D6.01 General

This chapter defines the file organization structure, data formats, and delivery procedures for the electronic engineering data created during a highway design project. These standards are mandatory components of designing a WSDOT project. The designer is responsible for resolving all omissions, deficiencies, and errors in a timely manner to prevent any negative impacts on the construction project schedule.

D6.02 Data Organization

All electronic project files and data will be organized as defined in **Deliverables 3** and **4** of this manual.

D6.02(1) InRoads Project Spreadsheet

The InRoads Project Spreadsheet contains pertinent information on the various elements that make up the InRoads project. The InRoads Project spreadsheet is the guide to the project's contents, and provides information on how the various design feature components relate to one another.

The categories documented in the InRoads Project Spreadsheet are shown below. Specifics required for each general category can be seen in the InRoads Project Spreadsheet (see **Forms 4**).

- Project Information
- Monumentation information
- Geometry (ALG) information
- Surface (DTM) information
- Libraries (ITL, IRD) information
- Resource file (XIN) information

The InRoads project spreadsheet will be named *ID1234*_**InRoadsDesignDoc.xlsx** and will be stored in the **EngDataDesign_DesignEngDoc** project folder.

D6.02(2) Project Journal

The designer will create and maintain a project journal, which is used as a living document to record the project's design progress. The project journal will provide sufficient detail so that anyone reviewing the project can see the project's evolution.

The project journal shall include alternatives considered and the related data locations, documentation on data brought into the project, and details on major design decisions.

The purpose of the project journal is the recording of details related to the final design and the considered alternatives, so that anyone reviewing the project can understand the project's design methodology as it relates to the engineering data. Entries in the project journal should be as descriptive as possible. The project journal is created and maintained in the **EngDataDesign_DesignEngDoc** folder.

Below are a few examples of project journal file entries though not all potential types of entries are covered. If the designer is making an addition or revision that directly relates to the use of the final design data, it should be documented in the project journal file.

- Any modifications to the project-specific resource file
- Notation on the importation of any new datasets into the project, their sources and any manipulation of the source data (datum transformation, clipping, etc.) performed
- Any change in the project's datum or coordinate system
- General design philosophies used (for instance, it would be noted how the designer broke up the project up into design components and how the design components relate to one another for volume computations).

A Project Journal Template will be copied to the **EngDataDesign_DesignEngDoc** project folder at project creation. The copied template file will be renamed to *projID***InRoadsJournal.xlsx**. This file is automatically set up when the WSDOT Create Project Utility is utilized or the journal template file can be saved to the proper location and renamed manually.

D6.02(3) WSDOT Standard Resources

Designers will use the most current WSDOT resources for InRoads including feature styles, super tables, macros and roadway components.

WSDOT InRoads resources are automatically downloaded to all WSDOT computers connected to the network and are updated as needed.

The MicroStation working seed file for InRoads is located in the resource location that is appropriate to the Windows version, in the **…seed\InRoads3D.DGN** folder.

WSDOT provides consultants with a complete set of InRoads resource files in the form of libraries, tables, macros and configuration files. These files are available for download from WSDOT's CAE website at:

http://www.wsdot.wa.gov/design/cae

D6.02(4) Project-Specific Resources

The WSDOT CAE Create Project process automatically copies the necessary civil, geometry and survey preference files into the **EngDataDesign_Standards** folder, and renames them to include the project name. These copies are the project-specific resource files that need to be used during design, and archived with the project.

WSDOT provides tools and procedures that facilitate InRoads users in maintaining their project and user specific preferences, styles and symbologies and still keep current with standard WSDOT CAE preferences, styles and codes. Designers will use the tools and procedures that are documented on the WSDOT CAE website (http://www.wsdot.wa.gov/design/cae) to keep the WSDOT standard portions of the project specific resources in synch with the latest release of the WSDOT resource files each time the standard WSDOT files are updated.

All permanent project elements will have a feature style or geometry style assigned. Design elements should be assigned standard WSDOT feature styles, geometry styles, survey features names.

D6.02(5) Descriptions

InRoads commands for creating alignments, roadways, surfaces, templates, etc., include a description field. The designer will use these input fields to describe an element beyond what is required by the element naming conventions described later in this section. Descriptions can contain such information such as alignment references, DTM names, stations, dates, links to other files, etc.

D6.02(6) Project Datum

Per the *WSDOT Highway Survey Manual*, a project datum should always be calculated and used for WSDOT data.

Project datum calculations will be completed per the methodology defined in Chapter 6 of the WSDOT *Highway Survey Manual*. The project datum may be calculated by the designer or the surveyor depending on the project requirements. Where multiple combined factors are required, a map of the project datum areas will be provided and (if necessary) impacted control must be documented. The method and decision path of determining project datum coordinates for impacted control must be included in the documentation.

The State Plane to Project Datum conversion report should be in a universally readable format. ASCII Text, Microsoft Excel, or Word files are acceptable formats. This report will be stored in the project network file structure in the **Survey_SurveyDoc** folder

The report should use a projID_description naming convention.

Example: L1234_State Plane to Project Datum.rpt

D6.02(7) Project Monumentation

Monumentation maps that are applicable to the survey/project limits will be provided by the designer or collected by the surveyor. This documentation will be included in the final project documentation package in the **_SurveyDoc** folder of the project directory structure

Monument documentation must include source documentation such as WSDOT Monument Database Report of Survey sheets or county reports of survey documentation. These documents must indicate the monument designation, latitude and longitude coordinates, current legal State Plane Coordinate (SPC) system coordinates (NAD 83/91), current North American Vertical Datum (NAVD 88) elevation (if measured), method of collection, accuracy, units, and scale. An index file listing each document and its source and contact information is required.

Monumentation documentation will remain in its original format and retain its original name as provided by the source. Monumentation maps may be scanned and the electronic scan treated as the source. PDF is the preferred format for scanned monumentation maps though JPG and TIF files are also acceptable.

D6.03 Requirements for Specific Data Types

There are many InRoads database elements and files required to complete the design project. Those that have specific requirements are detailed throughout this section.

D6.03(1) Survey Data

Surveyed data is assigned InRoads feature styles by virtue of the translation process between field survey feature codes and InRoads civil configuration settings.

All features for survey and mapping will be standard as per the WSDOT feature table. The proper assignment of feature will ensure that the ground attribute, color, level, weight, cell, and style will be correct throughout the design process.

The surveyor and designer will make full use of the description field if additional information is needed to describe the element beyond what is required by the naming convention.

D6.03(2) Geometry Elements

Geometry elements in InRoads shall be stored in an ALG file using the project name. Individual alignments may be set Read-Write or Read-Only for the purpose of file sharing, but all alignments should be set to Read-Write before delivery. In exceptional cases where more than one project ALG file is necessary, a description shall be appended to the project name. All geometry elements shall be properly documented in the InRoads Project Spreadsheet.

Horizontal Alignment Geometry

InRoads horizontal alignments will have names that match those used within the contract drawings wherever possible. This will be in the form of the horizontal alignment name followed by an optional description. The following standards encourage ideal search and filtering options.

Alternate alignments are not intended as deliverables and should be designated specifically with the characters "_Alt" and the alternate's number.

Examples:

LL – LL Line

LL_Alt2 – Alternate 2 LL Line

LM_Centerline – LM Line

HighPtRd – Highpoint Road

Horizontal Alignment COGO Elements – Points, Curves, Spirals, SCSs

Point names in the Cogo Buffer are ideally numeric only, due to some special characters that InRoads uses to edit alignments. InRoads contains a specialized command that allows alpha-numeric point names, and these can be used with the proper setup and syntax.

Ditch Geometry

Alignments that control ditches will have the prefix of the related horizontal alignment followed by the characters "Ditch". An odd number would indicate a ditch to the left of the alignment and an even number indicates a ditch to the right.

Examples:

BLine_Ditch1 – First ditch on the left of the B Line

Either: **LR_Ditch3** – Second ditch on the left of LR Line

Or: **LR_Alt1_Ditch3** – Second ditch on the left of LR Line Alternative 1

Wall Geometry

Alignments that control walls will be named in one of two ways: **Wall#_Desc** or **Centerline_Wall**.

Examples:

Wall1_Workingline – Working line of first wall on the left side of the project corridor

LR_Wall2 – First incidental wall on the right side of the alignment

Offset Geometry Alignments

Geometry related to the alignment, including all horizontal controlling alignments used in the compilation of the final template will have the same prefix as the alignment and a descriptive component (often the standard field code or an abbreviation of the feature style name is used). This allows for ideal corridor geometry filtering for data management.

Though not a strict standard, it is useful to number the alignments so that odd numbers are on the left and even numbers are on the right, ideally in increasing order as you move out from the alignment itself. "Lt" and "Rt" designators are also acceptable.

Examples of controlling and offset alignment names:

LL – Controlling alignment

LL_ELNew1 or **LL_EdgeLineNew1** – First left edge line new

LL_LLNew2 or **LL_LaneLineNew2** – Second right lane line new

LL_LLNew3 or **LL_LaneLineNew3** – Second left lane line new

LL_LLNew_Rt or **LL_LaneLineNew_Rt** – Right lane line new

LL_ETWNew1 or **LL_EdTravWayNew1** – Left edge of traveled way new

LL_ETWNew2 or **LL_EdTravWayNew2** – Right edge of traveled way new

LL_EPSNew_Lt or **LL_EdPavShldNew_Lt** – Left shoulder paved edge new

Right of Way Geometry

The basic naming convention for new right of way geometry is to prefix the geometry name with "RW." An odd number indicates an alignment left of the controlling alignment and an even number indicates one to the right. The designer should make full use of the description field if additional information is needed to describe the element beyond what is required by the naming convention.

D6.03(3) Superelevation

The superelevation is a process of the InRoads Roadway Designer and is associated with a corridor. The superelevation naming convention is to use the name of the primary alignment that is the geometric control for the corridor.

If more than one superelevation design is needed for a horizontal alignment, an underscore character followed by descriptive information should be appended to the controlling alignment name, which will be the corridor name in the Roadway Designer.

D6.03(4) Vertical Alignments

If there is only one vertical alignment associated with a horizontal alignment, it should have the same name as the parent horizontal alignment. When there are multiple alignments associated with a horizontal alignment, the vertical alignments should have an underscore character followed by descriptive information appended to the controlling alignment name.

Examples: for multiple vertical alignments associated with horizontal alignment **LL1**

LL1_DesignSpeed60 – Profile with sight distances calculated for 60 mph

LL1_DesignSpeed50 – Profile with sight distances calculated for 50 mph

D6.03(5) Design Templates

Template Libraries

A single design template library deliverable must contain all of the templates necessary for the project design. Although multiple libraries may be used during the design phase, the final template library will be a collection of each designer's templates, components, and end conditions.

The InRoads template library format is *.ITL and the basic naming convention for this template type is the project name as the prefix. Each template folder category within the library has a descriptive name that indicates the component type (lane, sidewalk, structures, etc.) or end condition.

The InRoads Roadway Designer shall be processed with the final deliverable files, all alignment or stationing issues (red and blue text) resolved and templates synchronized. The design corridors shall be fully functional in the roadway designer and capable of producing the delivered surfaces.

Roadway Design Libraries

The InRoads roadway design library uses the *.IRD file format for specifying roadway corridors and superelevation specifications. The file naming convention for this library is to use the project identifier as the prefix and a concise description of the intended use (e.g. **XL1234_Roadways**, **XL1234_Walls**, **XL1234_I405-SR522IC**, etc.).

D6.03(6) DTM Surfaces

Documentation for DTM surfaces

Documentation for DTM surfaces will be stored in the **EngDataDesign_DesignEngDoc** folder. The InRoads Project Documentation spreadsheet contains a tab for documenting the surfaces in the InRoads project. All steps necessary to recreate the existing surface from the original data sets will be documented in this file or in separate narrative files. The documentation will include which datasets were used, any transformations necessary and any edits done in design to the original survey data. Merged design surfaces will be documented in the same manner.

Existing Ground Surface

The DTM surface that best models the existing condition for the project will include the name **EXIST** (e.g., P1234_Existing.dtm). Other existing surface models will have descriptive names prepended with "EX."

Finish Surfaces

The DTM surface that best models the finished condition for the project will include the name FIN. Other finished surface models will start with the characters "F." Finished surface layers that are generated by the InRoads Roadway Modeler will include the alignment name, followed by the layer name.

Examples:

LL1_FIN.dtm

LL1_SUBG.dtm

LL1_CSTC.dtm

Other Surfaces

Names of surfaces created for work with staged construction, ponds or other project features will be descriptive and will tie the surface to the design element they represent in the plan set.

D6.03(7) Cross Sections

Existing and finish ground cross sections will be created in a special design file named *projID*_**xsc.dgn** with each cross section set labeled. Standard WSDOT cross section preferences should be used. The naming convention for the InRoads custom cross section set text file is **P1234_ALname.xsc**. The cross section DGN and XSC files are placed in the project's **\...\EngDataDesign_Deliverables** folder.

D6.03(8) Report Files

The **Reports** folder will include:

- End-area volumes
- XML alignment reports
- Superelevation transition reports
- Other text reports that describe geometry or surface elements generated during the design process

Designers should use descriptive names that relate directly to the design function performed and the data being used when creating other design-related report files.

D6.03(9) DGN Design Files

Designers will create a DGN of the final design to graphically document the finished product and make design element retrieval and viewing easier. This practice provides anyone reviewing the data with an easy method to view all design elements related to different components of the final design.

D6.03(10) RWK Files

Designers will maintain up-to-date project listing files and file paths in the form of RWK files. The RWK files point the InRoads program to the physical location of the project files, including surfaces, typical section libraries, coordinate geometry projects, roadway libraries and preference files. The RWK files shared between design groups can reference the specific file names only and do not need to include the full path if the referenced files are in the same project folder.

D6.04 Project Closure and Transition

The following requirements will apply after the designer has prepared all the appropriate electronic information for an InRoads design package as described in **Deliverables 6.02**.

D6.04(1) Project Cleanup

The final data set contains the InRoads design data and all supporting information necessary for the customer and/or future designers to understand and use the data in InRoads. All data not necessary for construction of the project or of use to future designers should be deleted. The resulting dataset should contain only the data necessary for the final project design.

To ensure the quality of the engineering data, the following InRoads utilities should be used on the InRoads project prior to compiling the Design and Construction archives.

- The InRoads *Remove User Data* application add-in removes the GUID that InRoads assigns to the alignment when that element is copied from another alignment. This tool makes the alignment and all copies derived from it into simple graphics.
- The *Geometry Utilities Assign Names* command cleans up the COGO Buffer by deleting extraneous points and ensuring that each point is assigned. This tool also checks for coincident or duplicate points.
- The *Check Integrity* commands check horizontal and vertical elements identifying and fixing discontinuities, non-tangencies, transposition, mismatched radii and other issues relating to the geometric integrity.
- The *Compress Surface* command removes points that are marked as deleted in the surface model, which reduces the size of the model on disk and in memory.

D6.04(2) Preparation of Construction Deliverable

Upon completion of the design process, the construction deliverable will be prepared and placed in the ***projID*\EngDataDesign_Deliverables** folder. This deliverable is a subset of the EngDataDesign data, and contains only the information that is needed by the construction office. Generally, this subset is prepared by copying the entire dataset and then removing all data related to considered (but not selected) alternates, to permit applications, or to any other data not specifically needed for the construction of the project.

D6.04(3) Archival of Design Data

The entire ***projID*\EngDataDesign** folder will be archived according to regional archive policies. Archiving the entire folder ensures that all files pertaining to the final design - including all alternatives considered and a snapshot of the file set delivered to construction - are preserved and available for a future designer.

D6.04(4) Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in **Deliverables 2**.

Delivery will be accomplished by providing the customer access to the project folder if both the designer and the customer share a network resource that allows them both to reference the same folder structure. Access to the entire project folder is necessary when transferring interrelated survey, design and CAD data sets. However, if the InRoads design data is independent of other project data relating to CAD and survey, then access to just the **EngDataDesign** subfolder is sufficient.

If a shared network location is not an option, the designer will provide the customer with a copy of the final data. This can be accomplished using any medium that can reliably contain the entire folder structure to be transferred (e.g., an e-mail, an FTP site, a compact disk, portable flash drive or a DVD).

D6.04(5) Data Archival

On projects where the designer is internal to WSDOT, it is the designer who is responsible for archival of the final electronic design data per the region's policy for archival of electronic project data. When an external supplier is providing data to WSDOT, it is the WSDOT customer who is responsible for archival of the final electronic data per the region's policy.

If no regional archival policy exists, the responsible party needs to ensure the data is appropriately archived for future reference.