VDOT CADD MANUAL
CHAPTER 5

CONTENTS

FIGURES

5 CADD DELIVERY

5.1 SEALING AND SIGNING OF PLANS

5.1.1 DIGITAL SIGNATURES AND SEALS

5.1.1.1 INTRODUCTION

All plans and documents as defined in IIM-LD-243 submitted for Right of Way and Construction shall be sealed and signed by the Responsible Person(s) (Licensed Professional Engineer, Certified Landscape Architect, or Licensed Land Surveyor).

Projects will require a **Digital Signature and Seal/Stamp**. Plans submitted for advertisement must be digitally sealed and signed by the dates shown in the "Cut-Off Dates for Advertisement" spreadsheet. For information on which sheets require signatures and by whom, refer to IIM-LD-243.

Throughout this chapter, references are made to ".cel" files which are MicroStation or ORD cell libraries. Please refer to Chapter 3 for additional information regarding using cell libraries.

5.1.1.2 DIGITAL SIGNATURE DEFINITION

Digital Signatures are used to sign electronic documents. A **Digital Signature** is a type of Asymmetric Cryptography used to simulate the security properties of a handwritten signature on paper. It's a method of encrypting a file so that the authenticity of the signed document can be publicly verified with the use of Public and Private Keys.

VDOT will utilize the IGC Medium Assurance Certificate to sign and seal plans. IdenTrust Global Common (IGC) Certificates are cross-certified with the U.S. Federal Bridge Certification Authority, enabling trust by U.S. Federal, State, and local governments, along with commercial entities or applications wishing to rely only on Certificates proven to be issued in a standards-compliant manner. IGC certificates are approved by the General Services Administration to replace certificates that were previously issued under the Access Certificates for Electronic Services (ACES) program.

IGC certificates are PKI Compliant (Public Key Infrastructure). An IGC Digital Certificate ensures authenticity and accountability in citizen-to-government, business-to-government, and government-to-government electronic transactions. All plans and documents are to be signed with IGC Digital Certificates. Additional information can be found at:

- http://www.identrust.com/virginia/vdot.html
- https://www.identrust.com/support/faq/igc

5.1.1.3 DIGITAL SEAL / STAMP

Each "Responsible Person" will require a Digital Seal / Stamp. It will look like the image in Figure 5-1. The CADD Support Section will create the image file of the seal for VDOT staff. VDOT staff should send an email requesting the creation of the seal image file to the CADD Support Section Helpdesk to CADDSupport@vdot.virginia.gov and include the Licensed Profession, Name, and License Number to be included on the seal. Any changes to seals for VDOT staff must be communicated back to the CADD Support Section Helpdesk at the email address above so a new seal image can be created.

Figure 5-1: Sample Seal

5.1.2 MICROSTATION - PLACING PE BLOCK FOR SEALING & SIGNING

5.1.2.1 MICROSTATION CELLS

New projects or sheets created after July 1, 2009 can and should utilize sheet cells created with sealing and signing blocks nested inside. The existing sheet cells have been updated to include the blocks. The blocks must be edited for **Division or Company Name, Location, and Technical Discipline** while in MicroStation. The editing may be performed without dropping the sheet or cell status. The sealing and signing block is located in the sheet2015.cel cell library and is named DES_PLANSHEET_PEBLOCK. The origin, shown in Figure 5-2 is located in the upper right corner of the cell for ease of placement.

Figure 5-2: MicroStation Cells
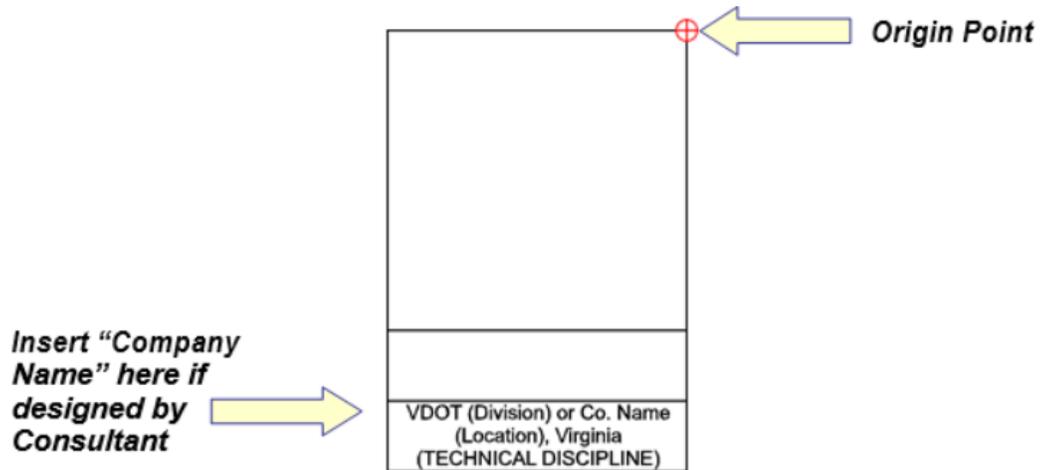
All editing must be done to the sealing and signing block before the PDF file is created.

5.1.2.2 INTERIOR PLAN AND PROFILE SHEETS

The upper right corner next to the project information on interior Plan and Profile sheets is the preferred location for the sealing and signing blocks, as shown in Figure 5-3 and Figure 5-4. Additional sealing and signing blocks may be added when required using the DES_PLANSHEET_PEBLOCK cell described above.

Figure 5-3: Preferred Location on Interior Plan Sheets

5.1.2.3 DELETING OR MODIFYING SEALING & SIGNING BLOCKS IN A SHEET CELL

When a sealing and signing block needs to be deleted from a sheet cell, use the **Drop Element** tool in MicroStation. Place a check in the boxes for **Complex** and **Shared Cells**, then data on the sheet cell and data again to accept. In doing so, the individual components of the sheet itself remain intact and the unused sealing and signing block can be deleted.

The profile sheet is the only exception to this rule. The typical profile sheet will likely require two sealing and signing blocks. Since the profile sheet is made up of primarily many parallel lines, when the cell status is dropped a single time, the only information that can be moved or deleted is the sheet text. The sealing and signing block and other sheet components remain intact. When additional sealing and signing blocks are required, the status must be dropped a second time, allowing the cropping of multiple grid lines around the block's perimeter.

5.1.2.4 EXISTING PROJECTS

Sealing and signing blocks can be added to old and current projects using the DES_PLANSHEET_PEBLOCK cell as noted above. When the preferred placement is not possible, the blocks should be placed using the 'best fit' method (wherever practicable on the plan sheet).

5.1.2.5 BASE SURVEY FILES

The only MicroStation DGN survey file requiring a seal will be the Master Plan Survey File. This will be accomplished using the tools within MicroStation. For more detailed information on the Process, see the department's Survey Manual.

5.1.3 PROJECTWISE FILING

5.1.3.1 FILE SUBMITTAL AND FILE MANAGEMENT

Files requiring digital seals and digital signatures will be stored in **ProjectWise**. The PDF files must be sealed and signed in accordance with IIM-LD-243 before being submitted to VDOT.

For VDOT Staff, files which need to be sealed and signed must be checked out of **ProjectWise** by the responsible person on his or her own computer. All files requiring digital seals and digital signatures will be located in **ProjectWise** under the **Plan File Room** Environment. Plans can be found by roadway project number (or bridge plan number for bridge projects) under the Road Plans, Bridge Plans or Right of Way Plans folder. The files in the Plan File Room are also separated by District and by roadway project number (or bridge plan number for bridge projects).

VDOT employees in a responsible position have the Bluebeam Revu software necessary to digitally seal and sign plans installed on their machines. Consultants and other entities may use Bluebeam Revu, Adobe, or similar PDF software and are responsible for the installation and licensing of whichever software they choose to use for digitally sealing and signing plans. The previously described seal image file is placed in the upper portion of the sealing and signing block as shown in Figure 5-5. The digital signature is placed in the box below the image and the PDF file is saved. Once the individual files have been sealed and signed, the files should be checked back into **ProjectWise**.

- Link to Bluebeam Revu / Sign and Seal webpage

Figure 5-5: Signing and Sealing Block with Digital Seal and Signature
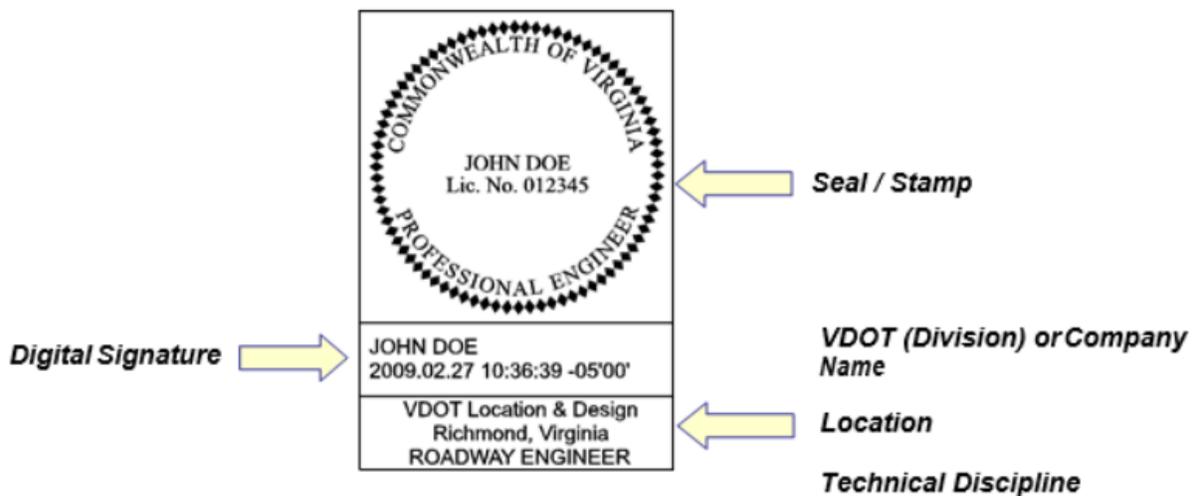
5.1.4 SEALING & SIGNING BLOCK REQUIREMENTS

5.1.4.1 DIMENSIONS AND TEXT SIZES

The dimensions and text sizes for the digital seal is shown in Figure 5-6 below.

Figure 5-6: Sealing and Signing Block Requirements
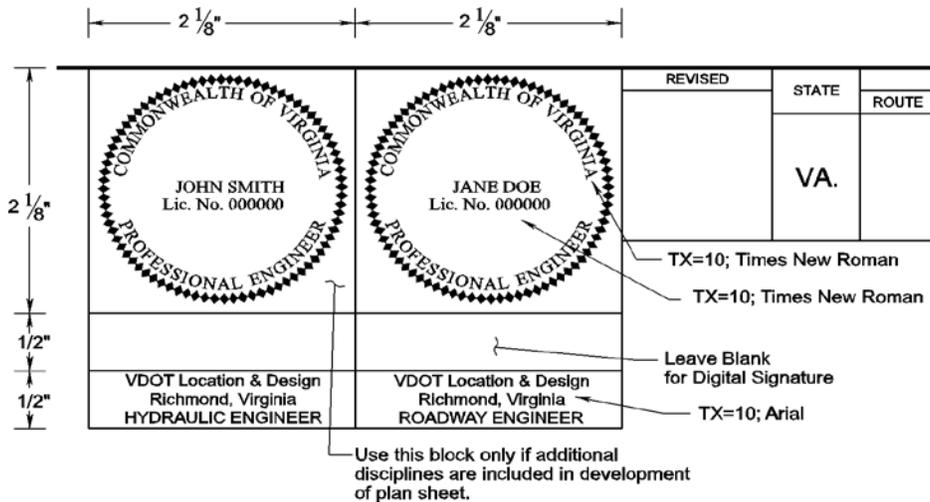
5.1.4.2 NOTES / QUICK REFERENCE GUIDE

- The upper right corner next to the project information block is the preferred location of blocks for sealing and signing.
- While the preferred orientation is horizontal, these blocks may be placed vertically, or in an alternate location if necessary. Use "best fit" method.
- Seals / stamps should be placed with Bluebeam Revu or Adobe using the "Place Stamp" tool.
- Digital signatures should be placed with Bluebeam Revu or Adobe using the "Place Signature" tool.
- The sealing and signing blocks are part of the sheet cells. When additional sealing and signing blocks are required, a cell named DES_PLANSHEET_PEBLOCK can be added from the sheet2015.cel cell library.
  - "Location" is determined by office location of responsible person.
  - "Technical Discipline" is defined as the responsible person sealing and signing plans and can include roadway, hydraulic, civil, bridge and materials engineers as well as land surveyors and landscape architects among others.
- The edit text command can be used to modify text as needed. Editing must be done while in MicroStation and not in Bluebeam Revu or Adobe.

5.1.5 FILE FORMAT REQUIREMENTS

5.1.5.1 FILE FORMAT

Since July 1, 2009 PDF files have become the official format for plan submittals instead of TIF files. Additional information about electronic deliverables can be found at the following link.

- Link to Electronic Plan Submission Process Flow Chart

5.1.6 OTHER TYPES OF PROJECT REQUIREMENTS

5.1.6.1 NO PLAN PROJECTS

For information about sealing & signing "No Plan" projects see the Road Design Manual, Appendix A7. For the current version of the "No Plan" title sheet, see the CADD "No Plan" Directory located in ProjectWise.

5.1.6.2 BRIDGE PROJECTS

For information about sealing & signing bridge plans, see the IIM-S&B-79 and the Structure and Bridge Division's Office Practices.

5.2 ELECTRONIC DELIVERY

5.2.1 POLICY AND PROCEDURES FOR ELECTRONIC DATA DELIVERABLES

5.2.1.1 INTRODUCTION / PURPOSE

This document contains VDOT's policies and procedures for required electronic (computer) data as it relates to engineering design project deliverables for project development. VDOT requires supplementary electronic data delivery items. This data will be in the formats specified by this document. In general, the design data and the original ground survey digital terrain model (DTM) data are to be provided in OpenRoads Designer or OpenRoads/GEOPAK format and the graphical data is to be provided in the OpenRoads Designer or MicroStation format. Organizations wishing to perform professional surveying and engineering services for VDOT are required to deliver electronic data as specified by this document. These policies and procedures also require organizations to accept and utilize pertinent electronic input data as provided by VDOT.

5.2.2 SCOPE

Electronic data deliverables are required at the following list of project development stages and official VDOT milestones. Archiving requirements for project files is described below.

- Preliminary Field Inspection (PFI) Stage
- Public Hearing (PH) Stage
- Field Inspection (FI) Stage
- Right-of-Way Acquisition (Partial Take) Stage
- Right-of-Way Acquisition (Total Take) Stage
- Pre-Advertisement Conference (PAC) Stage
- Plan Coordination Review (PCR) (Tier 2 Projects Only)
- Advertisement Plans Stage (Advertisement Submission)
- Pre-Award Revisions
- Construction Revision
- As Built (as needed)

Additional details for preparation of deliverables can be found at the following links:

- Link to Electronic Plan Submission Process Flow Chart
- Link to Form LD-436 QC Checklist

5.2.3 ARCHIVING FILES

VDOT has developed instructions for archiving files in ProjectWise at the required milestones. Files should be saved at each milestone submittal and prior to working on the next milestone.

- Link to Archiving Files in ProjectWise Job Aid

5.2.3.1 ARCHIVED MILESTONES AND REQUIREMENTS

The information provided in the following sections describes the types of files that shall be archived for the respective project development stage. The archived files will be placed in the Archive folder structure discussed in Chapter 2 for the appropriate milestone.

- * Preliminary Field Inspection – OpenRoads/GEOPAK Files and DGN Files
- * Citizen Information – OpenRoads/GEOPAK Files and DGN Files
- * Public Hearing – OpenRoads/GEOPAK Files and DGN Files
- Right of Way Total – OpenRoads/GEOPAK Files and DGN Files
- * Field Inspection – OpenRoads/GEOPAK Files and DGN Files
- Right of Way Partial – OpenRoads/GEOPAK Files and DGN Files

- * Advertised Submission – OpenRoads/GEOPAK Files and DGN Files, and all Files necessary for the contractor to build the project
- Pre Award Revision – All Revised Files
- Construction Revision – All revised files
- As Built Plans – All plan DGN files for the project

* Note: See Drainage Manual Section 3.3.3 schedule for additional hydraulic files to be archived at the noted milestones.

S&B will always archive files at advertisement submission, revisions (pre-award or construction) and as-built submission, and may occasionally need to archive files at another stage depending on the project.

DGN and associated files used to produce the plans must be archived.

Files archived at the advertisement submission, for pre-award and construction revisions are available to contractors on VDOT's ProjectWise Web Server. It is imperative that files are archived properly at these stages.

5.2.3.2 ARCHIVING PLANS FOR DESIGN BUILD PROJECTS

In order to ensure that all records are up to date and accurate for Design-Build projects, the Alternate Project Delivery Division (APD) has determined a need to capture data at various phases of the project delivery process (both pre-award and post-award) in ProjectWise. It is critical to house this documentation electronically in a centralized repository where it can be accessed by anyone from VDOT.

All plans shall also be submitted in electronic format using the provided version of OpenRoads Design or MicroStation with OpenRoads/GEOPAK CADD software. Files shall be submitted in both DGN and PDF formats and stored in VDOT's ProjectWise Datasource.

Post-award submittals are provided at the Right of Way (ROW) Phase and Construction (CN) Phase. Submittals are also provided post-construction at the As-built Phase. Archiving plans into a complete and comprehensive package containing all plan related documentation at one time will allow the project to be viewed as a whole. There a currently no specific parameters in place regarding the electronic storage structure of the post-award documentation.

The Archive folder structure for Design-Build projects shall have the following sub-folders:

- RFQ
- RFP
- ROW Submittals
- CN Submittals
- As-Built Plans

District Project Managers will be responsible for ensuring the ROW, CN, and As-Built Plans are uploaded in ProjectWise under the Archive folders for the project's UPC number.

5.2.4 DESCRIPTIONS OF THE ELECTRONIC DELIVERABLES

This section describes the kinds of electronic data delivery items which are required by one or more of the types of services included in the scope of the project.

5.2.4.1 DESIGN DATA

This item refers to the collection of engineering data which is used to both specify the design (input data) and describe the final results (output data).

5.2.4.2 GRAPHICAL DATA

This item refers to the CADD (dgn) files which depict design data as plan sheets, typical sections, and summaries, among others.

Graphical Data also refers to PDF files which are required to be signed & sealed as the official plan documents.

5.2.4.3 DIGITAL TERRAIN MODEL (DTM)

This item refers to all data associated with the development and use of the DTM.

5.2.4.4 VDOT STANDARD DATA

This item refers to a group of files provided by VDOT which contain standard symbology, and graphical file setup procedures, among others.

5.2.4.5 TEXT FILES

This item refers to files which contain reports and listings, among others.

5.2.4.6 SPREAD SHEET DATA FILES

This item refers to structured computational worksheets such as Microsoft Excel files.

5.2.4.7 ENGINEERING ESTIMATE

This item refers to data input through AASHTOWare Pre-Construction, VDOT's electronic estimating software.

5.2.5 DESCRIPTIONS FOR GEOPAK AND OPENROADS ELECTRONIC DATA ITEMS

This section specifies the format for each kind of electronic data. Detailed File Specifications and formats are included. All design data will be in OpenRoads Designer or OpenRoads/GEOPAK format, and each are discussed below.

5.2.5.1 GEOPAK FILES

The following is a list of GEOPAK files and a description of their contents. Throughout this section, references to job number are referring to the GEOPAK job number assigned to the GEOPAK project by the user when creating the project's coordinate geometry database files. VDOT does not provide any specific standards or requirements for the selection of this job number when creating the coordinate geometry database files. The GEOPAK job number discussed in this section is NOT the same as the "Job Number" (i.e. C501, B601, etc.) discussed in Chapter 2 of this manual under the Plan File Room Naming Conventions for VDOT Project Numbers.

job###.gpk File - This binary file is created when the user starts a coordinate geometry (COGO) session for the first time or when a project is created through GEOPAK Project Manager. The file may be appended during the design process. All coordinate geometry elements are stored in this file. Multiple users can access this file at the same time, and only one file should be created for each project. The "###" is the only variable in this filename. It represents a GEOPAK project job number (up to three alphanumeric characters) which should unique to a project and is defined by the user upon creation (i.e. job101.gpk).

fname###.ioc File (Example: align999.ijd) - ASCII input file for loading data during a COGO session. "###" represents the job number and "oc" is the operator code (users initials). The user assigns the filename characters as indicated with the example where the job number is 999 and the user is John Doe (jd).

fname###.ooc File (Example: align999.ojd) - ASCII output file created by GEOPAK during a COGO session. The variables are the same as defined in the example above as assigned by the user.

fname.inp File (Example: desxs.inp) - Any ASCII input file for running GEOPAK processes. The name is user defined but always has an '.inp' extension.

fname.dat File - A binary file that contains string and point information to be used for digital terrain model construction. The name is user defined but always has a '.dat' extension.

fname.tin File - A binary file containing triangular surfaces also known as the digital terrain model (DTM). The name is user defined but always has a '.tin' extension.

Project-name.prj File - Binary file resulting from the creation of a new project.

fname.x File - ASCII input files that define criteria data as well as re-definable variable data.

The following is a list of files with a description of their contents generated when a user creates a run. These files are placed under the projdbs folder in the user's folder.

- **Project-name.002 File -** Resource file for running superelevation.
- **Project-name.003 File -** Resource file for running proposed cross sections.
- **Project-name.004 File -** Resource file for running earthwork.
- **Project-name.005 File -** Resource file for running cross section sheets.
- **Project-name.008 File -** Resource file for defining working alignment.
- **Project-name.009 File -** Resource file for running existing ground profile.
- **Project-name.010 File -** Resource file for running 3d modeling.
- **Project-name.011 File -** Resource file for drawing pattern lines.
- **Project-name.00a File -** Resource file for running vertical alignment.
- **Project-name.00b File -** Resource file for running plan/profile sheets.
- **Project-name.00c File -** Resource file for running limits of construction.
- **Project-name.00d File -** Resource file for running existing ground (DTM).
- **Project-name.00e File -** Resource file for running existing ground cross sections.
- **Project-name.00f File -** Resource file for running reports and cross section quantities.

Graphical Data: Graphical data will be in OpenRoads Designer or MicroStation Design File format. Additionally, all graphical data must conform to VDOT graphics file and CADD standards in accordance with VDOT's policies and manuals, (i.e., CADD Manual, Survey Manual, Road Design Manual and I&IM's.)

Digital Terrain Model Data: DTM data will be compiled by GEOPAK. The data files will represent the completed models with all required surfaces. Each surface will be triangulated. Completed models will consist of:

- All survey data base segments (points and discontinuity lines)
- All surface data bases (terrain, subterranean)
- All design data

5.2.5.2 OPENROADS DESIGNER AND OPENROADS FILES

OpenRoads DATA: MicroStation design files that contain civil data including alignments, profiles, terrain surface, civil cells, corridor models, final surfaces, and other geometry. In addition, the files could include other MicroStation elements used in creation of the corridor model for point controls or corridor references.

ITL: OpenRoads Template Libraries

XML: Output files that could contain alignments, profiles, DTM for terrain surface, final surfaces, and other geometry.

ICM: Output files (infrastructure consensus model) that is rich data exchange format using the Bentley i-model standard.

Please refer to IIM-LD-118 for additional information and guidance.

5.2.6 ELECTRONIC DATA DELIVERY & STORAGE

All electronic delivery items will be maintained in and provided to VDOT using VDOT's ProjectWise File Management System. See Chapter 2 for instructions on the use of ProjectWise.

5.2.7 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE SURVEY STAGE

5.2.7.1 DOCUMENT DATA

SURVEY BASELINE/CONTROL FILE:

Example: "sctl(UPC#).dgn" - This file contains the control data for the survey being conducted.

PLANIMETRIC FEATURES and UTILITIES:

Example: "s(UPC#).dgn" - MicroStation 2D file, to current VDOT standards in accordance with VDOT's policies and manuals, (i.e., CADD Manual, Survey Manual, Road Design Manual and I&IM's.)

DTM:

Example: "s(UPC#).tin" - GEOPAK "TIN" file. This file contains a completed triangulated surface database. It will also be embedded within the sdt(UPC#).dgn file.

5.2.8 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE PRELIMINARY FIELD INSPECTION REVIEW STAGE

See the Electronic Plan Submission Process for Preliminary Field Inspection Plans for instructions.

5.2.8.1 DESIGN DATA

- Baseline Alignments
- Construction Alignments (proposed)
- Grades
- Design Data Shapes - templates, side-slopes, medians (preliminary)
- Design Data Stations (preliminary)
- Earthwork Parameters (input data)
- Geometric Data
- Original Cross Sections
- Design Cross Sections

5.2.8.2 GRAPHICAL DATA

- Design Graphical Data File
- Plan Sheet (roll)
- Profile Sheet (roll)
- Cross Section Plot
- Plot File (roll)

5.2.8.3 DTM DATA

- NONE

5.2.8.4 TEXT FILES

- GEOPAK Quantities Report
- Design Data and Alignment Reports

5.2.9 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE PUBLIC HEARING STAGE

See the Electronic Plan Submission Process for Public Hearing Plans for instructions.

5.2.9.1 DESIGN DATA

- Baseline Alignments
- Construction Alignments
- Grades

- Design Data Shapes (templates, side-slopes, medians)
- Design Data Stations
- Earthwork Parameters
- Geometric Data
- Original Cross Sections
- Design Cross Sections

5.2.9.2 GRAPHICAL DATA
- Design Graphical Data File
- Plan Sheets
- Profile Sheets
- Cross Section Plot Sheets
- Entrance Sheets
- Drainage Design
- PDF Files (Title, Plan, Profile, Typical Sections, etc.)

5.2.9.3 DTM DATA
- GEOPAK Original Ground tin file
- Intermediate Surfaces
- Final Design Surface

5.2.9.4 TEXT FILES
- GEOPAK Design Cross Section Listing
- GEOPAK Quantities Report
- Design Data and Alignment Reports

5.2.9.5 SPREADSHEET DATA
- Hydrology/Hydraulics (as required)
- ROW Data Sheet

5.2.10 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE FIELD INSPECTION STAGE

See the Electronic Plan Submission Process for Field Inspection Plans for instructions.

5.2.10.1 DESIGN DATA
- Baseline Alignments
- Construction Alignments
- Grades

- Design Data Shapes (templates, side-slopes, medians)
- Design Data Stations
- Earthwork Parameters
- Geometric Data
- Original Cross Sections
- Design Cross Sections

5.2.10.2 GRAPHICAL DATA
- Design Graphical Data File
- Plan Sheets
- Profile Sheets
- Cross Section Plot Sheets
- Entrance Sheets
- Drainage Design
- PDF Files (Title, Plan, Profile, Typical Sections, etc.)

5.2.10.3 DTM DATA
- GEOPAK Original Ground tin file
- Intermediate Surfaces
- Final Design Surface

5.2.10.4 TEXT FILES
- GEOPAK Design Cross Section Listing
- GEOPAK Quantities Report
- Design Data and Alignment Reports

5.2.10.5 SPREADSHEET DATA
- Hydrology/Hydraulics (as required)
- ROW Data Sheet

5.2.11 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE RIGHT OF WAY ACQUISITION PLANS STAGE

See the Electronic Plan Submission Process for Right of Way Plans (Total-Takes or Partial-Takes, if applicable) for instructions.

5.2.11.1 DESIGN DATA
- Baseline Alignments
- Construction Alignments

- Grades
- Design Data Shapes (templates, side-slopes, medians)
- Design Data Stations
- Earthwork Parameters
- Geometric Data
- Original Cross Sections
- Design Cross Sections

5.2.11.2 GRAPHICAL DATA
- Design Graphical Data File
- Plan Sheets
- Profile Sheets
- Cross Section Plot Sheets
- Entrance Sheets
- Drainage Design
- PDF Files (Title, Plan, Profile, Typical Sections, etc.)

5.2.11.3 DTM DATA
- GEOPAK Original Ground tin file
- Intermediate Surfaces
- Final Design Surface

5.2.11.4 TEXT FILES
- GEOPAK Design Cross Section Listing
- GEOPAK Quantities Report
- Design Data and Alignment Reports

5.2.11.5 SPREADSHEET DATA

- Hydrology/Hydraulics (as required)
- Right of Way Data Sheet with metes and bounds on appropriate properties
- Areas of Take

5.2.12 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE COMPLETE ROAD CONSTRUCTION PLANS (PRE-ADVERTISEMENT CONFERENCE) STAGE

See the Electronic Plan Submission Process for Pre-Advertisement Conference Plans for instructions.

See the [Electronic Plan Submission Process for Plan Coordination Review Plans](#) for instructions.

5.2.12.1 DESIGN DATA

- Baseline Alignments
- Construction Alignments
- Grades
- Design Data Shapes (templates, side-slopes, medians)
- Design Data Stations
- Earthwork Parameters
- Geometric Data
- Original Cross Sections
- Design Cross Sections

5.2.12.2 GRAPHICAL DATA

- Design Graphical Data File
- Plan Sheets
- Profile Sheets
- Cross Section Plot Sheets
- Entrance Sheets
- Drainage Design
- Summary Sheets
- All Plans as Specified by the Contract
- PDF Files of complete plan assembly and cross sections

5.2.12.3 DTM DATA

- GEOPAK Original Ground tin file
- Intermediate Surfaces
- Final Design Surface

5.2.12.4 TEXT FILES

- GEOPAK Design Cross Section Listing
- GEOPAK Quantities Report
- Design Data and Alignment Reports

5.2.12.5 SPREADSHEET DATA

- Quantities
- Summary Sheets (as required)

5.2.13 OVERVIEW OF ELECTRONIC DATA REQUIRED AT THE COMPLETE ROAD CONSTRUCTION PLANS (ADVERTISEMENT SUBMISSION) STAGE

See the Electronic Plan Submission Process for Advertisement Submission Plans for instructions. All MicroStation and ORD files (and any associated files) must reside in this folder. These are the files that contractors will view or download during the advertisement process.

Additionally, see the Electronic Plan Submission Process for Pre-Award Revisions and the Electronic Plan Submission Process for Construction Revisions for instructions regarding changes made to the plans after the Advertisement Submission.

5.2.13.1 DESIGN DATA
- Baseline Alignments
- Construction Alignments
- Grades
- Design Data Shapes (templates, side-slopes, medians)
- Design Data Stations
- Earthwork Parameters
- Geometric Data
- Original Cross Sections
- Design Cross Sections

5.2.13.2 GRAPHICAL DATA
- Design Graphical Data File
- Plan Sheets
- Profile Sheets
- Cross Section Plot Sheets
- Entrance Sheets
- Drainage Design
- Summary Sheets
- All Plans as Specified by the Contract
- PDF Files of Complete Plan assembly and Cross Sections

5.2.13.3 DTM DATA
- GEOPAK Original Ground tin file
- Intermediate Surfaces
- Final Design Surface
- Construction Staking Data

5.2.13.4 TEXT FILES

- Alignment Listing
- Grade Listing
- Toe of Slope Listing
- Construction Stakeout Report
- Design Cross Section Listing

5.2.13.5 SPREADSHEET DATA

- Quantities
- Summary Sheets (as required)
- Index of Files

5.2.14 AVAILABILITY OF ELECTRONIC FILES TO CONTRACTORS

Electronic files are made available to contractors through CABB and the VDOT ProjectWise Web Server. These files can be viewed via the web page or copied down to the contractor's work stations. Instructions for contractor access to the electronic files are provided on VDOT's Construction Division Advertisement webpage.

- Link to [VDOT Construction Division Advertisement](#) webpage

The electronic PDF version of the plans as advertised becomes the official plan assembly and will be available through the ProjectWise Web Server and through the ProjectWise Plan File Room as discussed in Chapter 2. For instructions on creating PDF files, see Chapter 4.

The **project manager** is to ensure that the final electronic project files are made accessible through ProjectWise at the "Advertise Submission Stage" to the Scheduling and Contract Division. The following files in accordance with VDOT's Electronic Deliverable specifications as noted below and discussed above are required.

- MicroStation and ORD DGN Files
- Reports
- Index of Files
- PDF Files (located in the appropriate Plan File Room)
- OpenRoads/GEOPAK Files (when applicable)

The <u>project manager</u> or designee <u>must verify</u> that VDOT's project construction cost estimates (AASHTOWare Preconstruction Estimate, Spreadsheet Estimate, etc.) <u>have not</u> been included in the files made available to the contractor through the Plan File Room folders or the Advertised Submission folder in the Archives.

5.3 3D MODEL / BIM / CIM

5.3.1 AUTOMATED MACHINE GUIDANCE IN CONSTRUCTION

Three-Dimensional Design and modeling is intended to facilitate Automated Machine Guidance (AMG) in construction. Bentley's OpenRoads Designer and OpenRoads/GEOPAK software provide the 3D Design tools and are the Department's gateway to provide the necessary data for AMG. AMG technology can reduce time and cost of construction because it increases productivity by equipment operators, fewer grade checks are needed, it allows for greener construction (less fuel and equipment wear), it increases safety, less rework is required, and less survey staking is required. Contractors invest in AMG for safety, productivity, and to stay competitive.

The benefits of 3D Design and AMG are well documented on the Federal Highway Administration 3D Engineered Models webpage.

Some goals in providing the engineering and CADD data to the contractor are to encourage the use of AMG in construction and to facilitate more accurate bidding.

5.3.2 DESIGN LEVEL OF DETAIL (LOD)

For information about the required LOD, see the VDOT 3D Model Development Manual and the OpenRoads Designer webpage.

5.3.3 DELIVERABLE FORMAT

For information about deliverable format for 3D Model / BIM / CIM data on applicable projects, see the IIM-LD-118.