LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Pre-Construction & Construction Design Deliverables	NUMBER: IIM-LD-118.7
SPECIFIC SUBJECT: Software Requirements / Data Management and Exchange Requirements of Roadway Projects	DATE: July 21, 2021
	SUPERSEDES: IIM-LD-118.6
APPROVAL:	Susan H. Keen, P.E. State Location and Design Engineer Approved July 21, 2021

Changes are shaded.

CURRENT REVISION

- Added language specifying the Department's current standard CADD software packages to be utilized for project design and plans production and other minor revisions.

EFFECTIVE DATE

- Unless identified otherwise within this IIM, the information contained herein is effective upon receipt.

BACKGROUND

- Roadway Design and Plans Production shall utilize the Department's current standard CADD software packages: (PowerGEOPAK), which combined MicroStation/GEOPAK/OpenRoads technology and OpenRoads Designer (ORD), which combined Microstation/OpenRoads Connect. **All new projects with a scoping close date after October 1, 2020 are required to be designed in ORD, unless the schedule shows that the project will be advertised no later than December 2021.** The Department will provide software licenses. Software license requests are to be submitted using the LD-893 form.

- To increase uniformity and consistency of project and construction files, the CADD data and files must be developed in accordance with this IIM and the CADD Manual. The exchange of CADD Data and Electronic Plans must also be in accordance with this IIM and utilize ProjectWise.

- The utilization of OpenRoads technology shall be required for all Tier 1 and 2 construction and Tier 2 maintenance projects with minimum plans and above, where new survey was completed on or after January 1, 2016.

- Any Tier 1 Maintenance or State of Good Repair project, is not required to use OpenRoads unless requested by the Assistant District Administrator for Preliminary Engineering or Construction. Further discussion on the categorization of maintenance projects is provided in IIM-LD-249.

- Any exemption on the requirement to utilize OpenRoads technology shall be at the discretion of the State Location and Design Engineer. Exemptions could include projects such as major culvert replacements, hired equipment contractors, or HSIP.

- For projects not required to, or where exceptions have been granted, not to use OpenRoads technology, the current GEOPAK product shall be used where survey has been completed.

- OpenRoads technology is designed to remove technical barriers associated with 3D modeling. OpenRoads technology provides opportunities to improve the efficiency and effectiveness of the Department's plan development process by improving plan quality, decreasing design error, and making it easier for our customers and stakeholders to visualize project impacts.

- OpenRoads 3D modeling/visualization tools shall be used on any project where the Project Manager has deemed it necessary to show project concepts in three dimensions, or using graphical tools to the same effect, during public stakeholder meetings. These stakeholder meetings include project public hearings, project team meetings, six-year plan hearings, or SMART SCALE scoring sessions, etc.

  - For all projects using OpenRoads technology, the use of the 3D model should be discussed at Project Scoping.

  - The 3D model should be reviewed at appropriate project development milestones to ensure the intent of improving plan quality, easing project visualization, and decreasing design error is being achieved.

- Proper exchange of files for projects using the Department's current versions is essential to maintain design intent for construction consistency.

- The electronic files prepared in accordance with this IIM, as further discussed below, shall be provided by the Department through ProjectWise to any contracting entity that may wish to use them to prepare the project construction bid package. For roadway construction projects that use OpenRoads and are advertised after July 1, 2018, the 3D model developed during project design shall be provided to any bidding contractor at contract advertisement as a supplemental information source for the project construction. Given the 3D model is being provided as supplemental information, it is not required to be digitally signed.

- All other typical project documents currently provided, as further discussed below and in the CADD Manual, will continue to serve as the binding articles of the contract.

- Long Term Goals - By July 1, 2020, Construction Division will evaluate as to whether 3D models that are developed during project design will be an article in the contract documents.

DEFINITIONS

PDF Format: The Portable Document Format (.pdf) is an open standard for electronic document exchange.

LandXML Format: LandXML is a XML schema specifically designed to standardize the transfer of civil engineering and surveying data.

ASCII Text File Format: ASCII (American Standard Code for Information Interchange) is the most common format for text files. Text files stored in ASCII format are sometimes called ASCII files.

CADD Software: The Department's CADD software packages are PowerGEOPAK and ORD.

i-Model: i-Models are specialized containers used to exchange information for projects. They allow for information to flow easily, completely, and accurately between and within design and construction environments. All component information including properties, geometry, graphics, and relationships are provided in an open format.

ProjectWise Software: ProjectWise is an engineering project collaboration software designed for the AEC industries. It helps project teams to manage, share and distribute engineering project content.

FILE REQUIREMENTS AND DELIVERABLES AT CONSTRUCTION ADVERTISEMENT

---

1. The following files are required as part of the project development process, without exemption, for all projects currently under development:

    - **Complete Plan Assembly - <u>PDF</u> Files**
        - The PDF files are the Official Plan Assembly

    - **CADD Design Files - MicroStation <u>DGN</u> Files**
        - Un-segmented Bentley formatted files of Survey, Roadway, Drainage, ROW, Traffic, Utility, MOT, etc.
        - In addition, include all DGN files used to create the PDF Plan Set.

    - **Final Project Geometry – <u>LandXML</u> Files**
        - Include horizontal and vertical alignment data for each design corridor or cross section set represented in the final design and temporary roadway geometry for staged construction.
        - Files must include key points
        - Separate LandXML files are required for each alignment.

    - **Monument / Control Points – <u>CSV</u> File**
        - This file contains the horizontal and vertical control points in P, N, E, Z, D format. This file will contain both primary and secondary control points that were originally included in the traverse control for the project.

    - **Survey Report for Project Control – PDF File**
        - This file will contain the LD-200 cards for the primary project controls (Figure 10-F Survey Manual), the Location Survey Report (Section 2.01 Survey Manual), traverse and level loop raw/adjusted closures and items outlined in Section 10.06 of the Survey Manual.

    - **Project Index of Files – <u>HTML</u> or <u>XLS</u> File**
        - A uniform index of files must be provided to include all electronic files provided as part of the bid package and must include at a minimum; filename, sheet number if applicable, description, and all references files.
        - The preferred version of the index of files is provided in Chapter 8, Section 8.5 of the CADD Manual.

    - **Existing or Surveyed Surface – <u>LandXML</u> File**
        - The surface as it exists prior to construction or a construction phase when a project is multi-phased.

    - **Final Design Surface – <u>LandXML</u> Files**
        - The proposed design surface complete in all its parts. It may be contained in a single merged surface or in several component surfaces. The final design surface must be checked for accuracy prior to LandXML translation.
        - Files must include Key Points

- **i-Model – <u>ICM</u> File**
  - Include all engineering design data used to create the PDF Plan Set, 3D Model, and Cross sections.

Note: LandXML is the preferred format. Other formats can be provided upon request (e.g. ASCII files) from the contractor.

All required reports and supporting data as defined in the Roadway Design Manual, Traffic Manual, and Drainage Manual are to still be provided.

FILE MANAGEMENT and DATA EXCHANGE / PROJECT TEAM COLLABORATION

File Management, exchange, and project team collaboration for all project design and plans production shall utilize ProjectWise from Scoping through Advertisement Submission and Award of the project.

To establish ProjectWise access, a COV (Commonwealth of Virginia) domain account is needed for external users to access the system. Completion of the following forms ITD-36E & LD-899 is required. The Department will provide software licenses.

ProjectWise is the only repository for roadway projects during project development. It is a collaboration software used by the department to access and share design and project management files. Use of ProjectWise for all projects is essential to maintain file integrity and fully utilize all of ProjectWise capabilities. The practice of having working files on a local drive that are not connected to ProjectWise severely limits collaboration, and therefore, shall be avoided.

DOCUMENT MANAGEMENT SYSTEM BENEFITS

The following items demonstrate how proper use of ProjectWise can be a benefit to project development.

- Every time you check out or copy out a document, a copy of it is placed in your local working directory. Depending upon how user settings are configured, local copies of documents may remain in your working directory when you check files in. This improves performance, because delta file transfer will compare the local file to the one on the server and only transfer the changes.

- Checking out a document downloads a copy of it to your working directory and locks the document so that no other user can check out or export the document until you check it in or free it.

- If your editing application is integrated with ProjectWise Explorer, you can update your changes to the server from the editing application without closing or checking in the document.

- ProjectWise does not allow unauthorized users to overwrite documents.

- When existing ProjectWise projects are associated with CONNECTED projects you can go to the project's Project Portal in ProjectWise Explorer and access ProjectWise Connection Services including ProjectWise Project Performance Dashboards, ProjectWise Project Sharing, and ProjectWise Deliverables Management.

- ProjectWise allows for integration to other systems such as Project Pool and IPM, which allows for automated transfer of attributes.

- The Dependency Viewer tab shows any known dependencies of a selected document.
    - ProjectWise searches its database for any known dependencies of the selected document, and generates a temporary dependency map to show the document and all documents linked to it, with each document represented by a block.
    - Logical set (master file and its references), documents with link sets, or a flat document set (group of documents).

- Managed Workspaces is a methodology for managing VDOT workspaces in ProjectWise to match VDOT's CADD Standards. The Department can create and maintain their complete workspace configuration, workspace resources and standards in ProjectWise or ProjectWise Drive.