 days for temporary attenuators and sand barrels.
■ Installing Attenuators	1 to 3 days/unit.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
CHART FOR ESTIMATED CONTRACT TIME

DATE__________________ **SHEET_____OF_____**

ACTIVITY	UNIT OF WORK	PROD RATE	WORK DAYS																	

FEDERAL-AID PROJECT NO. _________________________ STATE PROJECT NO. _______________________ COUNTY________________________
NAME ___________________________ PHONE NO.______________________ WORK DAYS FROM MATRIX = CONTRACT TIME ___________

DD-803

23 of 23

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 804

FUNDING SOURCE IDENTIFICATION SIGNS

March 10, 2020

Supersedes November 1, 1994

DELETED

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

805
USE OF CORPORATION LINES
March 16, 2006

All projects shall show the boundary (corporation) lines between municipalities and their surrounding areas.

The corporation lines, within the project limits, shall be shown graphically in the plans and on the Title Sheet, with station value(s) assigned to the entrance(s) and/or exit(s) from the municipality when the proposed alignment crosses its corporation lines. Utilizing this information which has been shown on the plans, it will be left up to the contractor to correctly calculate the breakout of quantities between “Municipal” and “Non-Municipal”. This information is then used to determine the proper assessment that should be applied to contracts in or partially in one or more municipalities to cover the business and occupation or any other municipal tax which may be applicable.

In each applicable Table in the Tabulation of Quantities sheets, the stations of the corporation lines will be shown but not indicated as corporation line stations. Quantities shall be computed up to the indicated station(s), utilizing these stations as “breakpoints”, and then continued from this “breakpoint”. No summation of quantities will be made in the Tables at this “breakpoint”; rather the contractor will be responsible for this computation.

Also, a General Note is to be placed in the plans when this situation occurs on a project. A sample note is given here:

<u>Notice to Contractors</u>

This project is (in part is) located in the corporate boundaries of the city (cities) of (city name(s)).

The Corporation Limits depicted in the plans are based on the best available information provided by the city (cities) of (city name(s)). The corporate boundaries have not been surveyed or field-verified and should be considered approximate.

Separate quantities for work to be performed within the corporate boundaries of the (each) city are not provided in the plans.

It shall be the responsibility of the contractor to determine the quantities applicable to the (each) city for all municipal taxes levied by the (each) city, to include but not be limited to Business and Occupation Taxes.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

806
POLICY FOR INSTALLATION OF
SCREENING ON HIGHWAY OVERPASSES
November 1, 1994

Attached is the West Virginia Department of Transportation, Division of Highways policy for "Installation of Screening on Highway Overpasses".

POLICY FOR INSTALLATION OF SCREENING ON HIGHWAY OVERPASSES

Background

Objects thrown or dropped from highway overpasses by pedestrians or the drivers or passengers of vehicles using the structure usually fall harmlessly to the ground, causing no more than a litter problem. However, some highway structures are placed over or adjacent to other transportation facilities such as another roadway, a railroad or a navigable stream, or to sensitive areas such as playing fields, school yards or high-turnover parking lots. In these cases, measures may need to be taken to prevent the accidental or deliberate throwing of objects or debris onto persons or property below.

In all cases where screening or fencing of an overpass is proposed, the benefits and impacts must be carefully weighed. While the screening may result in an increase to the safety of those below the highway, there are possible detrimental impacts including increased maintenance and repair costs, reduced access for bridge inspection crews, increased difficulty in snow removal and ice control, and where the screening is on a traffic barrier or parapet, the possibility that an errant vehicle may climb the face of the barrier and strike the screen. All of these factors must be considered in the decision to install screening and in the design which is chosen.

Additional information can be found in the AASHTO publication, "A Guide for Protective Screening of Overpass Structures."

Policy

It shall be the policy of the Division of Highways to evaluate the need for screening on bridges or overpasses when:

1. A new structure is being designed;

2. An existing structure is being renovated; and

3. A pattern of accidents or public complaints indicates that there is a problem with objects or debris being thrown or dropped from an existing overpass or viaduct.

Factors which will be considered in the decision to install, or not to install, screening shall be as follows:

1. Presence of a sidewalk;

2. If no sidewalk, proximity to a school, playground or neighborhood which may generate a significant number of children who may play on or around the structure. Besides protecting those below, the screening may prevent children from climbing on the railing and falling off of the structure;

3. The presence of a transportation facility such as a roadway, a railroad or a navigable waterway below the overpass or bridge. In the case of a railroad or navigable waterway, the frequency and sensitivity of the traffic passing under the structure shall be taken into account;

4. Requirements of the entity or agency over which the structure passes such as a railroad, the Corps of Engineers or the National Park Service;

5. Effect on aesthetics or on maintenance, including inspection, snow removal or ice control or navigation lights, and the maintenance of the screening itself; and

6. Effects on the safety of vehicles crossing the structure, especially where speeds are high.

This policy is intended to recognize that isolated incidents of the type which it is intended to address may occur at any structure. The intent is to assist the designer in identifying those bridges where the probability of occurrence is high or where problems are known to exist and to assure that reasonable protective measures are taken at those locations.

The type of screening to be used will be determined by the designer, based on the dimensions of the structure and the sensitivity of the area to be protected. It will be the responsibility of the designer to document the project file with the decision not to install screening, the factors influencing the decision and the reason or reasons for the type of screening chosen.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

807
APPALACHIAN HIGHWAY PROJECTS
PREFERENTIAL USE OF WOOD POSTS

November 1, 1994

The Appalachian Regional Development Act of 1965 provides that "in the construction of highways and roads authorized under this section, the States may give special preference to the use of mineral resource materials indigenous to the Appalachian region."

Where it is compatible with the character of the project and abutting land use, for example, in rural areas, wood shall be specified for guardrail posts and for fence posts.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

808
CLIMBING LANES
November 1, 1994

Truck climbing lanes shall be of the same width as the through lanes on the mainline. A usable four-foot shoulder shall be provided with three feet being paved if paved shoulders are being used on the highway. A two-foot offset is to be provided from the four-foot usable shoulder to the face of guardrail.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

809
FIELD OFFICES
February 8, 2017
Supersedes August 1, 2003

Attached is the West Virginia Department of Transportation, Division of Highways policy on the construction of "Field Offices".

This document provides general information and guidance regarding the determination of the type of construction field office required for West Virginia Department of Transportation, Division of Highways' construction projects.

Attachment

FIELD OFFICES

The Division's specifications include four types of construction field offices; Item 640002-001, Large Field Office and Storage Building; Item 640001-001, Standard Field Office and Storage Building; Item 640006-001, Small Field Office; and Item 640005-001, Minimal Field Office. Their inclusion in construction contract plans is to be as set forth below.

Engineers Estimated Contract Amount	**All Roadway System Classes**		
Greater than $10,000,000	640002-001 Large Field Office and Storage Building	640003-001 Building Equipment	
Greater Than $5,000,000	640001-001 Standard Field Office and Storage Building	640003-001 Building Equipment	
Greater Than $1,000,000	640006-001 Small Field Office	640003-001 Building Equipment	

<table>
<tr><th colspan="5">Engineers Estimated Contract Amount $1,000,000 or less</th></tr>
<tr><th colspan="5">Roadway System Class</th></tr>
<tr><td>NHS</td><td colspan="4">NON-NHS</td></tr>
<tr><td rowspan="3">640006-001
Small Field Office</td><td colspan="2">Not Scheduled to extend thru winter</td><td colspan="2">Scheduled to extend thru winter</td></tr>
<tr><td>* Option 1</td><td>* Option 2</td><td>* Option 1</td><td>* Option 2</td></tr>
<tr><td>640005-001
Minimal Field Office</td><td>No Field Office</td><td>640006-001
Small Field</td><td>No Field Office</td></tr>
<tr><td>640003-001
Building Equipment</td><td></td><td></td><td>640003-001
Building Equipment</td><td></td></tr>
</table>

* At Regional Construction Engineer's option

Where projects are being designed by Consultants, all contacts with the District Construction Engineer will be made through the WVDOH Project Manager for the subject project.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

810
PHOTOGRAMMETRIC MAPPING, SURVEY CONTROLS AND AERIAL PHOTOGRAPHY
September 1, 2003

Attached is the West Virginia Department of Transportation, Division of Highways, guidelines for the "Photogrammetric Mapping, Survey Controls and Aerial Photography" to be used on all projects.

Attachments

PHOTOGRAMMETRIC MAPPING, SURVEY CONTROLS AND AERIAL PHOTOGRAPHY

All persons engaged in Photogrammetric Mapping and Aerial Photography shall reference the requirements as described in the "Reference Guide Outline Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways," and the Surveying and Mapping Manual, U.S. Department of Transportation, Federal Highway Administration.

Aerial Photography

Aerial photography shall be undertaken for the primary purpose of providing imagery of appropriate quality, accuracy and scale, and related products as may be used in the photogrammetric compilation of planimetric base, topographic, or orthophoto maps which meet U.S. National Map Accuracy Standards. The contractor shall furnish all materials, supervision, labor, equipment, and transportation, and shall execute and complete all of the work required by the contract in conformance with these specifications and any contractual modifications to these specifications. If conflicts exist, the Classification Standards of Accuracy, and General Specifications of Geodetic Control Surveys and the Manual of Photogrammetry and the Surveying and Mapping Manual referenced above will govern.

Unless specifically directed otherwise, photography will be accomplished during the period when deciduous trees are barren, and generally between 10:00 a.m. and 2:00 p.m. local time when the sun angle is not less than 30 degrees. Photography will not be acquired when the ground is obscured by snow, haze, fog, or dust; when streams are not within their normal banks; or when the clouds' shadows will appear on more than 5% of the area in any one photograph. The photographs shall not contain objectionable shadows caused by relief or low solar altitude.

Overlap (Forward Lap) on all photography in the direction of the line of flight shall be 60% ± 5%. Overlaps (Forward Laps) not within this range may be sufficient cause for rejection of all photographs in the strip. Exception to 60% for projects using airborne GPS. The overlap (Forward Lap) for projects designated to be flown using Airborne GPS may be 80% ± 5%.

Sidelap between the line of flight shall be 30% ± 5%. Sidelaps not within this range may be sufficient cause for rejection of one of the flights. Exception to 30% for projects using airborne GPS. The sidelap for projects designated to be flown using Airborne GPS may be 50% ± 5%.

Tip and tilt of the photography should be kept to a minimum. Tip and tilt shall not exceed 4^{o}. Tip and tilt greater than 4^{o} shall be cause for rejection.

Crab of the photography in excess of 3^{o} is undesirable and crab in excess of 5^{o} on two or more of the photographs shall be cause for rejection.

Infrared photography: approximately 10" x 10" contact print. An indirect photographic technique (electronic thermography or equivalent) will be employed to detect low level heat emissions.

Aircraft

The aircraft to be used shall be equipped with all essential navigational and photographic instruments and be operated by a well-trained and experienced crew. Performance of the aircraft shall be adequate to complete the proposed project in accordance with the technical specifications. All operations shall be in conformity with the applicable official regulations and ordinances.

Aerial Camera

All aerial photography shall be exposed with a calibrated precision type camera. A calibration report from USGS shall not be more than 3 years old and shall have an AWAR rating of at least 85 line pairs per millimeter per inch resolution. Unless otherwise specified, the aerial camera will be a Wild RC-20, 6" focal length; a Wild RC-30, 6" focal length; and/or a Zeiss RMK TOP, 6" focal length; or Zeiss LMK 2000 or 1015 or equal precise camera with forward-motion compensation. The use of flight management systems and gyro-stabilized camera mounts are highly recommended. The focal plane of the aerial camera must be set so the calibrated focal length shall be 153.00 mm ± 3.00 mm. The camera shall expose a 9" x 9" image negative. The focal plane and fiducial (reference) marks must be permanently fixed in rigid orientation with one another. The cameras must produce eight (8) fiducial (reference) marks on each negative for accurate location of the principal point (geometric carts). The platen against which the film is pressed shall not vary from a true plane by more than ± 0.0005.

Film Labeling

Each exposure shall be clearly labeled by mechanical means in ink at the edge of the negative just inside the image area and on the north edge for north-south flights and on the west edge of east-west flights. This labeling shall include the following information as a minimum:

WVP-No.	Date of Photography	Scale of Photography	Camera Focal Length	Flight Line No.	Exposure No.

The "Scale of Photography" shall be given as a representative fraction, e.g., 1:6600. "Flight Line" numbers are not to be repeated anywhere within the photographic coverage of the contract, but will be numbered consecutively, starting with line no. 1 and continued sequentially over all flight lines and scales. "Exposure Numbers" for any flight strip will be numbered consecutively from "Exposure No. 1," and continuing to the end of that flight line.

Photo Index Map (if required and requested)

Upon successful completion of all photography for a project, the Consultant shall prepare and deliver 2 copies of an index map, sheet size 23" x 34". The title block shall have the following information:

Aerial photo index, project name, Consultants name, date of photography, negative scale, scale of photo index, and lens-camera combination serial number. A north arrow shall be placed near the upper right hand corner of the sheet. Towns, streams, major roads and other items, which would aid in identifying a particular area, shall be labeled.

All prints and diapositives shall be exposed on approved paper and film by means of an automatic dodging printer. Prints and diapositives shall be delivered flat, trimmed on all sides, as flush with the image as possible, and still retain the fiducial marks. Photographs and diapositives which are not clear and sharp in detail and of below average contrast, and not free from static marks, stains, and other blemishes that would interfere with their intended purpose will be rejected.

Field Control , Datum and Units

See Appendix A

Analytical Triangulation

Analytical triangulation shall be used to supplement ground control for absolute orientation of the stereo models. Supplemental control established by this process shall have a root-mean-square not exceeding one part in 10,000 of the flight height.

Map Compilation

The Consultant shall digitally compile maps. Stereo photogrammetric methods using only precision analytical instruments of recognized accuracy and of a type approved by the Division of Highways shall be used for map compilation. Planimetric data and topography (contours) shall be furnished in three-dimensional format obtained from digital terrain models. Digital data described herein will have the following working units:

MU (Master Unit) = Feet
SU (Sub Unit) = Inches
PU (Positioned Unit) = 100

MicroStation Design Plane and Global Origin

There are a number of factors that affect the coordinate range within the state of West Virginia. These include:

State plane zone – south or north
Horizontal datum – NAD 27 or NAD 83
Units – meters or U.S. survey feet

It is possible to design a MicroStation seed file that can accommodate any and all combinations of the above options. Geographically, the maximum horizontal coordinate positions within the state will be around 3,000,000 feet in the easting position and 860,000 feet in the northing position. The finest resolution that will work with all possible combinations of units, datum, and zone is 0.001 feet. Many surrounding states including Kentucky and Georgia have adopted a positional unit or unit of resolution of 0.001 feet.

The Global Origin is set as the lower left corner of the design plane and assign it the unique coordinate position (0,0) and adopt the following convention for the Working Units:

Master units: Feet
Sub units: Inches
100 Sub units per master unit
10 Positional Units per Sub Unit

This combination will allow us to provide mapping for the entire state of West Virginia within one seed file. The finest resolution for coordinates in this file will be 0.001 feet.

Mapping Scale (English)

1"=20'	CI 1.0 ft.
1"=50'	CI 2.0 ft.
1"=100'	CI 2.0ft
1"=200'	CI 5.0 ft
1"= 400'	CI 10.0ft

Terrain Data

Terrain data shall consist of mass points, breaklines, and spot heights. Terrain data shall be free from duplicate points and free from points duplicated in different files. Duplicated points are defined as points that have identical coordinates.

Contour Accuracy

At least 90% of all contours shall be within one-half the regular contour interval at correct elevation. No contours shall be more than a full regular interval from correct elevation as could be determined by test sections or profiles from existing or basic control. Contours in any local area, which could be brought to within this tolerance by shifting up to 0.4" (on the map) in any direction, will be accepted as being correctly plotted. This requirement will not be applicable in areas where the ground is obscured during aerial photography by foliage or prevalent smoke. Dense shadow contours shall be shown as dashed lines. Areas which are totally obscure shall have a polygon placed around said area and labeled "Obscure Area".

Planimetric Features

Ninety percent of all planimetric features shall be plotted "well-defined." "Well-defined" is defined as being plottable at the published scale within 1/50 of an inch. Well-defined features are those that are easily visible or recoverable on the ground. Examples include road intersections, railroad crossing, towers, corners of buildings and structures, and centers of small buildings.

Features not identifiable upon the ground within "well-defined" limits are not considered as test points, even though their positions may be scaled closely on the map. Examples include outlines of tree lines, wetlands, shore lines, and in many cases, drainage.

Sheet Size

All sheets shall conform to the "English" series size. The overall sheet dimensions are 34" wide and 22" high.

Reduced drawings (1/2 size) shall be printed on "A3" size paper which has dimensions of 11" x 17".

Grid

On all scales a 5 inch x 5 inch grid shall be placed on the sheet with the line intersections emphasized. Any intersection outside of the mapping boundary shall be labeled with its respective north and east coordinates.

Cells and Levels

A current cell library and level symbology package obtainable from the Division of Highways shall be used.

Data Files

Map data files are to be furnished on CD-ROMS in DTM (ASCII), Intergraph DGN and Auto CADD format. Each file shall contain topographic data corresponding to the interior of the neat area of each finished sheet of mapping. One set of all final mapping data shall be submitted on CD-ROM.

Scanning

Film diapositives are to be scanned with a high quality, properly aligned and calibrated, industry standard photogrammetric scanner. The photogrammetric scanner must have an acceptable positional (geometric) accuracy (RMSE equal to or less than 3 microns in both the X and Y direction) and a high radiometric resolution (24 bit is acceptable for color). Each scanned image must include all of the film diapositive (including all fiducial marks) and must be clear and free of defects not found on film diapositive. Each film diapositive is to be scanned separately at true micron resolution in JPEG tiled with 256 tiling on a CD. The image contrast must be balanced and consistent throughout the entire collection of scanned film diapositives. Each scanned image will be judged for acceptability and may be rejected if the above requirements are not met.

Orthophotograph Compilation

All maps must meet the accuracy, quality, and completeness described in detail herein. Image consistency will be pleasing in overall appearance in terms of image density levels and density ranges. Objectionable scan lines, mismatched imagery, dust marks, scratches, out-of-focus imagery, or other defects that interfere with normal use may be cause for rejection of the orthophotographic maps.

Completed Projects

The Engineering Division has the responsibility of filing and maintaining the current status of all photogrammetric maps, aerial photography, image files, and survey control data for photogrammetrics.

Upon the completion of a project the following materials will be submitted to the Engineering Divisions Photogrammetry Section: All scales of photogrammetric hardcopy mapping (Hardcopy only if requested by WVDOT Project Manager), detailed model reports, aerial photography, camera calibration reports, control photography, negatives, film diapositives, and digital images.

Ground control data will include global positioning system station logs, established monument descriptions, field books, and control point reports.

Design (DGN) files will contain all digitized features including but not limited to houses, roads, annotated contours, vegetation, and drainage. Two copies of these files are to be delivered in Microstation and Auto CADD Formats on CDs to the Photogrammetry unit.

Digital Terrain Model (DTM) files will include all triangulation results and digitized surface information including regular points and breaklines.

APPENDIX A

"FIELD CONTROL, DATUM AND UNITS"

WV DOT 2000 Technical Guidelines for GPS Control Surveys

"FIELD CONTROL, DATUM AND UNITS"

WV DOT 2000 Technical Guidelines for GPS Control Surveys

Control surveys for the West Virginia Department of Transportation are normally accomplished early in the project. Many times these surveys are completed during the photogrammetric mapping of the project corridor. As such the control effort serves multiple purposes including providing photo control positions and establishing control monuments for the design and construction surveys that follow. Carrier phase (survey grade) GPS methods can provide very accurate positioning. Due to the importance of the control work, the following guidelines must be followed during the control phase.

Datum and Units

All control surveys shall be established using West Virginia state plane coordinates in the zone (north or south) in which the project falls. The limits of the north and south zones fall along county lines. When portions of a project lie in both the north and south zones as defined for the state of West Virginia, the project should be referenced to the zone that contains the *majority* of the project.

Unless instructed otherwise by the Department, all surveys shall be referenced horizontally to the North American Datum of 1983 (NAD 83) and vertically to the North American Vertical Datum of 1988 (NAVD 88.) Horizontal ties to NGS control points that are part of the High Accuracy Reference Network (HARN) are strongly preferred. Horizontal control points classified as either A- or B-order by NGS make up the HARN. West Virginia's HARN was adjusted in 1995 and as such the HARN positions are therefore referenced to the NAD 83 (1995) datum. The original adjustment of the NAD 83 datum was completed in 1986; positions resulting from this adjustment are therefore referenced to the NAD 83 (1986) datum. Positions between the two adjustments should not be mixed and matched within a control network as substantial differences resulted from the more accurate adjustment made for the West Virginia HARN.

All positions should be expressed in the units of U.S. survey feet. The U.S. survey foot is based on the equality of 39.37 inches equals 1 meter, exactly. The international foot is based on the equality of 2.54 centimeters equals 1 inch, exactly While the differences between the U.S. survey foot and international foot may first seem insignificant, they are in fact very significant when working with positional values in the hundreds of thousands or millions common with state plane coordinate positions.

Therefore, when converting positions between metric and English units, the following conversion factors should be used:

3.2808333333333 feet per meter

or,

0.3048006096013 meters per foot

Alternately, the exact conversion can be used for programming spreadsheets or other software for the conversion between metric and English units:

3937 / 1200 feet per meter

or,

1200 / 3937 meters per foot

The table below summarizes the requirements as set forth in this section:

Control Survey Requirements	
Control Method	Survey Grade GPS
Horizontal Datum	NAD 83
Vertical Datum	NAVD 88
State Plane Zone	Natural – North or South
Units	U.S. Survey Feet

GPS Network Design

Control surveys established using GPS methods should be conducted using static and/or rapid static observation methods. Kinematic methods should not be employed for establishing control positions. Networks should be designed for strong geometry using closed loops and should make use of independent baselines only. Radial networks with no redundancy are not acceptable for control projects. All points must be connected to the network by at least two independent baselines.

Additionally, trivial or dependent baselines should not be used in the final network. The number of independent baselines gained from any observation session will be one less than the number of receivers employed in the observation. For example, three independent baselines will be gained from an observation session where four receivers collected simultaneous data.

The table below highlights the minimum requirements for GPS network design for control projects:

Network Requirements	
Min Number Known Horizontal Control Points – When Using HARN	2
Min Number Known Horizontal Control Points – When Using 1st Order	3
Min Number Known Vertical Control Points (1st or 2nd Order Preferred)	4
Max Number Baselines in Single Loop	12
Max Loop Length (miles)	62
Min Number Observations Represented in Loops	2

A minimum of two horizontal control points must be included in the network when A- or B-Order control points from the West Virginia HARN are used. A minimum of three horizontal control points must be included when first-order control points are used. Horizontal control points classified as second- or third-order should not be used as horizontal control for new networks.

At least four vertical control points must be included in any control network. Additional vertical control points should be added as GPS networks become larger. NGS first- or second-order control points are preferred over third-order control. Vertical control may be established by extending differential level loops through network points or by occupying known benchmarks during network observations. Regardless of the method employed, vertical control stations must be occupied at least twice during network observations.

The figure below illustrates a GPS network with good network geometry and adequate horizontal and vertical control ties.

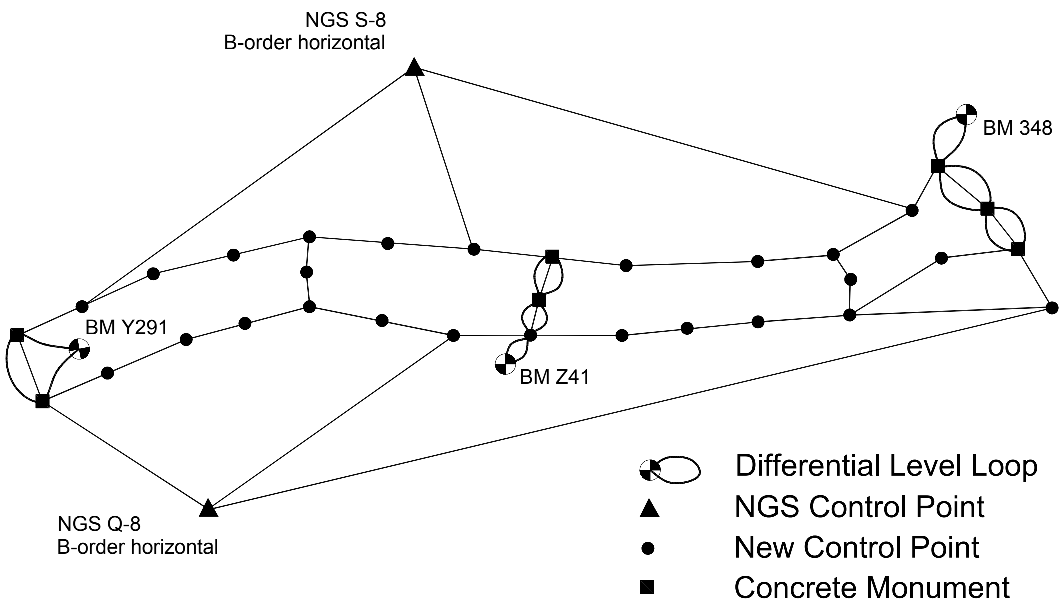


Figure 1 – *The GPS network shown above has strong geometry. The minimum requirements are met for the number of horizontal and vertical control points in the network.*

Notice in the figure that two horizontal control points were tied to the network. Three independent baselines extend from each of these B-order control points to the network. Additionally, level loops were carried out from three benchmarks to eight network points. The differential elevations were then available for use in the network adjustment.

The geometric location of the vertical control points is as important as the sheer number of vertical control points used. Notice in this case that the vertical control points are well dispersed throughout the network. Two of the vertical control points fall at the westernmost limits of the network. Three points fall along the easternmost limits. Three additional points are located near the center of the project. The number of points and their near ideal location within the network should provide accurate GPS elevations for all points within the network.

Contrast the first network with the geometry found in the network shown below:

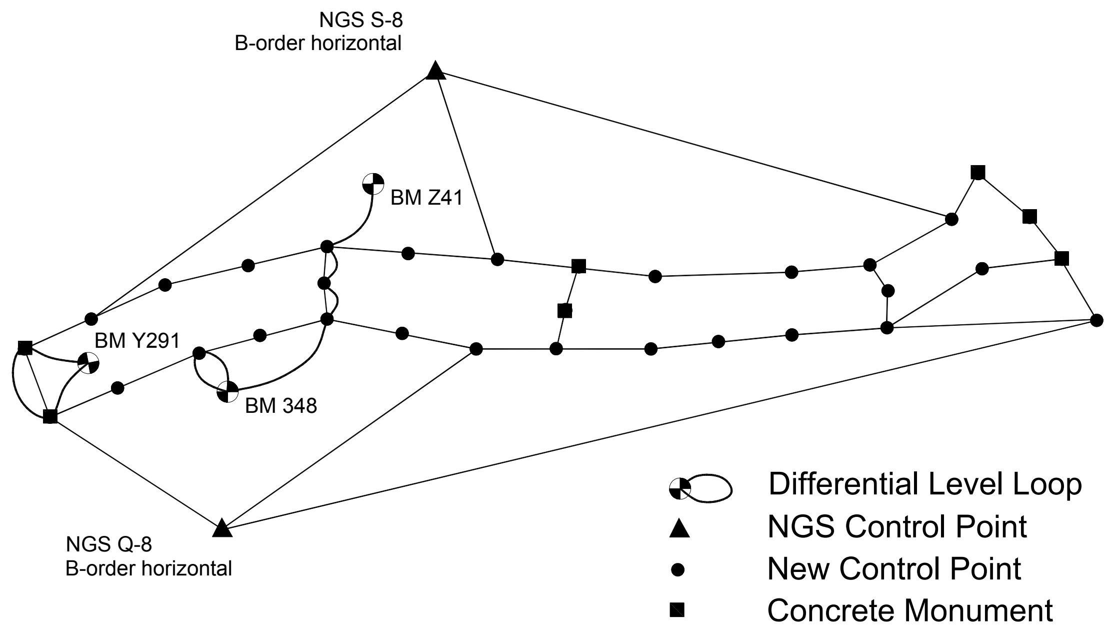


Figure 2 – *While the minimum requirements are met for the number of horizontal and vertical control points in the network, the location of the vertical ties would be expected to provide less accurate elevations for the eastern limits of the project.*

This network satisfies the general requirements for GPS surveys. Again two HARN points were tied in the network by three independent baselines for each point. Differential elevations were established at six network points. Based solely on the number of vertical control points, this network might appear to meet the requirements for control surveys. The location of the vertical control points within the network, however, would not be expected to produce as strong results as the previous example. In this case, all of the vertical control points are located in the westernmost third of the project. The GPS elevations derived near the easternmost limits of the project could have significant error due to the lack of vertical control points in that part of the network.

To ensure accuracy for all new control points established, the maximum number of individual baselines that comprise a closed loop shall be held to 12. Consider the example network below:

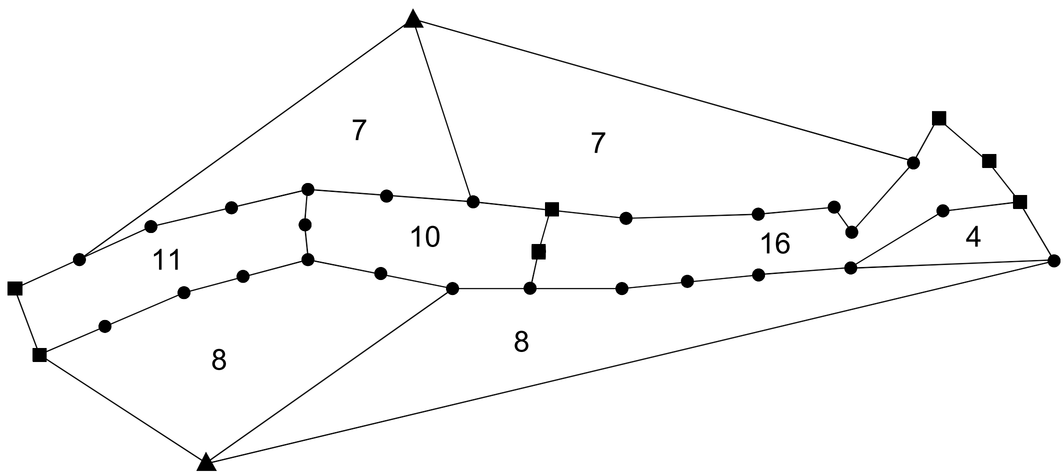


Figure 3 – *The number of independent baselines in each of the closed loops is shown in the network above. The rules for construction of a control network are violated as 16 baselines comprise the loop found in the right half of the network.*

This network adheres to the rule for baseline construction with the exception of the closed loop that comprises the right half of the network. This loop is formed by 16 independent baselines – exceeding the maximum of 12 baselines. A baseline could be added to the network near the center of the closed loop to allow the network to comply with the limit of 12 baselines.

In addition to the requirements for the maximum number of baselines in a single closed loop, the following table lists the occupation requirements for control networks:

Independent Occupations Per Station	
3 or More	10%
2 or More	
New Stations	30%
Vertical Control Stations	100%
Horizontal Control Stations	25%
2 or More for "Station Pairs"	100%

To meet the requirements of the Department, 10 percent of the network points must be occupied at least three times; 30 percent of the new stations must be occupied at least twice. All vertical control stations should be occupied two times. In contrast, only 25 percent of the horizontal control stations must be occupied at least two times. All "station pairs" or intervisible permanent monuments should be occupied at least twice during the GPS observations to ensure their accuracy for future conventional surveying needs.

Consider the figure at right where each of the different linetypes is indicative of an observing session or three GPS technicians. It should be apparent that observations were conducted at network points 11, 12, and Mon A for one session. The table below lists the number of occupations conducted at each of the network points.

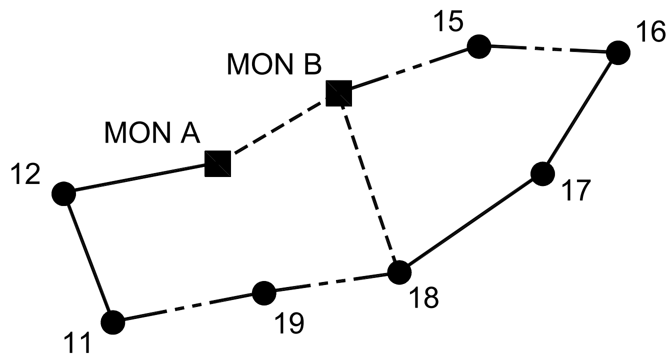


Figure 4 – *Individual observations in the control network are shown as different linetypes.*

Number of Occupations	Network Points	
One time	12, 15, 17, and 19	44%
Two times	11, Mon A, Mon B, and 16	44%
Three times	18	11%

Table 1 – *The number of independent occupations from the network shown in Figure 4 is summarized.*

Notice from the table that each of the occupation requirements is met. Eleven percent of the points were occupied three times. The two points that comprise the intervisible monument pair were occupied twice.

Monumentation Requirements

Permanent monument pairs must be established as part of any control project carried out for the Department. This requirement ensures these monuments will be readily available for conventional surveys that are conducted during the design and construction of the facility. These permanent monuments shall be constructed of an iron pin with cap set in concrete. The concrete must extend a minimum of 24" below the ground surface and the iron pin must extend a minimum of 30" to ensure the stability of the monument during the planning, design, and construction phases. Monuments shall be constructed as intervisible pairs such that either monument is readily visible from the other.

Each monument shall be referenced to surrounding features in the landscape by a minimum of three distances. A sketch of the area surrounding the monument shall be made. A general "to reach" description shall be provided for each monument by providing directions to major features such as road intersections, bridges, railway crossings, etc. All reference information shall be entered on a single monument description sheet. A sample sheet is included in the appendix to this document.

A minimum of three intervisible monuments shall be established for small projects, such as bridge replacement projects. Larger projects shall have, as a minimum, intervisible pairs established at a nominal spacing of one mile.

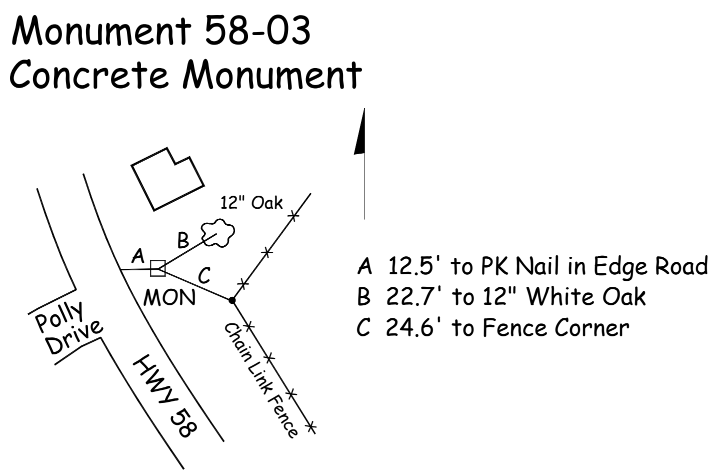


Figure 5 – *A sketch of the monument should include the major features found in the landscape near the area of the monument and at least three distances to easily identifiable points.*

Whenever possible, monuments should be located in public rights of way or other areas accessible to survey crews. Moreover, they should be located outside the construction limits of the project so that they are preserved during construction of the facility.

Obviously the main purpose for leaving behind pairs of intervisible monuments is to facilitate future conventional ground surveys. To ensure an accurate azimuth between intervisible monuments is gained from the GPS surveys, all intervisible monument pairs must be connected by an independent baseline. Review the figure below:

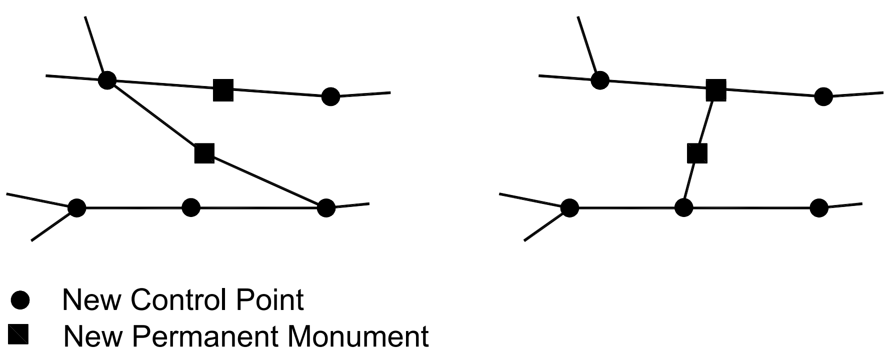


Figure 6 – *The absence of a baseline tie between the two permanent monuments in the network at left above would result in a less accurate azimuth between the intervisible pair. Conversely, the baseline tie between the monuments in the figure at right above should lead to an accurate azimuth between the monuments.*

To review the requirements for permanent monuments, all control projects conducted for the WVDOT shall:

- Establish as a minimum three permanent intervisible monuments for a small project. Larger projects should establish intervisible pairs of permanent monuments at a nominal spacing of one mile.
- Establish permanent monuments in public rights of way or other areas with easy access.
- Provide a detailed reference sketch and "to reach" description so that the monuments can be found easily in the future.
- Establish baseline ties between monument pairs to ensure accurate azimuths are gained from the GPS observations.

Offset Control Points

When control projects are conducted to provide control for aerial photography and mapping projects the construction of targets prior to the photographic mission is preferred. Due to project or time constraints, some projects will be conducted without the benefit of the placement of aerial targets prior to the flight. In these cases, the photo control points will consist of features found in the natural landscape. The control of "photo-identifiable" features can provide accurate when care is taken in the establishment of control positions.

Whenever possible, a strong preference is given to features that do not require an offset for the GPS occupation. Many fence corners, sidewalk intersections, pavement striping, parking lot corners, and similar features provide excellent control locations for photogrammetric mapping projects. There are times, however, when utility poles or other features must be used as photo control points. Offsets are necessary when control features are used that can not be occupied directly with a GPS receiver. Extreme care must be used in measuring the direction and distance from the GPS control point to the photo-identifiable feature.

Acceptable methods of measuring the direction and distance of the offset include:

- Magnetic compass readings and cloth tape distances to the offset feature as long as the offset distance is held to five feet or less. The magnetic declination and convergence angle must be applied in the office calculations.
- Astronomic observations to establish direction for subsequent total station measurement of the direction and distance to the offset point. The convergence angle must be applied in the calculations.
- Establishing two control points in the vicinity of the photo identifiable feature so that a total station can be used to measure the direction and distance to the photo features. The azimuth determined from the state plane coordinates is a grid azimuth; the convergence angle and declination to not apply to these calculations.

The measurement of the direction by using a hand-held magnetic compass is the cheapest and easiest method of determining the direction to the offset point. This method is also the least reliable, due primarily to a lack of care in the field and omissions in the office calculations. Extreme care must be used when this method is employed.

The magnetic pole differs from the pole of the earth's axis. Therefore the magnetic declination (difference between magnetic north and true north) must be determined and applied to all offset calculations when the direction is determined by compass readings. Be very careful, the magnetic declination changes with time. Although USGS 7.5-minute quadrangle maps show the magnetic declination in their legend, the declination is a snapshot in time. It is not unusual for the actual declination to differ from the one shown on the quad sheets by several degrees due to the age of many of these maps.

Software should be used to predict the declination for the time and location of the actual project survey. The USGS provides free software that can be used for accurate magnetic declination determination. The magnetic declination for the state of West Virginia currently (November 1999) varies from around -6.3 degrees at Williamson to approximately -10.3 degrees at Martinsburg.

Additionally, the convergence angle must be applied to all offset calculations when a magnetic or astronomic azimuth is determined. The convergence angle is the angular difference between true north and grid north. The convergence angle is solely a factor of the location of the project in the state plane projection. It is readily available from geographic conversion packages, like CORPSCON, which is available free of charge from the U.S. Army Corps of Engineers. Many GPS packages provide the convergence angle as part of the output from their software. Finally, the convergence angle is listed along with the state plane positions for all control points found in the NGS database. The magnitude of the convergence angle will be much less than the magnetic declination. The magnitude of the convergence angle increases as you move away from the center of the projection.

JV4743;		North	East	Units	Scale	Converg.
JV4743;SPC MD	-	691,483.72	1,049,003.59	sFT	1.00002143	-0 35 10.3
JV4743;SPC WV N	-	119,028.440	734,566.160	MT	0.99994137	+0 59 55.6
JV4743;SPC MD	-	210,764.658	319,736.935	MT	1.00002143	-0 35 10.3
JV4743;UTM 18	-	4,383,213.164	247,942.209	MT	1.00038229	-1 52 10.7
JV4743;UTM 17	-	4,383,591.944	763,405.613	MT	1.00045432	+1 57 14.0

Figure 7 – *NGS data sheets list the convergence angle (last column) for all points within their database. The excerpt from a data sheet shown above illustrates the West Virginia north zone state plane coordinates along with the scale factor and convergence angle.*

Example

An offset from a GPS point to a utility pole was measured using a magnetic compass. The indicated direction was N 43° E. USGS software was used to determine the magnetic declination as -7° 15'. CORPSCON was used to determine the convergence angle for the point in the West Virginia north zone as +1° 10'. Determine the corrected grid direction that should be used in the offset calculations.

Solution

A sketch of magnetic (MN), grid (GN), and true north (star) at this point is shown above. We want to convert the direction from a magnetic azimuth to a grid azimuth. It should be apparent that the magnitude of the correction will be the sum of the magnitudes of the two angles, or 8° 25'. In this case the correction must be subtracted from the magnetic reading. Therefore the correction to be applied to the magnetic reading is -8.4 degrees. The actual correction for the angle is shown below:

$$\text{Grid Azimuth} = 43° - 8.4°$$
$$= 34.6°$$

A detailed sketch must be provided regardless of the method employed to determine the coordinates of the offset control point. The sketch must include a north arrow, the GPS control point, the photo control point, surrounding features found in the landscape near the control point, and the direction and distance *from the GPS control point to the photo point.*

The final survey report provided to the Department should include all offset calculations performed for the project. Information provided for these offset calculations must include the magnetic declination (when applied) and convergence angle for the project area.

Final Survey Report

A survey report must be prepared for all control projects performed for the Department. The contents of the survey report should include each of the following:

- Executive summary
- Network map
- Baseline summary (showing baseline quality statistics)
- Network adjustment summary (showing final weighting strategies)
- Final coordinate position listing for all network points
- Offset calculations (where applicable)
- Final coordinate listing for photo control points (where applicable)
- Data Sheets for all monuments established
- Data Sheets for all known horizontal and vertical control points held in the final adjustment

The executive summary should provide a good overall explanation of the control project. Information in the executive summary should include, as a minimum:

- Project location, date, and professional in charge of project
- GPS observation methodology (static, rapid static, etc.)
- Coordinate projection used
- Applicable horizontal and vertical datum
- Units (U.S. survey feet, meters, etc.)
- GPS hardware used
  - single- or dual-frequency

- Software used for baseline processing and network adjustment
- Crew size
- Maximum baseline length
- Type of ephemerides employed in baseline processing – broadcast or precise
- Number of network points (include known and unknown)
- Number of fixed horizontal control points in final solution
- Number of fixed vertical control points in final solution
- Number of independent baselines
- Ratio – independent baselines to network points
- Listing of all horizontal and vertical control points employed, including the order of accuracy of each

A sample executive summary is shown in the appendix to this report.

Data sheets for each of the permanent monuments established shall be provided in the final survey report. Each of the monument data sheets shall include:

- A detailed sketch of the monument, including a minimum of three distances measured to readily identifiable features in the surrounding landscape.
- A "to-reach" description, referencing major features such as road intersections, bridges, railroad crossings, etc.
- The applicable state plane zone (WV north or WV south.)
- The applicable horizontal and vertical datum.
- The final state plane position of the monument (northing and easting.)
- The orthometric elevation of the monument, including the method used for establishing the elevation (GPS derived, differential levels, etc.)
- The units of measurement (U.S. survey feet, meters, etc.)
- The geoid model employed when elevations are GPS derived (GEOID96, GEOID99, etc.)

Finally, data sheets should be included in the report for each horizontal and vertical control point used in the control project. Printouts of the NGS control data sheets should be included when NGS points are used. The data sheets for each of the points should indicate the order of accuracy of the control point and the known positional values.

Project Datum Calculations

Distances between points in a state plane coordinate projection (grid distances) differ somewhat from the distances measured between the same points on the surface of the earth. This is because it is impossible to project information from the earth's curved surface to a mathematically perfect (flat) grid without introducing a small amount of distortion.

The small differences between grid and actual (surface) distances become an issue in transportation design and construction. West Virginia (and many of our neighboring states) has adopted a method of creating individual coordinate projections for projects that encompass limited geographical areas. The idea is to create a "project datum", or small coordinate projection, where the distances within this new grid are effectively the same as the distances on the ground. This project datum is a derivative of the state plane coordinate projection.

The Department used to employ county factors for use in creating a project datum projection. These county factors were determined using an average elevation and scale factor for the county. The factors were determined for the North American Datum of 1927 (NAD 27). The factors should not be used for projects today because:

- The factors are not appropriate for the NAD 83 horizontal datum used almost exclusively today.

- Many projects have considerable length and extend through multiple counties, creating confusion as to which county factor (or average county factor) should be used for the project datum shift.

- Significant elevation changes within a project's length can require more careful consideration in the determination of the appropriate project factor.

The current method employed for projects conducted for the Department is as follows:

- Determine the state plane position of all control points within the project.
- Determine the average scale and elevation factors for smaller projects; determine the scale and elevation factors at the beginning, middle, and end of larger projects.
- Calculate the "combined" or grid factor for the project as the product of the scale and elevation factors. The grid factor at the beginning, middle, and end of larger projects will be determined.
- Calculate a weighted average grid factor for the larger projects from the formula:

  GF = (Beginning + 4 x Middle + Ending) / 6

- Calculate the project datum factor as the inverse of the average grid factor.

  PDF = 1 / Grid Factor

- 'Stretch' the state plane coordinates by holding one point at or near the center of the project. The project datum factor defines the amount of the stretch.

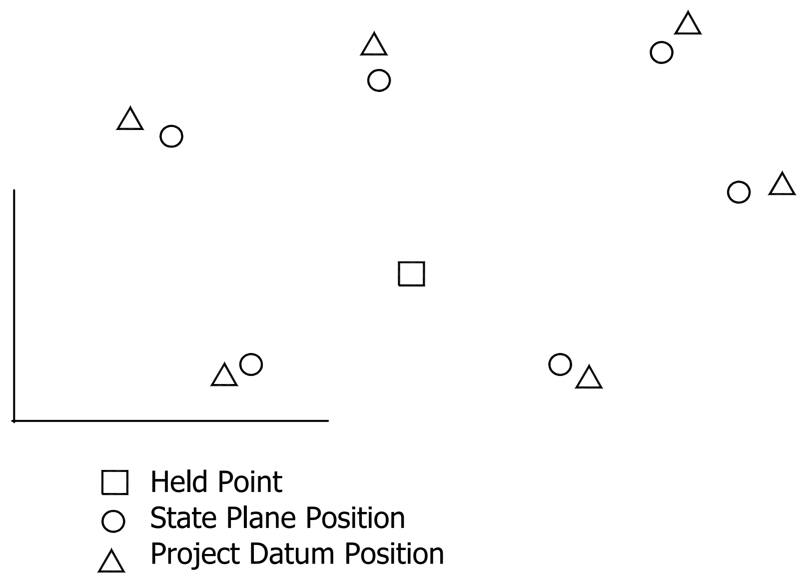


Figure 8 – *The new positions of the points on the project datum reflect a stretch outward from the held point. In this case a point near the center of the project was held fixed.*

Detailed information regarding the determination of the elevation and scale factors are illustrated in the following sections.

Elevation Factor

The elevation or ellipsoid factor (formerly known as sea level factor) is used to project a horizontal ground distance to the ellipsoid used in geodetic calculations. Technically it is the ratio of the distance on the ellipsoid to the actual surface distance.

From similar triangles, this is the same as the ratio of the earth's radius to the radius plus the elevation of the survey line above the ellipsoid. The earth's radius is approximated as 20,906,000 feet or 6,372,150 meters. How is this radius determined? The constant of 20,906,000 is a good average of the earth's radius for the conterminous United States. Technically the radius changes, becoming smaller as you move north due to the flattening of the earth at the poles. However, an average radius is accurate enough for most calculations.

Prior to the NAD 83 adjustment, the orthometric height (also known as a "sea level elevation") was considered to be the same as the ellipsoid height. This was made possible because the geoid and ellipsoid surfaces coincided in the Clarke Spheroid of 1866 used as the basis for the older NAD 27 geodetic system. This made the calculation of the elevation factor very simple. Since the orthometric height and ellipsoid height were considered one and the same, the elevation factor was determined by entering the orthometric elevation into the following equation:

$EF = R / (R + H)$ **{NAD 27 only}**

where

EF = Elevation factor
R = average radius of the earth
H = orthometric height ("sea level" height)

If you look carefully at the equation above, it should be readily apparent that the elevation factor will always be less than 1.0 as long as the point is above sea level. This is because the denominator will be greater than the numerator for all positive orthometric elevations. Therefore, in West Virginia the distance on the ellipsoid will *always* be shorter than the surface distance.

Example

Compute the elevation factor for a line measured on the earth's surface that falls at an elevation of 895 above sea level. Use the calculations for the NAD 27 coordinate system.

Elevation Factor = R / (R + H)
= 20,906,000 / (20,906,000 + 895)
= 20,906,000 / 20,906,895
= 0.99995719

However, with the new GRS80 ellipsoid used in NAD83, the geoid separation (height of the ellipsoid above or below the geoid) must be considered in the determination of the elevation factor. As mentioned earlier, orthometric heights (commonly called heights above sea level) are actually heights above the geoid surface. However, the height above the ellipsoid, not the orthometric height, is required to determine the proper elevation factor for NAD 83 coordinate systems. The ellipsoid height of a point can be determined easily if the orthometric and geoid heights are known. By definition:

$h = H + N$

where

h = ellipsoid height
H = orthometric height (benchmark elevation)
N = geoid height (or geoid separation).

The geoid height ranges from -100 to +75 meters globally. However, remember that in the conterminous United States the geoid surface lies below the ellipsoid surface throughout. In fact, in the conterminous United States, the geoid height ranges from -8 to -53 meters[1]. Think of

[1] Milbert, Dennis G. And Smith, Dru A.; *Converting GPS Height into NAVD88 Elevation with the GEOID96 Geoid Height Model*, National Geodetic Survey

the geoid height as the amount of error, or the misfit, of the mathematically perfect ellipsoid in modeling the actual geoid surface of the earth. Taken in the proper context, our ellipsoid model fits remarkably well.

The variation of geoid heights is much less when examined on a state by state basis. For example, in West Virginia the geoid height varies from -30.5 to around -34.0 meters or -100 to -112 feet. An accurate geoid height is given on control data sheets downloaded from the NGS database. Alternatively the geoid heights can be computed from a geoid model, such as GEOID96 or GEOID99.

If we use our equation for the ellipsoid height in terms of the orthometric and geoid heights (substituting h for H + N), the elevation factor for use with NAD 83 coordinate projections becomes:

$EF = R / (R + H + N)$ **{NAD 83 only}**

where

EF = Elevation factor
R = Average radius of the earth
H = Orthometric height
N = Geoid separation

Problem

Determine the elevation factor for a line measured on the surface of the earth where the average orthometric elevation is 895 feet and the average geoid separation is -30.379 meters.

Solution

First, convert the geoid separation from meters to feet.

$$N = -30.379 * 3.28083 = -99.67 \text{ feet}$$

Next, apply the height information to the formula:

$$\begin{aligned} EF &= R / (R + H + N) \\ &= 20{,}906{,}000 / (20{,}906{,}000 + 895 + (-99.67)) \\ &= 20{,}906{,}000 / 20{,}906{,}795.33 \\ &= 0.99996196 \end{aligned}$$

It is very easy to automate the calculation of the elevation factor in any of today's popular computer spreadsheets. An example is shown below from Microsoft® Excel:

	A	B
1	Orthometric Height (ft)	
2	Geoid Height (ft)	
3		
4	Elevation Factor	=(20906000/(20906000+B1+B2))

The orthometric height is entered into cell B1 while the geoid height (or geoid separation) is entered into cell B2. A sample application of the spreadsheet is shown below:

	A	B
1	Orthometric Height (ft)	895.00
2	Geoid Height (ft)	-99.67
3		
4	Elevation Factor	0.99996196

Summary

- The elevation or ellipsoid factor is simply the ratio of the distance on the ellipsoid to the actual surface distance.
- For NAD 27, the elevation factor is determined from the formula R / (R + H), where H is the orthometric height and R is the average radius of the earth, or 20,906,000 feet.
- For NAD 83, the elevation factor is determined from the formula R / (R + H + N), where H is the orthometric height, N is the geoid height, and R is the average radius of the earth, or 20,906,000 feet.
- The elevation factor is not affected by the horizontal position of the point.
- In West Virginia, the elevation factor will always be slightly less than 1.

Scale Factor

While the elevation factor is used to project distances from the earth's surface to the ellipsoid surface, the scale factor is used to project from the ellipsoid surface to the grid plane. Technically the scale factor is the ratio of the grid distance to the ellipsoid distance. The grid distance (or distance on the state plane projection) is the length of the survey line on that imaginary cone (Lambert projection) used for West Virginia state plane coordinates. Unlike the elevation factor (which is always less than 1.0 in West Virginia), the scale factor will vary from slightly less than 1.0 to slightly more than 1.0. Why? In a Lambert projection, the cone or cylinder is made to intersect the ellipsoid slightly along two standard lines. The scale factor is exactly 1.0 at the lines of intersection of the cone or cylinder with the ellipsoid, less than 1.0 between these lines, and greater than 1.0 beyond the standard lines.

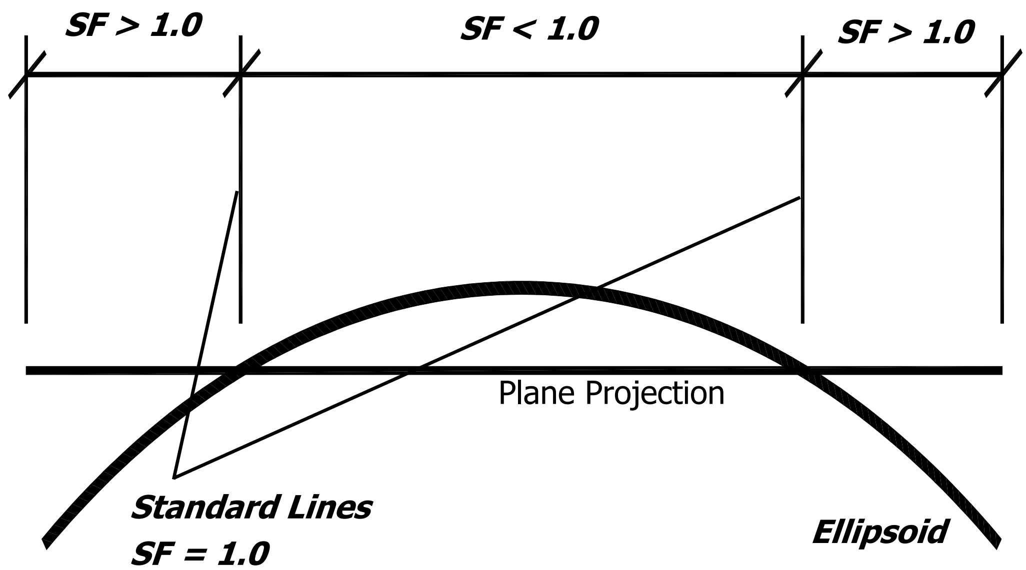


Figure 9 – *Unlike the elevation factor (which is less than 1.0 throughout West Virginia), the scale factor can be less than or greater than 1, depending upon whether the plane is above or below the ellipsoid surface as shown in the cross section above.*

The equation for the scale factor is much more complex than the one used for determining the elevation factor. In fact, the mathematics of the scale factor determination is well beyond the level of this text. However, the scale factor can be easily determined in a number of ways. The scale factor is listed on NGS data sheets for the natural state plane and UTM zones for control points in the National Spatial Reference System (NSRS). Alternatively, geographic software such as CORPSCON (provided free of charge by the US Army Corps of Engineers) provides the scale factor as part of the output for entered points. The scale factor depends on the type of coordinate projection as well as the location of the point within that projection. The scale factor for a single physical point on the earth's surface will vary for different coordinate projections. For example, the scale factor for a point in a state plane coordinate projection will be different than the scale factor of the same point in a UTM projection.

Check the NGS data sheets. All points include the geographic position (latitude and longitude) of the point, along with the local state plane and UTM positions. Individual scale factors will be listed for the UTM and state plane projections. Alternately, when you use geographic software, like CORPSCON, to translate from one coordinate system to another, the output will include the scale factor for the point in the specified coordinate projection.

NAME: BKW D	Record 1 of 1
INPUT	OUTPUT
LAT: 37 46 52.78303	N: 86725.49281
LON: 081 07 25.40555	E: 589101.39382
Convergence DD(A) & Scale Factor (K)	
	A: -00 04 35.34767
	K: 0.999950282

The scale factor in a Lambert projection is a function of the point's latitude *only*. Therefore, in Lambert projections, the scale factor remains constant for uniform latitudes. There are, however, small differences between moving east-west in a geodetic sense and moving east-west based on a state plane grid. Therefore the scale factor does not remain perfectly constant for fixed northing values based on the state plane coordinates. The table below illustrates these concepts for Lambert projections:

The scale factor is a minimum along a line parallel to and equidistant between the standard lines. In West Virginia, a Lambert projection, the scale factor is a minimum along the central parallel, or the line of latitude equidistant from the standard parallels. The change in the scale factor at the center of the projection is also a minimum.

In addition to using geographic software to determine the scale factor, the factor is also listed on NGS data sheets. Data sheets can be retrieved free of charge at the National Geodetic Survey web site at **http://www.ngs.noaa.gov.** Select the data sheet option from the NGS home page. You may search their database by area. Alternatively, you may key a control point name or permanent identifier (PID) into the search engine and retrieve the data sheet for that specific point.

We have highlighted the two different scale factors listed on the NGS data sheet for point **BKW D** in the example below. This point is part of the West Virginia High Accuracy Reference Network (HARN). You will notice the data sheet lists the state plane and UTM positions for this point. In this case, West Virginia South and UTM zone 17 coordinates are listed for BKW D.

Summary

- The scale factor is the ratio of the *grid* distance to the *ellipsoid* distance.
- The scale factor is solely a function of the horizontal location of a point within a given projection.
- The scale factor is less than 1 between the standard lines, exactly 1 along the standard lines, and greater than 1 outside the standard lines.
- The scale factor varies with the change in latitude for a Lambert projection such as that used for West Virginia.
- The scale factors for state plane and UTM projections are shown on the NGS data sheets for points in their database.
- Geographic software, like CORPSCON which is distributed free by the US Army Corps of Engineers, displays the scale factor as part of the computer output.

Grid or Combined Factor

The grid or combined factor is simply the product of the scale and elevation factors. Technically, the grid factor is the ratio of the grid distance (distance on the state plane grid) to the surface distance. The grid factor can be greater than or less than one, depending on the location within the state plane projection and the average elevation. Since the grid factor is the product of the elevation factor and the scale factor, at least one of these factors must be greater than one for the grid factor to be greater than one. Since we know the elevation factor is less than one throughout West Virginia, the scale factor must be greater than one (and of sufficient magnitude to counteract the elevation factor.) The scale factor is greater than one outside the standard lines of the projection. In other words, the scale factor will be greater than one near the southern or northern limits of the state plane zone.

Consider the example below:

Problem

Determine the average grid factor for a project where the average elevation factor has been computed as 0.99994589 and the average scale factor has been computed as 0.99999356. After computing the grid factor, determine the grid length of a horizontal line within the project that measures 984.34 feet on the earth's surface.

Solution

First calculate the grid factor, as shown below:

GF = EF * SF
= 0.99994589 * 0.99999356
= 0.99993945

Next, use this grid factor to determine the grid length of the line:

Grid Length = Surface length * GF
= 984.34 * 0.99993945
= 984.28

The length of this line on the state plane grid is some 0.06 feet (984.34 - 984.28) shorter than the corresponding surface distance. This distortion is equal to 1 part in 16,400.

Summary

- The grid or "combined" factor is the ratio of the grid distance to the surface distance.
- The grid factor is determined by computing the product of the elevation factor and the scale factor.
- Although the grid factor can be greater than or less than 1, for most of West Virginia the grid factor will be slightly less than 1.

Project Datum Shift

The math for the shift from state plane coordinates to project datum is straightforward and can be easily programmed using today's computer spreadsheet packages. The transformation to project datum is accomplished using the average or weighted average grid factor for the project by scaling *about* a point near the center of the project. One caveat for using an average factor – the project must be of limited geographical size such that an average factor can be used without introducing a significant amount of distortion. The geographical size can not be defined simply by stating the maximum length of the corridor as the appropriate size varies significantly based on the east-west or north-south nature of the project and the project's elevation change.

The maximum size of the project is dependent on a number of factors. In the Lambert projection used for the West Virginia state plane coordinate system, the scale factor is strictly a function of latitude. Therefore a project that extends in an east-west direction will experience little of no change in the scale factor. Obviously projects that extend in a north-south fashion, where the scale factor changes a great deal, will be more restricted in geographical area for a single project datum system. Elevation change also plays a major role in determining the maximum appropriate size of a project datum system. A project with little or no change in elevation can accommodate a much larger project datum system than one traversing up and down through the mountains.

The grid factors at the beginning, middle, and end of a project should be carefully examined to determine the amount of distortion that will be introduced by using an average factor for the entire project. Distortions greater than one part in 40,000 will generally require the addition of second project datum section. The Department should be consulted regarding multiple project datum sections when the distortion within a single projection will exceed one part in 40,000.

Project Datum Calculations

If we signify the coordinate position of the held point as (N_H, E_H) and the project datum factor (or the inverse of the grid factor) as PDF, the new coordinate positions of point i on the project datum can be determined from the following:

$$PDF = 1 / \text{Grid Factor}$$
$$N_{PD} = N_H + PDF * (N_i - N_H)$$
$$E_{PD} = E_H + PDF * (E_i - E_H)$$

where, point (N_i, E_i) refers to the coordinate positions of point i that is being transformed from state plane to project datum

Our goal is to preserve angles in the new project datum and only alter distances within the new grid projection. This holds true regardless of the point selected as the held point during the transformation.

One word of caution – coordinates transformed from state plane to a project grid can retain the appearance of state plane coordinates. This is because the shift from state plane to project datum can be a relatively small number. This opens up considerable possibilities that someone will use the coordinates as if they were state plane positions. All survey reports or mapping prepared on a project datum projection should clearly identify the coordinates as "project datum coordinates" to avoid the misuse of the coordinate information. All mapping and survey reports must also clearly list the project datum factor and the coordinate position of the held point used in the transformation to project datum.

The spreadsheet below was designed to make the conversion from grid coordinates to project datum, or surface, coordinates using the method adopted by the Department. Verify the math is correct in the spreadsheet.

	A	B	C	D
1	Grid Factor		Project Factor	=(1.0 / B1)
2	Held Northing			
3	**Held Easting**			
4				
5	State Plane		Project Datum	
6	**Northing**	**Easting**	**Northing**	**Easting**
7			=B\$2 + D\$1*(A7 - B\$2)	=B\$3 + D\$1*(B7 - B\$3)
8			=B\$2 + D\$1*(A8 - B\$2)	=B\$3 + D\$1*(B8 - B\$3)
9			=B\$2 + D\$1*(A9 - B\$2)	=B\$3 + D\$1*(B9 - B\$3)

An application of this spreadsheet is shown below. Notice that the point (456000,1285000) was held for the conversion. Therefore the shift from grid to project datum coordinates is fairly minor.

	A	B	C	D
1	Grid Factor	0.99998452	Project Factor	1.00001548
2	Held Northing	456,000.00		
3	**Held Easting**	1,285,000.00		
4				
5	State Plane		Project Datum	
6	**Northing**	**Easting**	**Northing**	**Easting**
7	456,351.25	1,283,452.68	456,351.26	1,283,452.66
8	458,451.38	1,288,418.65	458,451.42	1,288,418.70
9	454,846.27	1,285,867.44	454,846.26	1,285,867.45

Sample Project

A roadway corridor project in West Virginia extends from Huntington to Charleston a total length of approximately 45 miles through the West Virginia south state plane zone. The corridor follows the existing route of Interstate 64. A state plane control survey must be conducted for this project, extending from the beginning to end. Mapping will be provided for the project based on a single project datum projection. The approximate geographic coordinates and elevations for the beginning, midpoint, and end of the project were determined from USGS quadrangle maps. These positions are shown in the table below. Determine a weighted average grid, or combined, factor for the project based on the factors for each of the three points shown below. After determining the average grid factor for the project, shift the state plane positions to a project datum and then determine the error introduced by using an average factor at each of the three points.

	Latitude	Longitude	Elevation
Beginning - Huntington	38° 24' 00"	82° 27' 30"	750 ft
Midpoint - Milton	38° 26' 30"	82° 07' 30"	690 ft
End - Charleston	38° 21' 30"	81° 37' 30"	605 ft

Table 2 – *The NAD 83 geographic position and the orthometric height for the beginning, middle, and end of the project were determined from USGS 7.5-minute quad sheets.*

Remember that the grid, or combined factor, is determined from the product of the scale and elevation factors. One easy way to determine the scale factors for the points is to use geographic software such as the US Army Corps of Engineers freeware, CORPSCON, or other similar packages. The state plane coordinate positions and scale factors are shown below:

	Lat	Long	Northing	Easting	Scale Factor
Beginning	38° 24' 00"	82° 27' 30"	513,079.96 ft	1,550,599.54 ft	0.99993273
Midpoint	38° 26' 30"	82° 07' 30"	526,921.08 ft	1,646,298.43 ft	0.99993572
End	38° 21' 30"	81° 37' 30"	495,223.04 ft	1,789,291.45 ft	0.99993027

Table 3 – *The state plane position (West Virginia south, NAD 83, US Survey Feet) and the scale factor for each of the points was determined from Corpscon.*

Remember that the elevation factor for points on the NAD 83 datum is computed from the radius of the earth, the orthometric elevation, and the geoid height. The orthometric elevations for each of the points were provided in the first table, however, the geoid height has not been provided. A quick check of the GEOID96 model, or review of NGS data sheets for points in the immediate vicinity of this project provides a range of geoid heights from -33.1 to -33.3 meters or an average geoid height of around -33.2 meters. This translates to an average of approximately -108.9 feet.

HY2255 DESIGNATION - HURRICANE TV WSAZ MICROWAVE
HY2255 PID - HY2255
HY2255 STATE/COUNTY- WV/CABELL
HY2255 USGS QUAD - HURRICANE (1989)
HY2255
HY2255 *CURRENT SURVEY CONTROL
HY2255
HY2255* NAD 83(1995)- 38 26 39.23180(N) 082 03 29.13602(W) ADJUSTED
HY2255* NAVD 88 -
HY2255
HY2255 LAPLACE CORR- -0.57 (seconds) DEFLEC99
HY2255 GEOID HEIGHT- -33.34 (meters) GEOID99
HY2255
HY2255 HORZ ORDER - THIRD
HY2255

Geographic Position

Geoid Height

Figure 1 – *Research from the NGS web site reveals a geoid height of -33.34 meters for a point located very near the midpoint of the project.*

This average geoid height is more than accurate enough to apply to the determination of the elevation factor for all three points. Even though the actual geoid heights range from -33.1 meters to -33.3 meters, differences of this magnitude are completely insignificant in the determination of the elevation factor.

First, however, the geoid height needs to be converted from metric to English units, as follows:

-33.2 meters x 3.28083 = -108.9 feet

Next, determine the elevation factor for each of the points from the formula:

$EF = R / (R + H + N)$

$EF_{beg} = 20{,}906{,}000 / (20{,}906{,}000 + 750 - 108.9) = 0.99996934$
$EF_{mid} = 20{,}906{,}000 / (20{,}906{,}000 + 690 - 108.9) = 0.99987220$
$EF_{end} = 20{,}906{,}000 / (20{,}906{,}000 + 605 - 108.9) = 0.99997627$

Use the scale factor and elevation factor to determine the grid factor for each of the three points, as shown below:

	Scale	Elevation	Grid
Beginning	0.99993273	0.99996934	0.99990207
Midpoint	0.99993572	0.99997220	0.99990792
End	0.99993027	0.99997627	0.99990654

Table 4 – *The grid, or combined factor, is determined from the product of the scale and elevation factors.*

In this case, the average grid factor for the project is determined from the formula:

Project Grid Factor = (Beg + 4 x Middle + End) / 6

or,

Project Grid Factor = (.99990207 + 4 x .99990792 + .99990654)/6
= 0.99990672

Project Datum Factor = 1 / Project Grid Factor
= 1 / 0.99990672
= 1.00009329

In this project example, we will use the weighted average grid factor for the entire project to determine the project datum factor. It should be apparent, however, that we will introduce some error into the project by using a single factor. A quick examination of the actual grid factors for the beginning, middle, and end of the project reveals small differences with the average factor.

Consider a distance of 10,000 feet measured on the surface of the earth. At the beginning of the project, this distance would be reduced to 9999.0207 feet (review the combined factors in the table above) on the actual state plane grid. In our scenario, however, this distance would be approximated at 9999.0672 feet by using the weighted average combined factor. The error in this case is 0.0465 feet (9999.0672 – 9999.0207), or 1 part in 215,033 (9999.0207 / 0.0465). Using similar logic, confirm the errors listed in the table below are correct:

	Error	Error Ratio
Beginning	0.0465 ft	1 part in 215,033
Midpoint	0.0120 ft	1 part in 833,257
End	0.0018 ft	1 part in 5,555,036

What statements can be made from these results? Is it appropriate to use an average factor for this project which extends some 45 miles throughout the West Virginia south state plane zone? Without question, the slight error introduced by the average factors is insignificant for the conventional ground surveys that will be used during the design and construction of the roadway. There are projects that, due to their geographical size and ranges of elevation where it will be necessary to use two or more grid factors, and therefore two or more project datum systems, for the project.

Because this project extends generally east-west in a Lambert projection (West Virginia south), the change in scale factors from the beginning to the end of the project is almost nonexistent. Remember the scale factor changes solely with the change in latitude for a Lambert projection.

The conversion from state plane to project datum positions is shown in the spreadsheet below. The weighted average project factor and the position of the midpoint of the project are entered into the spreadsheet. Therefore the shift to project datum occurs *about* the midpoint. Notice that the coordinates for this point in the project datum system are identical to the state plane coordinates. The other points are shifted or scaled outward from this point.

	A	B	C	D
1	Grid Factor	0.99990672	Project Factor	1.00009329
2	Held Northing	526,921.08		
3	**Held Easting**	1,646,298.43		
4				
5	State Plane		Project Datum	
6	**Northing**	**Easting**	**Northing**	**Easting**
7	513,079.96	1,550,599.54	513,078.67	1,550,590.61
8	526,921.08	1,646,298.43	526,921.08	1,646,298.43
9	495,223.04	1,789,291.45	495,220.08	1,789,304.79

Now consider a project that is generally north-south in nature. A roadway corridor project extends from Weston to Fairmont a total length of approximately 40 miles through the West Virginia north state plane zone. The corridor follows the existing route of Interstate 79. A state plane control survey must be conducted for this project, extending from the beginning to end. Mapping will be provided for the project based on a single project datum projection. The approximate geographic coordinates and elevations for the beginning, midpoint, and end of the project were determined from USGS quadrangle maps. These positions are shown in the table below. Determine an average grid, or combined, factor for the project based on a simple arithmetic average of the factors for each of the three points shown below. After determining the average grid factor for the project, shift the state plane positions to a project datum and then determine the error introduced by using an average factor at each of the three points.

	Latitude	**Longitude**	**Elevation**
Beginning - Weston	39° 01’ 00”	80° 28’ 30”	1100 ft
Midpoint - Clarksburg	39° 17’ 00”	80° 17’ 00”	1300 ft
End - Fairmont	39° 30’ 00”	80° 04’ 30”	1400 ft

Table 5 – *The NAD 83 geographic position and the orthometric height for the beginning, middle, and end of the project were determined from USGS 7.5-minute quad sheets.*

The state plane coordinate positions, and scale factor for the three points is listed in the table below:

	Lat	Long	Northing	Easting	Scale Factor
Beginning	39° 01' 00"	80° 28' 30"	189,688.42 ft	1,691,469.70 ft	0.99999689
Midpoint	39° 17' 00"	80° 17' 00"	286,278.15 ft	1,746,773.98 ft	0.99995852
End	39° 30' 00"	80° 04' 30"	364,747.12 ft	1,806,247.81 ft	0.99994315

Table 6 – *The state plane position (West Virginia south, NAD 83, US Survey Feet) and the scale factor for each of the points was determined from Corpscon.*

A quick check of the GEOID96 model, or review of NGS data sheets for points in the immediate vicinity of this project provides a range of geoid heights from -32.3 to -32.6 meters or an average geoid height of around -32.45 meters. This translates to an average of approximately -106.5 feet.

Next, determine the elevation factor for each of the points from the formula:

$$EF = R / (R + H + N)$$

$$EF_{beg} = 20{,}906{,}000 / (20{,}906{,}000 + 1100 - 106.5) = 0.99995248$$
$$EF_{mid} = 20{,}906{,}000 / (20{,}906{,}000 + 1300 - 106.5) = 0.99994291$$
$$EF_{end} = 20{,}906{,}000 / (20{,}906{,}000 + 1400 - 106.5) = 0.99993813$$

Use the scale factor and elevation factor to determine the grid factor for each of the three points, as shown below:

	Scale	Elevation	Grid
Beginning	0.99999689	0.99995248	0.99994937
Midpoint	0.99995852	0.99994291	0.99990143
End	0.99994315	0.99993813	0.99988128

Table 7 – *The grid, or combined factor, is determined from the product of the scale and elevation factors.*

In this case, the average grid factor for the project is determined from the formula:

Project Grid Factor = (Beg + 4 x Middle + End) / 6

or,

Project Grid Factor = (.99994937 + 4 x .99990143 + .99988128)/6
= 0.99990606

Project Datum Factor = 1 / Project Grid Factor
= 1 / 0.99990606
= 1.00009395

In this project example, we will use the weighted average grid factor for the entire project to determine the project datum factor. Again we will introduce some error into the project by using a single factor. A quick examination of the actual grid factors for the beginning, middle, and end of the project reveals small differences with the average factor.

Again consider a distance of 10,000 feet measured on the surface of the earth. At the beginning of the project, this distance would be reduced to 9999.4937 feet (review the combined factors in the table above) on the actual state plane grid. In our scenario, however, this distance would be approximated at 9999.0606 feet by using the weighted average combined factor. The error in this case is 0.4331 feet (9999.4937 - 9999.0606, or 1 part in 23,088 (9999.4937 / 0.4331). Using similar logic, confirm the errors listed in the table below are correct:

	Error	Error Ratio
Beginning	0.4331 ft	1 part in 23,088
Midpoint	0.0463 ft	1 part in 215,961
End	0.2478 ft	1 part in 40,350

Table 8 – *The errors in a line measured on the surface at 10,000 feet and the corresponding error ratios at the beginning, middle, and end of the project are determined from the use of an average grid factor.*

How do these results differ from the earlier east-west project running from Huntington to Charleston? Because this project extends generally north-south in a Lambert projection (West Virginia north), the change in scale factors from the beginning to the end of the project is somewhat significant. Remember the scale factor changes solely with the change in latitude for a Lambert projection. This project introduces errors in excess of what is generally allowable for transportation projects, particularly near the beginning of the project. Therefore this project should be broken into two project datum sections.

The lessons learned from these examples can be summarized as follows:

- Projects can often be simplified by using an average grid factor for all points within the project.
- The appropriateness of the use of an average factor depends on a number of conditions, including: the geographic size and orientation of the project and the change in elevation throughout the project.
- Projects that extend generally north-south in Lambert projections will exhibit more range of grid factors and therefore more distortion will arise from using a single average grid factor.
- Conversely, projects that extend generally east-west in Lambert projections will exhibit little change in grid factors.

NGS Data Sheet

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 AA9348
*********************************************************************************
 AA9348  CBN      -  This is a Cooperative Base Network Control Station.
 AA9348  PACS     -  This is a Primary Airport Control Station.
 AA9348  DESIGNATION -      BKW D
 AA9348  PID         -                      AA9348
 AA9348  STATE/COUNTY-    WV/RALEIGH
 AA9348  USGS QUAD   -    PRINCE (1989)
 AA9348
 AA9348                          *CURRENT SURVEY CONTROL
 AA9348
 AA9348* NAD 83(1995)-   37 46 52.78303(N)    081 07 25.40555(W)     ADJUSTED
 AA9348* NAVD 88     -     764.14   (meters)           2507.0    (feet)     GPS OBS
 AA9348
 AA9348  EPOCH DATE  -        1995.00
 AA9348  X          -    778,899.866 (meters)                       COMP
 AA9348  Y          -  -4,987,460.465 (meters)                      COMP
 AA9348  Z          -  3,886,738.589 (meters)                       COMP
 AA9348  LAPLACE CORR-                       0.68   (seconds)              DEFLEC96
 AA9348  ELLIP HEIGHT-                       733.10   (meters)                GPS OBS
 AA9348  GEOID HEIGHT-                       -31.07   (meters)                GEOID96
 AA9348
 AA9348  HORZ ORDER  -  B
 AA9348  ELLP ORDER  -   FOURTH    CLASS I
 AA9348
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 AA9348.The ellipsoidal height was determined by GPS observations
 AA9348.and is referenced to NAD 83. AA9348
 AA9348.The geoid height was determined by GEOID96.
 AA9348;                        North                East       Units      Scale        Converg.
 AA9348;SPC WV S     -    86,725.493          589,101.394      MT    0.99995028    -0 04 35.3
 AA9348;UTM  17      - 4,181,560.634          489,105.206      MT    0.99960146    -0 04 32.9
 AA9348
 AA9348:              Primary Azimuth Mark                         Grid Az
 AA9348:SPC WV S     -  RALEIGH AZ                           067 33 54.6
 AA9348:UTM  17      -   RALEIGH AZ                           067 33 52.2
 AA9348
```

State, County, and Quad Sheet

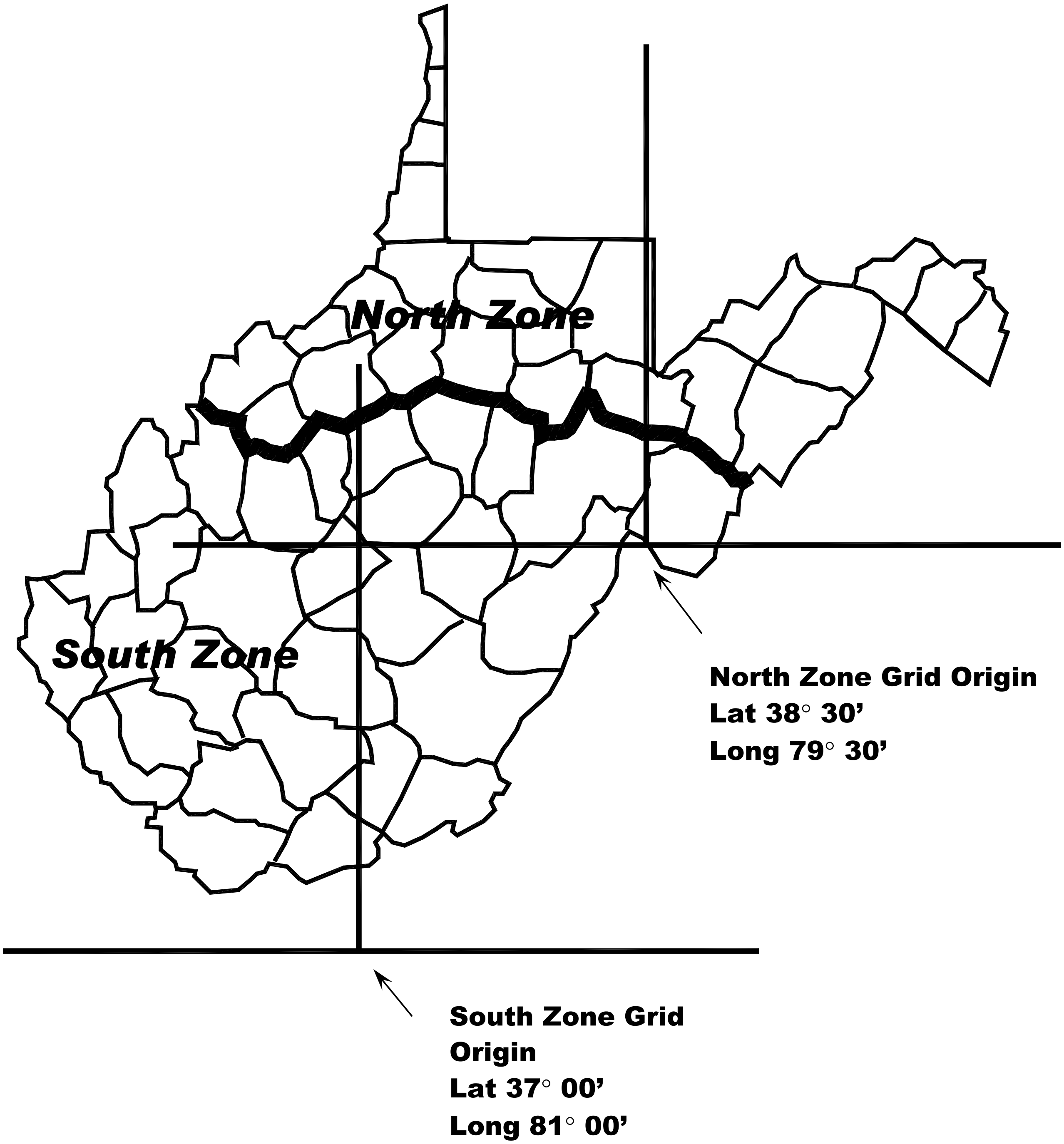
Latitude, Longitude, and Orthometric Height

Ellipsoid and Geoid Heights

Horizontal Accuracy – B-Order HARN Point

Scale Factor

Convergence


North Zone
South Zone
North Zone Grid Origin
Lat 38° 30'
Long 79° 30'
South Zone Grid
Origin
Lat 37° 00'
Long 81° 00'

WVDOT Seed File Definition

Universal Microstation seed file for the West Virginia DOT included working units of feet, sub units of hundredths of a foot, with 10 positional units per sub unit. Numerically, this would be represented by 1:100:10. Effectively this created a *resolution* (the most precise coordinate position that can be stored in the Microstation design file) of 0.001 feet. The entire state of West Virginia will fit in the Microstation design plane (the working area created by the selection of the working units) with these working units – regardless of:

- Where the project is located geographically in the state.
- Whether north or south zone coordinates are used.
- The selection of units for the project – metric or English.
- Whether NAD 83 or NAD 27 datum is selected.

While this combination of working units works very well for the typical roadway designer, it does not work out as well for structural engineers in detailing the typical roadway bridge or box culvert. This selection does not allow the structural engineer or detailer to work in the *architectural* units of feet and inches.

The alternative consideration is to use working units as follows:

Master Units	Feet
Sub Units	Inches
Positional Units	100 per Sub Unit

Numerically this would be represented as 1:12:100. The resulting *resolution* would be 0.0008, which will allow the use of slightly more precision in the actual coordinate positions within the design file. More importantly, this resolution will also allow the entire state of West Virginia to fit within the design plane under the same options as stated above.

These working units would allow the use of *both* architectural units and the standard engineering units of feet and decimals of a foot. Microstation was designed such that the user always has the ability when working in Microstation to work in the master units (and decimals thereof.) The user also has the option of toggling to the master and sub units, which in this case would be architectural units.

It appears that the roadway designers and structural engineers will have the greatest flexibility by using architectural units. One seed file can be used for all projects completed for the WVDOT.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-811
ACCESSIBILITY STANDARDS,
CURB RAMPS AND SIDEWALKS
January 23, 2017

This Design Directive defines the West Virginia Department of Transportation, Division of Highways' policy concerning curbs and sidewalks, and further compliance with the Americans with Disabilities Act of 1990 (ADA) and the U.S. Department of Justice 2010 ADA Standards. Other references will be given to assist the Designer/Project Manager during the assessment of a project for ADA requirements, as well as details and criteria that are to be used when ADA requirements must be met.

Attached to and made a part of this Design Directive is an ADA Exceptions Justification Form. See Section 50 of this DD for more information.

The policies described herein will apply to all projects, whether designed at the District level, in the Central Office, or the Special Projects Section.

Attachment

10. General

In compliance with the Americans with Disabilities Act of 1990 and the U.S. Department of Justice 2010 ADA Standards For Accessible Design, curb ramps as per DOH Standard Details shall be provided at all existing marked and unmarked crosswalks for which the Division of Highways has responsibility. Existing ADA features that are within the limits and scope of work of the project are to be checked for conformity with the DOJ 2010 ADA Standards for Accessible Design and are to be reconstructed if they do not comply. All curb ramps are to have Detectable Warnings installed. In addition, the existing condition of a sidewalk will not affect the decision of whether to add a curb ramp or not.

The following information is to be used to determine, for ADA applicability purposes, whether a project is considered a "Maintenance Project" under which curb ramps are NOT required to be incorporated into the project, or an "Alteration Project" under which curb ramps MUST be incorporated into the project. See the following web page for a more precise definition of some of the terms in the lists below: www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta_glossary.cfm.

A. Roadway Maintenance
1. Crack filling and sealing
2. Surface sealing
3. Chip, Slurry, and Fog seals
4. Scrub sealing
5. Joint crack seals
6. Joint repairs
7. Dowel bar retrofit
8. Spot high-friction treatment
9. Diamond grinding
10. Pavement patching
11. Shoulder repairs
12. Pipe and inlet repairs
13. Pulling and restoration of ditches
14. Guardrail repair and installation
15. Re-striping

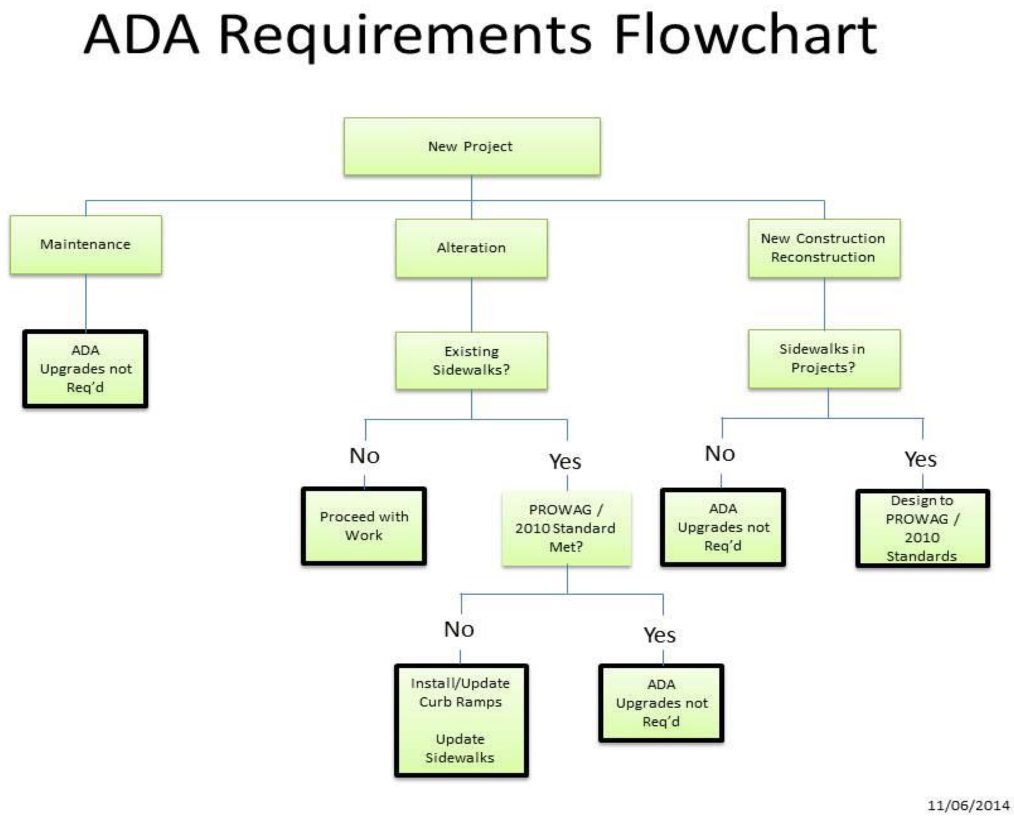
B. Roadway Alteration
1. Open-graded surface course
2. Cape seals
3. Mill and fill/Mill and overlay
4. Hot in-place recycling
5. Microsurfacing/Thin-lift overlay
6. Addition of new layer of asphalt
7. Asphalt and concrete rehabilitation and reconstruction
8. New construction
9. Widening of the existing pavement typical section
10. Addition of turning lanes
11. Pavement rubblizing

12. Installation of new drainage structures to improve existing drainage characteristics

C. Bridge Maintenance
1. All painting of bridge members
2. Scour Countermeasure Activities
3. Expansion Joint Repairs and Replacement
4. Concrete Crack Repairs
5. Refurbishing or restoration of existing bridge bearings
6. Deck drainage system repairs
7. Seismic retrofit activities that do not include replacement of bearings or structural members

D. Bridge Alteration
1. Bridge deck overlay projects
2. Repairs to structural members for the purpose of restoring or enhancing structural capacity
3. Strength repairs to substructure elements
4. Bearing replacement
5. Bridge deck replacement
6. Superstructure replacement

Alteration projects administered by a municipality on WVDOH R/W, such as a streetscape, involve funds expended on a public right of way. The alteration requires the municipality and the WVDOH to meet full compliance with all federal laws and regulations during the development of plans and construction. As part of the development of plans for construction, where full design criteria for pedestrian access is not feasible, the designer (the municipality or their consultant) shall prepare an exception justification form as described in DD-811 and submit with the plans for review and approval to the WVDOH. All exceptions approved by the Division shall be filed as required for all projects.



20. Existing Sidewalks

Projects considered an alteration by the Department of Justice (DOJ) as described in Section 10 of this DD will require all curb ramps within the project limits to meet the requirements of the Americans with Disabilities Act (ADA). This will also require installing curbs ramps where presently a curb ramp does not exist to make the sidewalk ADA accessible. Detectable warning systems will be required on all existing curb ramps that otherwise meet the ADA criteria. Existing sidewalks shall be evaluated for ADA Compliance using the DOJ 2010 ADA Standards for Accessible Design. These Standards are available at: www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm. The 2010 ADA Standards for Accessible Design consists of the U.S. DOJ TITLE 28 CFR Parts 35.151 from the Code of Federal Regulation combined with the 2004 ADA Accessibility Guidelines.

Within the project limits the evaluation of the sidewalks and any curb ramps which may exist within a project's limits is to be a field evaluation. An evaluation from remote sources such as Google Earth or the Division's pavement video records is not sufficient.

For sidewalks located outside of a municipality, the District/Division shall evaluate and fully document the entire sidewalk within the project limits for ADA Compliance. A cost estimate for the renovation and a copy of the ADA evaluation shall be forwarded for review to the District/Division ADA Coordinator. During project development, the District/Division shall consider incorporating side walk renovations into the project. If there is significant scope creep, the District/Division may request, through the District ADA Coordinator, that sidewalk renovations not be incorporated into the project, and be included in the WVDOH ADA Transition Plan. The ADA Coordinator shall obtain approval for this request from the State Highway Engineer. Regardless of when the sidewalks are renovated, curb ramp work to make the sidewalk ADA compliant must be incorporated into the alteration project, or completed prior to the alteration project.

For sidewalks located on the WVDOH Right of Way within a municipality where the municipality is responsible for the sidewalk maintenance, the District/Division ADA Coordinator shall contact the municipality to inform them that the existing sidewalks need to evaluated for ADA Compliance. Non-compliant sidewalks should be added to municipality's ADA Transition Plan. Regardless of sidewalk maintenance responsibility, curb ramp work must be incorporated into the project.

30. Curb Ramps on Resurfacing Projects in Urbanized Areas with Sidewalks

Alteration projects must include curb ramp installation if none previously existed where there is a pedestrian walkway with a prepared surface for pedestrian use within the scope of the project. Where a non-compliant curb exists within the pedestrian walkway, upgrading of the curb ramp to meet the Proposed Accessibility Guidelines for Pedestrian Facilities in the public Right-of-Way (PROWAG), dated July 26, 2011, is required.

When performing roadway activities at intersections and adjoining streets, the limits of resurfacing is to be the curb or gutter line of the street being altered.

The WVDOH recommends not paving to the end of the radius return on side street or alleys and impacting the existing curb ramps of the adjoining street. If flaring of the resurfacing project into an adjoining street is necessary, curb ramps shall be assessed for ADA compliance and addressed within the scope of the project.

Curb ramps are to be assessed for compliance with PROWAG, dated July 26, 2011, or constructed on resurfacing projects when:

A. Limits of the resurfacing project encroach into the boundary of the curb ramp detail;

B. Pedestrians may reasonably conclude that they would cross the resurfacing project from one curb ramp to another, even if the curb ramp is outside the limits of resurfacing;

C. Construction activities expand beyond the original limits and encroach into the curb ramp area; and

D. Curb ramps aren't present in sidewalks at signals, stop signs or yield signs (they must be constructed with the resurfacing project on each side of the pedestrian access route).

Additionally, when existing Type II (diagonal) curb ramps meet any of the above conditions, they must be assessed to determine if two separate ramps can be provided at the corner.

40. New Sidewalks and Replacement of Existing Sidewalks

The Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG), dated July 26, 2011, should be considered as minimum criteria for the design of any new sidewalk or the replacement of an existing sidewalk. The complete PROWAG document is available at the following web address: http://access-board.gov. Certain sections will be referenced for the designer in Section 40 of this DD.

Currently, PROWAG is still in the rule making process and the 2010 ADA Standards for Accessible Design is being enforced by the Department of Justice. Therefore, new sidewalks shall also be checked for compliance with the 2010 ADA Standards for Accessible Design. If sidewalks do not meet the requirements of the 2010ADA Standards for Accessible Design an ADA Exception Justification Report (attached) shall be submitted to the District/Division ADA Coordinator for review and concurrence

50. Technical Guidance and References

2010 ADA Standards (Existing Sidewalks)

The 2010 ADA Standards are to be used to evaluate existing sidewalks for ADA compliance. If the existing sidewalk is to be replaced, The Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way dated July 26, 2011 shall be used in the design of the new sidewalk.

A technical assistance “tool kit” which includes checklists and information on conducting assessments of existing facilities is available for use by Designers at the following web address: http://www.ada.gov/pcatoolkit/toolkitmain.htm. Chapter 6 of this resource provides the technical assistance, and Appendices 1 and 2 provide instructions and a survey form to use to analyze existing sidewalks.

A. In short, the above-mentioned checklist includes the following items (this listing is NOT all-inclusive).

B. Sidewalks shall be at least 3 ft. wide.

C. The cross slope shall not exceed 2%.

D. When sidewalks are less than 5 ft. in width, passing spaces with a minimum clear space of 5 ft. x 5 ft. shall be provided at intervals not to exceed 200'. Driveways, building entrances, and public sidewalk intersections may be used for passing spaces.

E. Where an obstacle (example: utility pole or fire hydrant) is considered immovable, a minimum 32” of sidewalk width (excluding curb width from measurement) must be provided for the pedestrian. Reduction of sidewalk width from 36” (3’) due to an obstacle requires an ADA design exception. When developing sidewalk widths, the Roadside Design Guide (RDG) requirements of clear zone (RDG Section 3.1) and minimum lateral offset behind the curb (RDG Section 3.4.1) must also be considered.

F. Curb ramps shall not exceed a running slope of 1:12 (maximum 1:10 is permitted at existing sites where it is not feasible to provide the 1:12 requirement due to space limitations and the rise is less than 6 inches).

G. A level landing should be provided at the top of a perpendicular curb ramp.

H. The transition from curb ramp to gutter should be flush; lips are not permitted.

I. The foot of a curb ramp should be contained within the crosswalk markings.

J. Gratings such as tree well covers, valve boxes with vent holes, manhole covers, etc. in the path of travel may not have an opening with a dimension of greater than ½” in any direction. Drainage inlets or any other item with openings greater than ½” in any dimension shall be located out of the path of travel.

K. Drainage is to be provided upstream of the foot of the ramp to ensure flow depth is at a minimum.

The Designer is cautioned to fully review the requirements contained in the Guide and consult the Checklist for complete information.

Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) (New Designs)

These standards shall be used in the design of all new sidewalks and the replacement of any existing sidewalks:

A. The pedestrian access route shall have a minimum width of 4 ft. excluding the width of the curb.

B. A level landing shall be provided at the top of a perpendicular curb ramp. The landing at the top of the curb ramp shall be a minimum 4 ft. wide when no obstructions exist at the backside of the landing and a minimum 5 ft. wide when obstructions exist such as a building, pole etc.

C. All other requirements described for Existing Sidewalks above shall apply, noting that the list is NOT all-inclusive.

Additional guidance may be found at the following web site concerning Public Rights-of-Way Access from the United States Access Board (generally referring to facilities in public rights-of-way): http://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way. A manual entitled "Special Report: Accessible Public Rights-of-Way Planning and Design for Alterations", dated August 2007, is available for technical assistance to the Designer, generally providing guidance for alterations of existing facilities at http://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/guidance-and-research/accessible-public-rights-of-way-planning-and-design-for-alterations.

Technical guidance, including sample details, is available for the proposed DOJ rules at the address given heretofore in Section 20 of this Design Directive (the DOJ 2010 ADA Standards for Accessible Design (www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm.) Chapter 2 of this resource includes Scoping Requirements, while Chapter 4 "Accessible Routes", include requirements and sample details for sidewalks and curb cuts.

Where a sidewalk which is being constructed or reconstructed along a State highway is carried around a radius, and ended, the surface of the sidewalk will smoothly meet the existing ground or adjacent sidewalk where conditions permit. If the sidewalk being constructed or reconstructed extends through the crosswalk on the intersecting street, curb cuts or ramps shall be provided.

The Checklists found in Design Directive 202, Field and Office Reviews for Initial Engineering, Preliminary Engineering and Final Design include lines for the Designer/Consultant Project Manager to initial for compliance when submittals are made.

60. ADA Exception Justification Report

If a requirement of the DOJ 2010 ADA Standards is deemed technically infeasible, the reasons for the exception must be fully documented and approved. Some reasons why an ADA requirement cannot be implemented include historical considerations, limited right-of-way, or problems with geometry (both horizontal and vertical). It is up to the Designer to determine feasibility. If an ADA exception is granted for technically infeasibility, the Designer should make every effort to mitigate the requirement. Specifically, Sections 201, 202, and 206 of the adopted DOJ 2010 ADA Standards discuss scoping, structural impracticality and technical Section 406 discusses Curb Ramps.

Attached to and made a part of this Design Directive is an ADA Exceptions Justification Form which is to be completed by the Designer/Project Manager for all projects which have exceptions to any ADA requirements. A copy of the proposed ADA Exception Report with the recommended signatures shall be mailed to the EEO Division ADA Coordinator to be forwarded to the ADA Board for approval. The completed Form is to be included in the Final Office Review and PS&E submittals.

West Virginia Division of Highways
EEO Division ADA Coordinator
1900 Kanawha Boulevard, East
Building 5, Room 618
Charleston, West Virginia 25305-0430

The District/Division ADA Coordinator shall maintain a copy of all approved ADA Exception Justification Reports and Sidewalk Evaluations for future reference.

SHEET 1 OF _____

AMERICANS WITH DISABILITIES ACT EXCEPTIONS JUSTIFICATION REPORT

PROJECT DATA

State Project No.	______________________	**Date:**	____________________
Federal Project No:	______________________	**County:**	____________________
Project Name:	____		
Project Description:	____		
	____		
	____		
Special Project Sponsor Name and Address:	____		
	____		
	____		
WVDOH Representative:	______________________		
FHWA Representative:	______________________		

(Note: Project Description in above table should be the complete scope of the project: i.e. major or minor construction, urban or rural, reconstruction, rehabilitation, pavement overlay, etc. using the descriptions given in DD-803 as a guide)

HIGHWAY ROUTE DATA

AASHTO Functional Classification

1. ☐ **Urban** ☐ **Rural**
2. ☐ **Arterial** ☐ **Collector** ☐ **Local Road**
3. ☐ **Freeway** ☐ **Divided/Arterial** ☐ **Two-Lane Arterial**
4. ☐ **Interstate**
5. ☐ **Other (i.e. school property)**

TERRAIN TYPE ☐ **Level** ☐ **Rolling** ☐ **Mountainous**

SHEET 2 OF _____

ADA REQUIREMENTS (Document Only Exceptions)

	ADA Requirements Triggered	Existing Condition	Design Criteria	Proposed Action	Criteria Source
1.	Sidewalk	________	________	________	________
2.	Curb Ramps	________	________	________	________
3.	Detectable Warnings	________	________	________	________
4.	Accessible Signals	________	________	________	________
5.	Accessible Parking	________	________	________	________
6.	Van Accessible Spaces	________	________	________	________
7.	Path of Travel	________	________	________	________
8.	Bridge	________	________	________	________
9.	Other	________	________	________	________

(Note: references to the appropriate Section number of the 2010 ADA Standards for Accessible Design and proposed PROWAG Standards are to be used as the Design Criteria and the Criteria Source in the above table and in the Exception Report)

APPROVAL SIGNATURES

RECOMMENDED:

1. ______________________________
   Consultant

2. ______________________________
   Project Engineer

3. ______________________________
   District/Division ADA Coordinator

APPROVED:

____
ADA Board Chairman

REVIEWED:

____
Federal Highway Administration

SHEET ____ OF _____

NARRATIVE DISCUSSION OF ADA EXCEPTION(S): Attach appropriate photos or other documentation as needed

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

812
SALVAGE VALUE OF MATERIALS
February 6, 1996

On all projects containing Federal Highway Administration (FHWA) funds which include removal of existing materials that have a salvage value, i.e., structural steel, guardrail, rotomilled HMA, etc., the designer is responsible for determining the final disposition of the salvaged material.

Salvageable material shall be dealt with by one of the following methods:

Method A - Salvaged Material to Become the Property of the Contractor - By this method, the Division of Highways and FHWA would receive proper credit for the salvaged material in the form of lower unit bid prices for the various items of work contained in the contract.

No special action will be required in the plans or proposal as this issue is addressed in Section 104.6 of the Standard Specifications.

Method B - Salvaged Material to Become the Property of the Division of Highways - If this method is chosen, the designer must do the following:

1. Will the salvaged material be used on future FHWA funded projects? If so, a statement certifying this fact shall be included in the PS&E package. If not, continue with Number 2.

2. At the time of printing, the salvage value of rotomilled HMA is $8 per ton. The service life of miscellaneous metal products (i.e. guardrail materials, right of way fence, etc.) shall be considered to be 20 years. This information shall be used to determine the salvage value of the material in question.

3. Include the salvage value in the PS&E package. If the salvage value for each salvaged item exceeds $5,000, the amount of the salvaged item should be credited to the Federal share.

4. Place a note in the plans clearly identifying the items to be salvaged. The note shall also identify the location of the Division of Highways facility where the salvaged items are to be delivered or where the salvaged items will be stockpiled for pick up by the Division of Highways. The location for delivery or pick up should be coordinated with the District.

   The designer shall carefully consider all costs associated with the salvage of an existing material to insure that these costs do not exceed the value of the salvaged material.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-813
BICYCLE/PEDESTRIAN ACCOMMODATION
September 30, 2013

The goal of the West Virginia Division of Highways (WVDOH) is to plan, design, construct, maintain and operate a safe, efficient, and economical highway system for all users of the system. While motor vehicle traffic is the major concern in performing this task, bicyclists and pedestrians must also be given proper consideration.

In order to integrate the needs of the motorized and non-motorized users of our highway system, the WVDOH, in cooperation with the Federal Highway Administration (FHWA), adopted "The Statewide Plan for Accommodation of Bicycle Transportation and Pedestrian Walkways" dated September 1997. Based on this document it is the policy of the WVDOH that during the design of all highway construction projects, consideration will be given, as outlined herein, for the incorporation of facilities for the accommodation of bicyclists and pedestrians.

The designer's attention is directed to the following publication: "Guide For Development Of Bicycle Facilities 2012 (Fourth Edition)", AASHTO (hereinafter referred to as the 2012 AASHTO Bicycle Guide) or most current edition. Many of the definitions in this Design Directive are summarized from this resource, and it is the source of any design standards not described here in detail. It is to be used as a reference supplementing this Design Directive.

Attachment

DEFINITIONS

Bicycle Facilities: A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking and storage facilities, and shared roadways not specifically defined for bicycle use. This includes new or improved lanes, paths, or shoulders for use by bicyclists as well as traffic control devices, shelters, and parking facilities for bicycles.

Bikeway: A generic term for any road, street, path, or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. **NOTE:** All public highways in West Virginia are open to bicycle traffic; however, on facilities such as Interstate Highways, bicycles are prohibited except in some very limited circumstances, such as when a fully controlled access highway is the only link between two separate bikeway segments.

Bicycle Boulevard: a local street or series of contiguous street segments that have been modified to function as a through street for bicyclists, while discouraging automobile through travel. Local access is maintained.

Bicycle Network: A system of bikeways designated by the jurisdiction having authority. This system may include bike lanes, bicycle routes, shared use paths, and other identifiable bicycle facilities.

Bicycle Lane: A portion of the roadway that has been designated for preferential or exclusive use by bicyclists by pavement markings. It is intended for one-way travel, usually in the same direction as the adjacent traffic lane, unless designed as a contra-flow lane.

Bicycle Route: A roadway or bikeway designated by the jurisdiction having authority, either with a unique route designation or with Bike Route signs, along which bicycle guide signs may provide directional and distance information. Signs that provide directional, distance, and destination information for bicyclists do not necessarily establish a bicycle route.

Category I Roadways: Any highway facility that is a partially controlled access facility or any highway facility that contains four (4) or more travel lanes with design speeds greater than 40 mph.

Category II Roadways: Any non-controlled highway facility or street not defined as being a Category I Roadway.

Pedestrian Walkway Facilities: A general term denoting improvements and provisions made by public agencies to accommodate or encourage walking. This includes new or improved lanes, paths or sidewalks.

Combined Facilities: A combined facility, for the purpose of this directive, is a facility designated for use by bicyclists and pedestrians.

Rural Areas: All parts of the highway system NOT within an urban area as described in "Urbanized Areas" below.

Shared Lane: A lane of a traveled way that is open to both bicycle and motor vehicle travel.

Shared Use Path: A bikeway physically separated from motor vehicle traffic by an open space or barrier and either within the highway right of way or within an independent right of way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users. Most shared use paths are designed for two way travel.

Trails: Facilities that may be used by, but not limited to, non-motorized vehicles, horseback riders, cross-country skiers, and pedestrians.

Urbanized Areas: All parts of the highway system within an urban area as shown on The West Virginia Urban Area maps maintained by the Planning Division. These maps are located on the Division's website at the following link: www.transportation.wv.gov/highways/programplanning/gti/GIS/MAPS/Pages/UrbanAreaMaps.aspx.

BICYCLES

During the environmental review and/or planning process, the WVDOH will assess the need and potential for the development of bicycle facilities as a part of the project. The criteria in the "Statewide Plan for Accommodation of Bicycle Transportation and Pedestrian Walkways", September 1997 will be considered. Reference is also made to the 2012 AASHTO Bicycle Guide or most current edition. It should be noted that the development of a bicycle facility may be combined with the development of a pedestrian walkway facility. The resulting combined facility would be designated for both bicycle and pedestrian use. The combined facility must meet the criteria for both bicycles and pedestrians while accounting for the required safe separation of these two transportation modes.

If it is determined that bicycle facilities are to be incorporated in the project, the environmental documents shall include recommendations as to the type of bicyclist(s), as well as the type of facility to be considered in the design process.

The designer shall use the following criteria when determining the need for bicycle facilities in new construction or reconstruction projects.

A. Urbanized Areas

- Bicycle facilities shall be established in all new construction or reconstruction projects that add a new highway or alter the functionality of an existing highway. Exceptions to this policy are described below.

- Bicycle facilities may not be required if one or more of the following conditions exist:

  - Bicycles are prohibited from using the roadway.

  - The cost of establishing a bikeway is greater than ten (10) percent of the estimated construction cost of the project.

  - Existing population conditions and other factors indicate an absence of need for bicycle facilities.

  - Development costs such as right-of-way, utility relocation, environmental mitigation, historical resource avoidance, and others may be considered when determining the need to establish a bicycle facility.

B. Rural Areas

- Designated bicycle facilities may be considered during the design phase of the project

- All new construction or reconstruction projects that add a new highway or alter the functionality of an existing highway, shall as a minimum, be designed as a Category II Roadway.

- The designer shall consider the continuity of bicycle facilities on highways where the classification of the highway changes from urban to rural in relatively short distances.

The final decision for inclusion of bicycle facilities in the project will be made during the design process utilizing the above criteria. If the designer proposes not to incorporate bicycle facilities in the proposed project, written approval must be obtained from the Deputy State Highway Engineer – Construction/Development or Operations, as applicable.

Bicycle facilities will be accommodated by one or more of the following methods:

- Designation of the project as a Bikeway or a Bicycle Route;

- Inclusion of a Bicycle Lane in the design of the project in urban areas; or

- Designation of or the inclusion of a Shared Use Path in the design of the project.

Sidewalks should not be designated for bicycle use. Bicyclists may be encouraged, with appropriate signing, to use short segments of sidewalks. One example of this would be a bridge structure that provides a safer environment to traverse the bridge. This would only be considered if the bridge sidewalk is wide enough to accommodate both pedestrians and bicyclists, in which case the criteria for a "Combined Facility" would be utilized (see the 2012 AASHTO Bicycle Guide or most current edition).

Design Bicyclist

To address the needs of bicyclists of various skill levels, the WVDOH shall use a classification of bicyclists. This system is a modification of the existing classification system used by AASHTO. This system is described as follows (taken from the 2012 AASHTO Bicycle Guide):

Experienced and Confident

This group includes bicyclists who are comfortable riding on most types of bicycle facilities, including roads without any special treatments for bicyclists. This group also includes utilitarian and recreational rider of many ages who are confident enough to ride on busy roads and navigate in traffic. Such bicyclists may deviate from the most direct route to travel in their preferred riding conditions. Experienced bicyclists may include commuters, long distance road bicyclists, racers, and those who participate in rides organized by bicycle clubs.

Most experienced riders are comfortable riding with vehicles on streets. Some prefer on-street bike lanes, paved shoulders, or shared use paths. They prefer a more direct route to their destination and avoid riding on sidewalks.

Casual and Less Confident

This group includes a majority of the population, and includes a wide range of people: (1) Those who ride frequently for multiple purposes; (2) those who enjoy bicycling occasionally but may only ride on paths or low-traffic and/or low-speed streets in favorable conditions; (3) those who ride for recreation, perhaps with children and; (4) those for whom the bicycle is a necessary mode of transportation.

Casual riders prefer shared use paths, bicycle boulevards, or bike lanes along low volume, low speed roads and streets. They may have difficulty gauging traffic and may be unfamiliar with the rules-of-the-road for bicyclists. They may use less direct routes to avoid heavy traffic volumes and are more likely to ride on sidewalks.

PEDESTRIANS

During the environmental review and/or planning process, the WVDOH will assess the need and potential for the development of pedestrian walkway facilities as a part of the project. The criteria in the "Statewide Plan for Accommodation of Bicycle Transportation and Pedestrian Walkways", September 1997 will be considered. Reference is also made to the following publication: "Guide for the Planning, Design, and Operation of Pedestrian Facilities, July 2004, AASHTO. It should be noted that the development of a pedestrian walkway facility may be combined with the development of a bicycle facility. The resulting combined facility would be designated for both pedestrian and bicycle use. The combined facility must meet the criteria for both bicycles and pedestrians while accounting for the required safe separation of these two transportation modes.

If it is determined that pedestrian walkway facilities should be considered, the environmental documents would include recommendations as to the type of facility to be constructed. Facilities to be considered are sidewalks, shoulders and/or separate paths.

Any pedestrian accommodation on a project must be in accordance with DD-811 (Curb Ramps and Sidewalks) and be in accordance with the additional design standards noted below.

The designer shall use the following criteria when determining the need for pedestrian walkway facilities in new construction projects.

A. Urbanized Areas

- Pedestrian walkway facilities shall be established in all new construction or reconstruction projects that add a new highway or alter the functionality of an existing highway. Exceptions to this policy are described below.

- Pedestrian walkway facilities may not be required if one or more of the following conditions exist:

    - Pedestrians are prohibited by law from using the roadway.

    - The cost of establishing a pedestrian walkway is greater than ten (10) percent of the estimated construction cost of the project.

    - Existing population conditions and other factors indicate an absence of need for pedestrian walkway facilities. Development costs such as right-of-way, utility relocation, environmental mitigation, historical resource avoidance, and others may be considered when determining the need to establish a pedestrian walkway facility.

B. Rural Areas

- Designated pedestrian walkway facilities may be considered during the design phase of the project.

- All new construction or reconstruction projects that add a new highway or alter the functionality of an existing highway, shall as a minimum, be designed as a Category II Roadway.

- The designer shall consider the continuity of pedestrian walkway facilities on highways where the classification of the highway changes from urban to rural in relatively short distances.

On bridge construction projects, a sidewalk shall be designed as a part of the bridge if sufficient pedestrian activity exists and there is not a suitable pedestrian crossing reasonably close to the bridge. In the case of bridge replacement projects, a sidewalk shall be designed as a part of the bridge if the existing structure had a sidewalk or if sufficient pedestrian activity exists and there is not a suitable pedestrian crossing reasonably close to the bridge.

DESIGN STANDARDS

The following design standards have been developed for bicycle and pedestrian accommodation. These lists are not considered to be all-inclusive. The designer should consult the 2012 AASHTO Bicycle Guide (or most current edition) for further guidance, especially for design guidance for Shared Use Paths. The "Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way" (PROWAG), dated July 26, 2011, should be considered as minimum criteria for the design of any new or the replacement of any existing pedestrian facility.

A. General (Applicable to Pedestrian and Bicycle)

- The designer is cautioned to review sight distances carefully due to extra height of barriers as a design exception could be necessary for the extra height where a normal height barrier would not have needed one.

- All paved shoulders to accommodate both pedestrians and bicycles

- All structures shall have a combination of railings, fences or barriers with a minimum height of 42" for pedestrians and bicycles. A 48" railing shall be considered for the following conditions:

    - Where bicycle speeds are likely to be high (such as on a downgrade)

    - Where a bicycle could impact a barrier at a 25 degree angle or greater (such as in a curve)

    - Where significant bicycle traffic is anticipated

    - Where a bicycle falling over the rail could be catastrophic, such as a high drop off or into traffic.

- Drainage grates for bicycle routes shall be of a bicycle safe design.

- Reference is made to DD-645, Rumble Strips, to bicycle mitigation methods for rumble strips.

B. Category I Roadways

- Bicycle accommodations are to be designed for one way operation

- Bicycles to be encouraged to utilize right shoulder (with signing)

- Bicycles to be encouraged to use exit and entrance ramps shoulders (with signing)

- Minimum 5’-0” width of right shoulder (non-structure)* without rumble strip

- Minimum 6’-0”width of right shoulder (bridge structure)* without rumble strip

- Bridge expansion joints must be bicycle safe on the right shoulder (no exposed finger dams)

***NOTE:** The values for shoulder width shown in DD-601 shall supersede the values shown above if the values in DD-601 are greater.

C. **Category II Roadways**

- Bicycle accommodations are to be designed for one way operation

- When the ADT is greater than 1000 vpd, shoulders may be paved if bicycle and/or pedestrian walkway facilities are to be considered

- When the ADT is less than 1000 vpd, paved shoulder widths of 2'-0" should be considered; however, paved shoulder widths of 4'-0" or greater are encouraged. For pedestrian facilities, in absence of paved shoulders, a stabilized shoulder of 2'-0" minimum or 4'-0" preferred widths should be encouraged.

- All structures shall have a minimum shoulder width similar to the approach roadway shoulder width, but does not have to exceed 5'-0"

- Bridge expansion joints for bicycle facilities

    - If shoulder is 5'-0" or greater, no exposed finger dams on the right shoulder

- If shoulder is less than 5'-0", no exposed finger dams on full roadway

- On curbed sections of roadways on bicycle routes, width of right lane shall be 14'-0", including the gutter pan.

- Structures without sidewalk shall have minimum shoulder widths of 4'-0"

- Structures with sidewalks shall have 4' minimum sidewalk widths and right lane/shoulder combined width of 14'-0" (12’-0” lane/2’-0” shoulder)

D. **Shared Use Paths**

- Designed for 2 way operation

- Minimum Travel Width - 10’ with 2'-0" graded shoulders

- Reduced width of 8’ in very rare circumstances or for short distances due to physical constraints.

- Structure railing/fence/barrier must be at least 5'-0" from the edge of shoulder of parallel roadway or separated by a combination of railings, fence or barrier with a height as described above.

- Superelevation 2% (no crown)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-814
ON JOB TRAINING
February 24, 2016

On all projects where the Engineers Estimated Contract Cost is greater than $2,000,000 dollars and the working day calculations are greater than 12 calendar months, a determination of the need for On Job Training will be required.

When a determination of the need for On Job Training is required, the designer shall provide to the EEO Division the following information after the final office review:

1) Title Sheet

2) Engineers Estimate

3) Working Day Calculations

After the required determination has been made, the EEO Division will inform the designer if On Job Training is required and the number of hours to bid under Item 699000-001 “ON JOB TRAINING.”

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-815
GUIDE FOR ERECTING MAILBOXES ALONG STATE HIGHWAYS
March 28, 2012

Attached is the West Virginia Department of Transportation, Division of Highways policy for “Erecting Mailboxes Along State Highways”.

GUIDE FOR ERECTING MAILBOXES ALONG STATE HIGHWAYS

PURPOSE

The purpose of this document is to provide guidelines concerning the installation and maintenance of mailboxes along State highways. It is to apply to all mailboxes and newspaper tubes within State-owned rights of way and served by vehicular United State Postal Service (USPS) carriers. The intention of this guide is to increase the safety to the public and the safety and convenience of the carrier and patron, while permitting postal patrons to receive their mail without interruption.

INSTALLATIONS PROHIBITED

No mailbox or newspaper tube is to be installed within any controlled-access right of way or where access to deliver or retrieve mail must be obtained from within the controlled access. An exception to this will be made if the mailbox is behind guardrail at an approach or intersection or if the mailbox or boxes are at least 30 feet from the edge of the through lanes.

No Neighborhood Delivery and Collection Box Units (NDCBU) will be permitted on State highway rights of way. Where such units are necessary, the property owner will be responsible for providing a location for each NDCBU and an associated vehicular pullout area off of the right of way. Where sidewalks are present, the NDCBU should be located at the back of the sidewalk.

No mailbox supports shall be placed in front of a guardrail. Where mailboxes are adjacent to guardrail, consideration should be given to relocating them or position them behind an available guardrail if a safe and stable all-weather walking path for the postal patron exists. The maximum distance of such a relocation should be 200'. No mailbox support shall be placed behind a “gating” or breakaway guardrail terminal.

PERMITS

No separate permit shall be required for the installation of a mailbox, although installations are expected to conform to this guide. Where a permit is being sought for a new residential or commercial driveway, the mailbox location and support type and the arrangements for delivery and retrieval of mail shall be reviewed as a part of that permit.

CLAIMS

From time to time, mailboxes will be damaged during normal maintenance operations such as snow removal and ice control or ditching. When such damage is brought to the attention of the Division of Highways, it shall be the responsibility of the Highway Operations Division to investigate and confirm the damage. An Accident Report (Form AR-13) is then to be prepared as necessary for submission to the Claims Section of the Enforcement Division. The owner will normally be reimbursed for damage and will be responsible for replacing and reinstalling the mailbox in accordance with this guide.

MAILBOXES

Mailboxes shall conform to USPS-STD-7B Mailboxes – Residential Mailbox Standards, which is available at the USPS site (www.usps.gov).

SUPPORTS

Mailbox supports and box attachments shall be of a type approved by the USPS. This may be a proprietary support system which is designed and approved for the purpose or may be a wooden or metal support. The support should be no stronger than required to resist service loads and minimize susceptibility to vandalism; a wooden support should be no larger than 4" x 4" (nominal) post and a metal support should be no larger or more substantial than a 1 ½” to 2" pipe. The pipes should be embedded no more than 24” into the ground, with no anchor plates. Supports may be equipped with an anti-twist plate extending no more than 10” into the ground to prevent the support from rotating.

The attachment to the support shall be a bracket or plate which is of sufficient strength to prevent the separation of the box from the post in a collision. The intent is that a potential errant vehicle will “ride down” the post and box together, rather than turning the detached mailbox into a projectile.

Where circumstances such as snow removal dictate, cantilever mailbox supports may be used. They should be strong enough to support the box and should provide for a strong attachment between the mailbox and the mounting. Construction of 4" x 4" treated lumber or a 1 ½” to 2" metal pipe is recommended; one acceptable support is shown in the Standard Details Book, Volume II, issued January 1, 1994 on Standard Sheet TE1-9. Other acceptable supports are shown in the latest issue of the AASHTO *Roadside Design Guide*.

Where multiple mailboxes are installed on one support, planks, metal channels or other mounting methods that may penetrate the windshield on any errant vehicle must be avoided. The proprietary supports and mounting systems that are available for this type of installation are preferred. In no case are more than four mailboxes to be placed on a single support. Where single or multiple mailboxes are placed in independent installations, supports shall be at least 40” apart, center to center unless they are behind guardrail.

One or more lightweight fiberglass, plastic, or metal newspaper tubes may be placed on each mailbox support, subject to the specifications of the USPS. Further guidance on these specifications is available in the latest issue of the AASHTO *Roadside Design Guide*, including USPS website references.

LOCATION OF MAILBOXES

Mailboxes are to be placed on the right side of the road in the direction of service of the carrier route. An exception may be made for one-way streets, where mailboxes may be placed on either side of the street.

Mounting height is to be as directed by the USPS; this will generally be 41” to 45” above the surface of the area used by the carrier’s vehicle while delivering mail.

Mailboxes mounted behind guardrail should have the door of the box flush with the face of the guardrail. Mailboxes mounted behind curb should have the door of the box flush with or slightly behind the face of the curb.

Mailboxes should be located so that a carrier or patron’s vehicle that is stopped at the box will be clear of the traveled way. This will be accomplished if the box or boxes are mounted slightly behind the shoulder if such shoulder is 8' wide or more. Where sufficient shoulders are not available, an attempt should be made to relocate the box or boxes to a wider area which may provide a turnout area. Where two or more mailboxes can be located and served at the same turnout area, the Division of Highways will, in the interest of public safety and convenience, provide stabilization stone to enhance an all-weather surface at the turnout area. See the **TURNOUTS** section below.

The location of a mailbox or mailboxes at or adjacent to intersections should be carefully reviewed for its effect on the safety of the carrier, the safety of the patron, and intersection sight distances. Where traffic operating speeds on the main road are 40 miles per hour (MPH) or more, an attempt should be made to locate the mail box or mailboxes on one of the crossroads, preferably 30’ (minimum acceptable 20’) down the crossroad. If the box or boxes must be located on the through highway, they shall be located on the downstream (far) side of the intersection, and preferably 150’ (minimum acceptable 100') or more from the edge of the crossroads. The influence on sight distance of stopped vehicles and of the mailbox itself (which will be mounted at the approximate driver eye height) shall be checked. Mailboxes should also be located at the far side of any driveways encountered.

Roadside clear zones shall be maintained whenever practical. Where mailboxes cannot be eliminated from the clear zone or placed behind guardrail, single or double mailbox installations with supports and attachment devices meeting the criteria described above will be permitted.

Because of varying road and curb conditions and other factors, the USPS recommends that the postmaster or carrier be contacted before erecting or replacing any mailboxes and supports. The Designer should contact the postmaster early in the development of the project to discuss any mailboxes that may need replaced on any project.

TURNOUTS

As described in the **LOCATION OF MAILBOXES** section above, turnouts should be provided where sufficient shoulders are not available, i.e. if the shoulder is less than 8’ wide. The designer is directed to the latest issue of the AASHTO *Roadside Design Guide* for more information on turnouts, including minimum design criteria.

ENCROACHMENTS

Massive or unsafe installations such as stone pillars; plows or other decorative supports; or multiple mailboxes mounted on planks that are located within the State right of way will be treated as encroachments. These non-conforming installations will be subject to removal or replacement with approved installations at the property owner’s expense once identified, as during a 3R project or road inventory survey.

For additional guidelines, reference is made to the latest issue of the AASHTO *Roadside Design Guide*.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD - 816
VALUE ENGINEERING
August 2, 2013

Attached is the West Virginia Department of Transportation, Division of Highways policy on "Value Engineering".

This document provides information and guidance regarding the implementation of a Value Engineering Program within the Division of Highways of the West Virginia Department of Transportation.

Attachment

VALUE ENGINEERING

PURPOSE:

This document provides information and guidance regarding the implementation of a Value Engineering Program within the Division of Highways of the West Virginia Department of Transportation. The policies described herein and the procedures set forth in the West Virginia Division of Highways “Value Engineering Manual” and “Construction Manual” are to be the references for Division employees who are involved in or affected by the Division's Value Engineering (VE) activities. The VE Manual is to be provided to Consultants at the time of the Scope of Work meeting on those projects requiring a Value Engineering Analysis.

GENERAL POLICIES; SCHEDULING OF ANALYSIS:

A. VE Analysis Notification:

The Project Manager and the Responsible Division shall notify the project team when a VE analysis is to be conducted on a project. The policies in the following sections shall be used to determine when a VE analysis is to be performed. When a VE analysis is to be conducted the Project Manager shall immediately notify the “Program Administration Division” in writing. The Program Administration Division shall then add a note in the tracking system indicating that a VE analysis is to be conducted.

B. Mandatory VE Reviews:

It will be the policy of the West Virginia Department of Transportation, Division of Highways, to apply Value Engineering following the requirements in the latest federal transportation bill referred to as MAP-21 to all projects with the following criteria:

Projects on the National Highway System (NHS) -
All projects on the NHS, receiving federal assistance, with an estimated **total cost greater than $50,000,000, shall undergo a VE analysis.**

Bridge Projects on the NHS –
All bridge projects on the NHS, receiving federal assistance, with an estimated **total cost greater than $40,000,000, shall undergo a VE analysis.**

A project meeting the above criteria, to be delivered by the design-build method, shall not be required to have a value engineering analysis performed.

A “project” will be defined by the limits shown in the controlling environmental document. The Total Project Cost includes all the cost associated with the environmental clearance, engineering, right of way, utilities, and construction phases of a project. All required VE analyses shall be performed, per the Division’s Value Engineering Manual, prior to Final Design.

The Value Engineering Analysis, for a project, will normally be conducted at the 30% plan (Preliminary Field Review) stage

C. Alternative Mandatory VE Reviews:

When it is proposed to conduct a Mandatory VE Analysis utilizing alternative procedures, approval must be obtained from the "Deputy State Highway Engineer – Development" and FHWA prior to conducting the analysis.

1. **Representative Contract Section:** The Division may utilize a "Representative Contract Section" concept as a substitute for conducting a VE analysis for each design section of the entire project. The selected "Representative Contract Section" should contain elements that are generally representative of those that will be encountered throughout the entire project limits. The approved recommendations of the Value Engineering Analysis, on the "Representative Contract Section", will be applied in the contract plan development of all subsequent design sections of the project.

2. **Design Report VE Analysis:** The Division may also choose to conduct the required Value Engineering Analysis of a major project during the Design Study Report Preparation.

D. WVDOH Initiated Reviews:

The WVDOH may choose to initiate a VE study on any project, regardless of cost, when it is felt that sufficient potential cost savings exist to justify the VE analysis costs. It is the intent of the Division of Highways to make periodic Value Engineering analyses of Standard Details; Standard Specifications; "allocation-type" projects; and Design, Traffic Engineering and Structural Directives on a cyclical basis. These analyses will, of necessity, have a lower priority than project analyses and, in the case of specifications, standards and directives will generally take place when they are being reissued.

E. Value Engineering Change Proposal:
(Initiated by Contractor)

Value Engineering Change Proposals (VECP), initiated by the Contractor during the execution of a construction project, are an integral part of the WVDOH value engineering program. The Construction Manual by Contract Administration shall be referenced on the processing of VECP's.

GUIDANCE FOR VALUE ENGINEERING STUDIES:

Management oversight and the conduct of the Value Engineering Analysis will be in accordance with the elements and procedures spelled out in the AASHTO "Guidelines for Value Engineering", current edition and the WVDOH "Value Engineering Manual".

PRODUCTS OF THE ANALYSIS:

The product of the Value Engineering analysis shall be a written report to Management containing at least the following information:

1. Project number and description, including type and length of project, number of lanes; right of way and utility involvement; and generalized scope of work.

2. Stage of development of the project when the VE was performed.

3. Value Engineering team members and work locations; designer or project manager and other resource personnel who were consulted.

4. Specific items considered.

5. Items recommended and the reasons. Where appropriate, sketches or detail drawings are to be included.

6. Items rejected and the reasons.

7. Cost data with summary of anticipated costs and savings. Costs and savings are to consider capital costs and life-cycle costs.

8. Once the written report has been presented, the Team, or Team Chairperson, should be prepared to make an oral presentation to Management. If an oral presentation is requested the designer may be involved to critique or respond to the Value Engineering team recommendations.

APPROVAL OF RECOMMENDATIONS:

After completion of the written and oral reports, the project designer, or the project manager and consultant, will reply to each Value Engineering recommendation. The replies will be reviewed and comments prepared by the affected Division Directors. The results of the reviews will then be consolidated and the Deputy State Highway Engineer Development will make a final determination regarding each Value Engineering recommendation.

Upon the action of the Deputy State Highway Engineer Development, on each VE recommendation, a Final Value Engineering Report shall be prepared by the project designer or the project manager and submitted to the responsible division director for approval. This report will describe the disposition of each recommendation and attach the VE Report.

FILING OF COMPLETED VE REVIEWS:

The project designer or manager shall forward a copy of the approved Final Value Engineering Report to the "Value Engineering Coordinator" for filing and inclusion in Annual VE Report to FHWA. The Value Engineering Coordinator will maintain a file of all Final Value Engineering Reports, as described in Section 10.11 of the WVDOH "Value Engineering Manual".

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD - 817
MINOR PREVENTIVE MAINTENANCE
December 2, 2013

Attached for your use is guidance on accessibility standards on public right of way and categorizing of projects and their associated activities per the Federal-Aid Highway Program.

Attachment

MINOR PREVENTIVE MAINTENANCE

INTRODUCTION:

The WVDOT and FHWA enter in agreements to administer the Federal-Aid Highway Program (FAHP) under Title 23, and other associated laws. These agreements have defined project activities under three broad categories of projects. These categories are:

A. New Construction/Reconstruction Projects
B. 3R (Resurfacing, restoration, or rehabilitation) Projects
C. All Other Projects

Also as part of this, the FHWA is responsible for ensuring that project planning, design, construction and operation adequately address pedestrian access for people with disabilities on the public right of way.

This design directive shall be used by all designers to determine which category a proposed project is classified as. Projects classified as Category “A” and “B” will require full design criteria and any design exceptions are to be addressed per DD-605. Any exception involving pedestrian access shall be documented by DD-811 by completing an AMERICANS WITH DISABILITIES ACT (ADA) Exceptions Justification Report. A project involving Minor Preventive Maintenance Activities is classified as Category “C”, “All Other Projects”, which does not require full design criteria, except for the work proposed.

The determination of a project’s category is important for several reasons. It is especially significant to determine if all the activities anticipated during a project meet the definition of Minor Preventive Maintenance. If project activities are categorized as Minor Preventive Maintenance, then the “designer” will not be required and should not submit any formal design exceptions for approval per DD-605. A project that is classified as Minor Preventive Maintenance, also, does not require upgrading of contiguous safety elements although some safety improvements may be incorporated.

A project altering the character of the surface, also known as an **alteration** on a public right of way creates the requirement to address accessibility compliance. The type of funds, federal, state, bond, or any other funding is not a determining factor in this compliance.

Projects administered by a municipality on WVDOH R/W, such as a streetscape, involve funds expended on a public right of way, creating an alteration. This requires the municipality and the WVDOH to meet full compliance with all federal laws and regulations during the development of plans and construction. As part of the development of plans for construction, where full design criteria for pedestrian access is not feasible, the designer (the municipality or their consultant) shall prepare an exception justification form as described in DD-811 and submit with the plans for review and approval to the WVDOH. All exceptions approved by the Division shall be filed as required for all projects.

EXISTING SIDEWALKS

Resurfacing projects are considered an alteration by the Department of Justice (DOJ) and will require all curb ramps within the resurfacing project to meet the Americans with Disabilities Act (ADA) for compliance during or prior to the resurfacing project. This will also require installing curbs ramps where presently a curb ramp does not exist to make the sidewalk ADA accessible. Detectable warning systems are also required on all existing curb ramps. Existing sidewalks shall be evaluated for ADA Compliance using the DOJ 2010 ADA Standards for Accessible Design. All designers addressing existing or proposed sidewalks are to use DD-811 CURB RAMP AND SIDEWALKS.

ROADWAY ACTIVITIES:

Per the above definition the Project Manager will consider the following proposed activities as **Minor Preventive Maintenance.** See the following web page for a more precise definition of some of the activities in the lists for Roadway Activities below: www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta_glossary.cfm.:

1. Crack filling and sealing
2. Surface sealing
3. Chip, Slurry, and Fog seals
4. Scrub sealing
5. Joint crack seals
6. Joint repairs
7. Dowel bar retrofit
8. Spot high-friction treatment
9. Diamond grinding
10. Pavement patching
11. Shoulder repairs
12. Pipe and inlet repairs
13. Pulling and restoration of ditches
14. Guardrail repair and installation
15. Re-striping

The following common roadway activities are **NOT** considered Minor Preventive Maintenance and as such are **alterations** and therefore require existing adjacent sidewalks to be addressed to meet ADA compliance as described in DD-811:

1. Open-graded surface course
2. Cape seals
3. Mill and fill/Mill and overlay
4. Hot in-place recycling
5. Microsurfacing/Thin-lift overlay
6. Addition of new layer of asphalt
7. Asphalt and concrete rehabilitation and reconstruction
8. New construction
9. Widening of the existing pavement typical section
10. Addition of turning lanes
11. Pavement rubblizing
12. Installation of new drainage structures to improve existing drainage characteristics

BRIDGE ACTIVITIES:

Per the above definition the Project Manager will consider the following activities as Minor Preventive Maintenance:

1. All painting of bridge members.
2. Scour Countermeasure Activities.
3. Expansion Joint Repairs and Replacement.
4. Concrete Crack Repairs.
5. Refurbishing or restoration of existing bridge bearings.
6. Deck drainage system repairs.
7. Seismic retrofit activities that do not include replacement of bearings or structural members.

The following common bridge activities are not considered Minor Preventive Maintenance and as such are 3R or reconstruction activities:

1. Bridge deck overlay projects.
2. Repairs to structural members for the purpose of restoring or enhancing structural capacity.
3. Strength repairs to substructure elements.
4. Bearing replacement.
5. Bridge deck replacement.
6. Superstructure replacement.

PROJECTS WITH MULTIPLE CATEGORY ACTIVITIES:

Many projects may involve some activities which can be categorized as Minor Preventive Maintenance and other activities which are 3R or reconstruction activities. Normally the project will be categorized per the 3R or reconstruction category on these projects. The Project Manager will then be required to consider the need of any formal design exceptions or safety improvements. Some projects, however, may not follow this rule. For example, a project may consist of five miles of Minor Preventive Maintenance such as a surface seal treatment and involve 100 feet of pavement replacement at the end of the project. This project may be categorized as Minor Preventive Maintenance.

A second example would be a large bridge painting project that involved a structural repair to only one or two members. This project may also be categorized as Minor Preventive Maintenance.

When the Project Manager believes that a project with multiple category activities, may qualify as a Minor Preventive Maintenance project, they shall document this and request approval per the following schedule:

District Design Projects:

1. Deputy State Highway Engineer/Operations
2. FHWA (Full Oversight Projects Only)

All Other Projects:

1. Deputy State Highway Engineer/Development
2. FHWA (Full Oversight Projects Only)

MINOR PREVENTIVE MAINTENANCE PROJECT REQUIREMENTS:

All projects categorized as Minor Preventive Maintenance shall be designed per all current applicable design policies. The following should not be developed or submitted on these projects:

1. Safety Improvements (unless they are integral to the project activity).
2. Development and submission of formal design exceptions per DD-605.
3. Development and submission of ADA Exceptions Justification Form per DD-811.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-820
DEVELOPMENT AND WRITING OF SPECIFICATIONS
December 23, 2005

Attached is the West Virginia Department of Transportation, Division of Highways policy on “Development and Writing of Specifications,” dated October 11, 2005.

The following procedures have been established for the preparation of specifications, i.e. standard specifications, supplemental specifications, special provisions for highway projects.

Attachment

DEVELOPMENT AND WRITING OF SPECIFICATIONS

Most of the following information is from the FHWA Technical Advisory T5080.16 "Development and review of Specifications" Dated 8/7/1992. Specifications are to follow the Technical Advisory outlined below, except that the use of passive voice is preferred.

1. PURPOSE. To provide to Federal Highway Administration (FHWA) division offices and State highway agencies (SHA) guidance for the development and review of specifications for Federal-aid highway projects.

2. DEFINITIONS

   a. Specifications - the compilation of provisions and requirements for the performance of prescribed work and the basis of payment for the work.

   b. Standard Specifications - a book of specifications approved for general application and repetitive use.

   c. Supplemental Specifications - approved additions and revisions to the standard specifications used to update the standard specifications between publications.

   d. Special Provisions - approved additions and revisions to the standard and supplemental specifications that apply only to an individual project or a small group of projects.

   e. Method Specifications - specifications that are explicit in the identification of the work methods or procedures to be used to complete the work included in the contract. Method specifications often include some measure of work control or direction by the contracting agency.

   f. Quality Assurance/Quality Control (QC/QA) Specifications and End Result Specifications - specifications that minimize prescriptiveness of work methods, materials, and equipment. The focus is on quality control responsibilities and measurement of end-product parameters that affect performance.

   g. National Reference Specifications - specifications prepared by recognized organizations or agencies that provide national standards of performance or measurement. These specifications have been proven over time to provide the desired quality.

3. BACKGROUND

   a. Clear, concise specifications are essential in achieving quality and efficiency in highway construction. Specifications define individual responsibilities, measurement and payment procedures, and provide the communication between the SHA and the contractor. Today's challenges in the highway construction program place a great demand on the SHA for clear and concise specifications. Factors which contribute to these challenges include:

(1) Increasing project complexity and scope,

(2) Increasing legislative and administrative requirements,

(3) New technology applications,

(4) Shortage of personnel in number and experience, and

(5) The proliferation of contract claims and litigation.

b. In the past, the State's Field Engineer was often the autonomous source of all project decisions and the sole judge of contract compliance. The State Field Engineer's experience was relied on extensively as reflected in the often used language "in the opinion of the Engineer," "as directed by the Engineer," or "as approved by the Engineer." The Field Engineer was often directly involved in the supervision and control of the work. Consequently, there was a tendency to provide and use broad, vague specifications to allow the Field Engineer the latitude to control the contractor's operation. Current construction industry business practices will not accept the sharing of operational control without shared liability.

c. Today, the Field Engineer is called on to have extensive knowledge not only of engineering practices, but also administrative and legal requirements. The increased emphasis on administrative and legal requirements has reduced the amount of time and energy that can be spent on construction quality related activities. The size, nature, cost, and complexity of projects has changed to reflect reconstruction and rehabilitation priorities. Therefore, the day-to-day problems on the project are greatly increased by the need to consider previously constructed work and how best to construct the new work in the midst of traffic that must be maintained.

(1) Specialty subcontracting has increased to deal with new and changing construction procedures and materials. Therefore, the Engineer relies on the specifications to a greater degree to provide needed information about specific construction and administrative requirements.

(2) Project development is an assembly line process. Smaller and smaller specialty parts included in the design are often provided by personnel with varying engineering backgrounds and experience in construction. As the number and specialized nature of the parts increase, integration of the parts into a whole unit becomes difficult.

(3) Changes in the complexity of construction projects and in construction methods have placed a significant burden on the specifications. The specifications must reflect these changes and clearly define the basic roles and responsibilities of the contract parties.

4. FUNCTIONS AND RESPONSIBILITIES

a. Description of Work - The function of specifications is to provide definitive directions, procedures, and product requirements considered necessary by the SHA for completing the work identified in the contract. After contract award, no additional duties or restrictions can be placed on the contractor without a contract revision.

(1) Description of Requirements - All of the requirements for acceptance of the work, including quality desired (and methods of quality control where applicable), quality and quantity measurement, and basis of payment by the SHA must be included.

(2) Restrictions Applicable - The description of the work must also include a clear description of restrictions applicable in the completion of the work. These restrictions may be in the form of administrative requirements, intermediate steps of approval or checking, or the methods of transfer of information between the SHA and the contractor.

b. Contract Responsibilities - In the specifications, each party to the contract must be made aware of their individual responsibilities in order to fulfill the contract. The SHA must be able to state clearly, in writing, the requirements and duties of both contract parties for each and every work item and process required. If there is no way to measure or evaluate the accomplishment of a stated responsibility, there is an immediate problem with the specification. Identification and description of responsibilities that cannot be measured will be costly. The specification objective is to provide a clear understanding of each party's responsibilities that cannot be misinterpreted.

(1) Limits of Responsibility - The limits of responsibility, whether individual or coordinated in nature, must be defined in the contract and specifications. Each party to the contract must know the actions that must be completed, what steps are necessary to meet the responsibility assigned to them, and how these steps or actions will be measured.

(2) Coordinate Responsibilities - The order of accomplishment by each party of their individual responsibilities must be established to identify the step-by-step actions needed to ensure that further work can realistically proceed on the item described.

(3) Explanations - There is no reason to provide information to justify or explain the requirements or procedures established in the specifications. The requirements and procedures are part of the work to be done for final product payment. Explanations and justification for actions to be taken by SHA personnel are better included in the administrative and construction manuals for use by SHA personnel only.

(4) Essential Information - The requirements and procedures defined must be essential to the SHA evaluation of the product for payment purposes. Requirements and procedures that are not essential to the attainment of the product quality or quantity serve no useful function and lead to nonenforcement in the field. This places the contractor and SHA in jeopardy concerning the credibility and use of the specifications.

(5) Failure to Comply with Specification - The issue of what will be done in the event that either party does not satisfy their respective contract responsibilities must also be addressed. The actions available to each party and the cost or delay that results from the failure of either party should be considered in specific terms.

c. Measurement and Payment -

(1) Once the work responsibilities are identified, a review of the measurement and payment procedures is needed to assure that the sequence of each party's actions do not interfere with the measurement of the work quality and quantity. The basis of payment for the work should reflect the responsibility and completion definitions included in the work description.

(2) Necessary preceding and succeeding events in the work accomplishment and whether the character of a material or item may change due to these events will have a bearing on the time and place of measurement. If either party has any further responsibilities for a bid item after measurement for payment, the nature and extent of that responsibility must be provided.

(3) When writing specifications and using them in the field, it should be remembered that "approval actions" and "acceptance" may be considered to be the same when conflict resolution reaches the claim stage or litigation. Exculpatory clauses that are inserted into approval documentation (for example, falsework design and structural design submittals) have not been generally successful as a defense in litigation.

5. FORMAT. A standard, five-part format for specifications has evolved over the years through the concerted efforts of the FHWA and the American Association of State Highway and Transportation Officials, in coordination with highway construction industry organizations.

a. The five part specification format consists of:

(1) Description of Work

(2) Materials Requirements

(3) Construction Requirements

(4) Method of Measurement

(5) Basis of Payment

b. This format establishes a uniform approach to providing needed information, describing the work to be performed and identifying the responsibilities of the contracting parties. Although items (2) and (3) of the format may not always be applicable, they should not be deleted. The specifications should show all of the format parts using the notation "none specified" where the information is not applicable. EXAMPLE --- for Section 201 - Clearing and Grubbing, there would be a subsection for description, construction, method of measurement, and basis of payment, but there would be no materials requirements. The subsection would be presented as follows: 201.02 Materials Requirements - None Specified.

c. Information that does not fall within the five labeled parts of the format is not considered to be essential to the standard specification.

6. CLARITY AND BREVITY

a. A successful specification is both clear and brief. Information that is not essential to the directions and commitments that will be a part of the contract only serves to confuse those applying the specification in the field.

b. Short sentences with simple, direct language should be used. Continuous restatements that the "contractor shall ....." and "the work shall consist of..." do not provide needed information. The subject of the specification section should stand on its own and establish the content of the material presented.

c. Repetition should be avoided. If the subject is one that cannot be measured or is not measured against a standard, the use of adjectives and other word modifiers will not change the meaning of the directions. For instance, in field applications, what would be the difference between "thorough consolidation" and "consolidation" of fresh concrete? The judgment made in the field would be whether or not the fresh concrete has been consolidated.

d. Use of active voice grammar is preferred to directly state the essential directions and procedures. Writing in the active voice is accomplished by moving the verb to the beginning of the sentence followed by the subject.

(1) Examples of how the usual (passive voice) language of past specifications can be changed by using active voice grammar and minor editing are shown below.

(a) Passive - The gravel shall be placed and shaped by power equipment to the specified lines, grades, cross-sections, and depths, without segregation. (21 words)

Active voice - Place and shape gravel to the specified dimensions without segregation using power equipment. (13 words)

(b) Passive - A mechanical broom or sweeper shall be provided which is adjustable to uniform contact with the surface and designed to thoroughly clean without cutting into the surface being swept. (29 words)

Active Voice - Provide a mechanical broom or sweeper that can be adjusted to uniform surface contact and does not cut into the surface. (21 words)

(c) Passive - Concrete shall be thoroughly consolidated against the faces of all forms and joints, including concrete in a previously constructed lane of pavement, by means of vibrators inserted in the concrete. (30 words)

Active Voice - Consolidate fresh concrete against all form faces, joints, and previously constructed pavement using insertion type vibrators. (16 words)

(2) The use of active voice may not always be the preferred method if there is a good possibility that confusion may result. Method specifications may become stilted and awkward since the description necessary to explain the process and methods required can be quite involved. The use of the active voice for QC/QA specifications may be easier in application since the results, rather than the work method, are measured.

(3) The primary goal is clear communication -- what is required of the contractor and how the completed results or method requirements be will measured by the SHA.

e. All terminology should be defined, particularly terms that are part of the required work responsibility of the contractor or those that have a bearing on the quality of the work or its measurement.

f. Instructions not included in the specifications must be specific and be included in the bid package. If the contractor must wait until after contract award to receive instructions from the Engineer, higher bid prices will naturally result.

g. Clarity is the responsibility of the writer. According to claim judgments made by the courts, the writer of specifications (the highway agency) is responsible for any conflict or confusion resulting from application of the specifications.

7. <u>FAIR AND EQUAL CONSIDERATION</u>

a. References to information not specifically included within the contract document should be accompanied by notification of where the information can be obtained. The notification should include a contact office and telephone number so the information is available to the contractor, suppliers, and subcontractors.

b. All requirements should be definitive and measurable. Requirements that involve "opinions of the Engineer" cannot be realistically bid since the quality requirements are not defined. Some terms are very difficult to define or measure unless additional information is provided, such as "a stand of grass," or "clean." The inclusion of requirements beyond what can be measured equally by both parties to the contract, or requirements that are open to differing opinions, should be eliminated.

c. Specification requirements should be based on procedures that are necessary to produce the measurable qualities desired by the SHA. Specifying procedures or properties that cannot be justified by experience and credibility, or that are not related to the product quality may lead to a conflict that cannot be equitably resolved.

d. Both parties cannot have the same authority and responsibility. The particular responsibility and authority of both contract parties must be clearly identified for all payment and procedure items.

8. <u>PRIMARY REVIEW POINTS</u>

a. Continuity of Thought and Logic - Continuity of information and thought needs to be checked throughout each section of the specifications.

(1) In this review process, consider the reader unfamiliar with the subject presented, and use "bite size" portions of information.

(2) In addition to the five-part format categories, the subject should be arranged into discrete, complete messages that can be expressed simply.

(3) Assure that the information in each message is presented in a logical, step-by-step continuous manner before moving on to additional material. The critical information needed in the message will become apparent as the logic is examined.

(4) Once a clear message is provided, use a new paragraph (or a new sentence) to present the next message.

b. Method of Presentation and Overall Organization - The sequence of the information and requirements should be reviewed and evaluated to assure clarity and continuity of thought. Locating information necessary for the accomplishment of the contract tasks should not be difficult for either the bidder or the SHA personnel.

(1) The Standard Specifications and their revisions are used and relied upon by third parties outside the contract but integral to the process. A well organized specification eliminates confusion and results in a smoother contracting process that, in turn, provides economic benefits to all concerned. Subsequent revisions, in the form of supplemental specifications or special provisions, will disrupt the

presentation of information, if the Standard Specifications are not clearly presented and organized.

(2) Presentation and organization are also important in the individual Contract or proposal. Arrangement of the subject matter, using the base format numbering system and sequence of the specifications, will provide an easier referral system for specification users.

c. Clarity of Measurement Procedures - Provide a clear description of the qualities to be measured for payment and the method of measurement.

(1) If a method of measurement cannot be defined, the need for measurement should be questioned. Unless a definitive method can be provided for use by both the contractor and the SHA, with unequivocal interpretation where possible, there will be conflict over the measurements taken.

(2) Where and when the measurement is to be made in the construction or processing procedures must also be clear. If sequential measurement and approval actions will be necessary, the sequence should be clearly spelled out.

(3) If the points in the work sequence, where the quantity and quality measurements are made, are not compatible with the work sequence, a clear description of the responsibilities regarding removal of unacceptable work or reduced payment must be provided. The consequences of failure, which include subsequent work that will be disturbed or removed as a result of the test or measurement determinations, must also be defined.

d. Conflicting Information and Requirements -

(1) All of the information provided must be coordinated with other requirements located throughout the specifications and reference documents to eliminate conflicts. The requirements of each specification provision must dovetail with the requirements of necessary preceding and succeeding provisions to accomplish the task described.

(2) The procedures used by the SHA to administer the contract, monitor construction, design the work, and sample and test compliance with the contract requirements must complement the specifications. If a procedure used might counteract the specifications, a change should be made in the procedures or specifications to prevent the situation.

9. DEVELOPMENT AND FEEDBACK. To ensure total coordination of work-related technical requirements with administrative requirements, the specification writers and reviewers must become thoroughly familiar with the general provisions (usually Division 100 in the Standard Specifications) and the entire bidding and contracting procedures used.

Detailed knowledge of both the technical and the administrative requirements and concerns is not always available from one or two individuals. The use of a committee or group of knowledgeable individuals to develop and evaluate the specifications is preferred.

a. Enforcement - If the specifications are to be credible, all provisions must be enforceable and enforced. Provisions not enforced in field application may point to an inequality in the specifications or administrative actions that must be corrected.

   The reason(s) for non-enforcement need to be identified and corrected wherever they exist. Some common reasons for non-enforcement are: (1) improper administrative procedures used, (2) conflicts due to other specifications, (3) lack of clarity in the specifications, and/or (4) specifications that are punitive, without justification, or are used to cover basic failures in contract administrative procedures or contract preparation.

b. Feedback Data - Problem areas due to specifications will become apparent in the evaluation of the field inspection report findings made by the FHWA and the SHA. Comments from industry groups should be considered.

   (1) Year end summaries of common change orders, time extensions, other contract revisions, and claims will also indicate whether or not there are specification deficiencies. A regular review of these items is recommended as a check on the adequacy of the specifications.

   (2) A review check should be made during project development to determine whether all the information included in the bid package is applicable to the project advertised. For example, two different special provisions may be printed back to back on a sheet of paper as a means of economizing. Insertion of the sheet in the bid package -- when both provisions do not apply to the contract -- will provide information that is not needed, waste the bidders time, and lead to confusion. Making constructability reviews when all of the contract provisions are available will also provide information regarding the applicability of the contract documents.

c. Review of "Grandfather" Application - Standard Specifications is often the final result of special provisions which where changed to supplemental specifications and then Standard Specifications. The applicability of special provisions within the broader range of the Standard Specifications should be continually monitored. An up-to-date special provisions list should be maintained to allow a quick comparison of the Contract requirements provided and the provisions available.

d. Development - Specification development and evaluation should be performed by a multi-disciplinary group. Representation of the FHWA in the review group is strongly recommended. A multi-disciplinary review group within the FHWA Division is also recommended.

(1) Within the groups used to develop and evaluate the specifications, caution must be used to identify the best approach to address organizational "mind set" problems and any biases of the individual members. A free and comprehensive exchange of information between all members of the groups is needed.

(2) If a procedure is used by a SHA department or division that generates conflict or uncertainty in the specification applications, the procedure causing the conflict or uncertainty should be adjusted or revised.

(3) The specification review and development process should be continuous (between publications) to account for impacts of new provisions and procedures.

e. Reviewing Specifications - A single review done at one sitting will not adequately complete the evaluation. Once reviewed, the material should be set aside and rechecked later to provide a fresh approach to the language and content. The need for subsequent review will be reflected by the comments and revisions noted.

(1) A separate specification review by a disinterested third party can provide valuable insight and evaluation of the material. The questions raised can point out basic problem areas, such as assumed knowledge or need for the requirement.

(2) Review for legal sufficiency is also suggested. This review should concentrate on the legal sufficiency but not require the attorney to write the specifications. "Legalese" language should be avoided.

f. Resource Files - A comprehensive file system should be maintained to provide a reference base that will track the development and success of each special provision, supplemental specification, or new specification. As each version is revised, the area and date of the revision should be noted to alert the user of the specification changes.

(1) The revised specifications should be filed by subject, whether revised as a special provision or as a supplemental specification, and maintained in a master file.

(2) Specifications are influenced by the legal requirements of the States and the Federal Government. Therefore, a file should be maintained of State and Federal laws that impact the construction and design processes. A policy statement file should also be maintained concerning the implementation of highway contracts. Extra care in the purging or updating of these files is recommended.

TECHNICAL ASPECTS OF WRITING SPECIFICATIONS

Writing specifications shall be in the following format:

1) Microsoft Word version as required by the Specifications Engineer.
2) Margins: top, bottom, right and left – 1inch.
3) Headers/Footers: ½ inch margin – top and bottom.
4) Font shall be 12 point letter size, with the exception of the heading which is outlined below.
5) Date shall be located in upper right corner (header) on all pages of the Special Provision indicating the date written or the latest revision date.
6) Page number out of number of pages is to be located at bottom of page (footer), i.e. "1 of 15".
7) The heading is to appear at the beginning of any and all specifications, whether standard, supplemental, project specific or standard special provisions. The heading is to in bold print and font size 14.
   a. Project information will be excluded from the heading when additions or revisions are being made to the standard and supplemental specifications and the specification revision has been approved by the Specification Committee and FHWA.
   b. Project information is, however, included in the heading to indicate additions and revisions to the standard and supplemental specifications that apply only to an individual project or to a small group of projects.
   c. The number and title of the major section of the specification being changed are to be included in the heading.
   d. Example of a "Project Specific" heading:

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT: _______________

FEDERAL PROJECT: ____________

FOR

SECTION ____
(TITLE OF SECTION)

e. Example of a “Standard Special Provision” heading:

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

SECTION ____
(TITLE OF SECTION)

8) The subsection and title of the specification being changed is indicated in bold letters.

111.2-Abcdef:

9) Briefly describe the action to be taken. The description of the action to be taken is typed in ALL CAPS with the first line indented five spaces as shown in the following examples:

ADD THE FOLLOWING:

ADD THE FOLLOWING AFTER THE LAST PARAGRAPH:

CHANGE THE DESCRIPTION TO READ AS FOLLOWS:

CHANGE THE PARAGRAPH TO READ:

DELETE THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

INSERT THE FOLLOWING AS THE FIRST SENTENCE OF PARAGRAPH THREE:

The above examples are just samples of the descriptions used to describe the action to be taken when changes are required in a specification.

10) Actual changed text or information to be incorporated into the specification.