

6 Roadway Design

Section 6 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.

WSDOT is currently transitioning to InRoads for new highway design projects. There is separate guidance for InRoads and legacy software, CAiCE (which is planned to be phased out of use).

6.1 InRoads Design Data

6.1.1 Data Organization

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

6.1.2 General Requirements

6.1.2.1 InRoads Project Name

Project names shall be limited to eight characters and shall contain no symbols or spaces.

6.1.2.2 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 Section 8.7).

- Project Information
- Monumentation information
- Geometry (.alg) Information
- Surface (.dtm) Information
- Libraries (.tml, .rwl) Information
- Resource file (.ini /.xin) Information

The InRoads project spreadsheet will be named ***projname_InRoads.xls*** and will be stored in the **Design/DesignDocumentation** project folder

6.1.2.3 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 **Design/DesignDocumentation** 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 INI 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 (see Section 8.5) will be copied to the **Design/DesignDocumentation** project folder at project creation. The copied template file will be renamed to *projnameInRoadsJournal.xls*. 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.

6.1.2.4 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.

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/eesc/cae/resources>

6.1.2.5 Project-Specific Resources

The WSDOT Create Project process automatically copies the necessary civil, geometry and survey preference files into the **Design\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 a configuration file comparison utility (*cae_rsc\inroads\utilities\IPFSynch.exe*) that allows InRoads users to maintain their project and user specific preferences, styles and symbologies and still keep current with standard WSDOT CAE preferences, styles and codes. Designers will use this tool 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 and transition control names.

6.1.2.6 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.

6.1.2.7 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 the *WSDOT Highway Survey Manual*, Chapter 6. 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 are acceptable formats. This report will be stored in the project network file structure in **Survey/SurveyDocumentation**.

The report should use a projname_description naming convention.

Example: **L1234_State Plane to Project Datum.rpt**

6.1.2.8 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 **.SurveyDocumentation** 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.

6.1.3 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.

6.1.3.1 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.

6.1.3.2 Geometry Elements

Horizontal Alignment Geometry

InRoads horizontal alignments will have names that match those used within the contract drawings wherever possible. This will ensure consistency between InRoads designs and the resulting contract drawings.

Alternate alignments will have the appropriate prefix followed by the characters “_A” and the alternate’s number.

Examples:

LL – LL Line

LL_A2 – Alternate 2 LL Line

LM – LM Line

HPRoad – Highpoint Road

Horizontal Alignment COGO Elements – Points, Curves, Spirals, Spiral Curve Spirals

Point names in the COGO Buffer should be numeric only, due to some special characters that InRoads uses to edit alignments.

Ditch Geometry

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

Example:

BLN_D1 – First ditch used in the design of the B-Line

LR_D3 – Third ditch used in the design of Alternate 1 of the LR Line

Wall Geometry

Alignments that control walls will have the prefix of the related horizontal alignment followed by the character “_W.” An odd number indicates a wall to the left of the alignment and an even number indicates a wall to the right.

Examples:

BLN_W1 – First wall used in the design of the B-Line

LR_W3 – Third wall used in the design of Alternate 1 of the LR Line

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 an abbreviation of the feature style name is used). Though not a strict standard, it is useful to number the alignments so that odd stations are on the left and even stations are on the right, ideally in increasing order as you move out from the alignment itself.

Examples of Controlling and Offset alignment names:

LL – Controlling alignment

LL_LEN1 or **LL_LaneEdNew1** – Left lane edge new

LL_LEN2 or **LL_LaneEdNew2** – Right lane edge new

LL_LEN3 or **LL_LaneEdNew3** – Left second lane edge new

LL_LEN4 or **LL_LaneEdNew4** – Right second lane edge new

LL_ETWN1 or **LL_EdTravWayNew1** – Left edge of traveled way new

L_ETWN2 or **LL_EdTravWayNew2** – Right edge of traveled way new

LL_SPEN1 or **LL_ShldPavEdNew1** – Left shoulder paved edge new

Right of Way Geometry

The basic naming convention for proposed 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.

6.1.3.3 Superelevation

In InRoads version 8.5, the superelevation is a child of the horizontal alignment. The basic superelevation naming convention is to use the name of the controlling alignment name.

In InRoads version 8.7, the superelevation is a process of the 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.

For both versions, if more than one superelevation design is needed for a horizontal alignment, an underbar character followed by descriptive information should be appended to the controlling alignment name.

6.1.3.4 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 underbar 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

6.1.3.5 Design Templates

Template Libraries

During the design phase, multiple template libraries may be utilized, but the final design template library must contain all templates needed for the design of the project. The final template library will be a compilation of each designer's templates, cut/fill tables and decision tables.

In InRoads version 8.5 and earlier, this template library is in the form of a *.TML file. The basic naming convention for a design template file is *projname_Design.tml*. Each template within the library has a descriptive name that indicates the alignment and type of template. Alignment-specific templates should have the alignment included in the name.

In InRoads version 8.7 and higher, the 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.

Roadway Definitions

The roadway definition file (RWL) contains specific horizontal and vertical definitions including station ranges, templates, end conditions, vertical and horizontal control elements. Each entry in the RWL file should be named appropriately and descriptively to be able to recreate the design. The roadway definitions will include the alignment name, types and station ranges where unique roadway definitions are required. This roadway definition library is used in InRoads version 8.5 and lower.

In InRoads version 8.7 and higher, the roadway definition is an element of the roadway design, and uses the *.IRD file format for specifying roadway corridors and superelevation specifications. The file naming convention for this library is to use the controlling alignment name as the prefix and the expected surface model (e.g., *AlignName_Finish.ird*).

6.1.3.6 DTM Surfaces

Documentation for DTM surfaces

Documentation for DTM surfaces will be stored in the **Design\DesignDocumentation** folder. The InRoads Project Documentation spreadsheet (see Section 8.7) 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.

Existing Ground Surface

The DTM surface that best models the existing condition for the project will include the name EXIST (e.g., *P1234_FinalExisting.dtm*). Other existing surface models will have descriptive names prepended with "EX." Models that are the result of merged surfaces will have descriptive names prepended with "MERGE."

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.

6.1.3.7 Cross Sections

Existing and finish ground cross sections will be created in a special design file named *projname_xsc.dgn*. Standard WSDOT cross section preferences should be used. The naming convention for the InRoads custom cross section set text file is *P1234_ALname.xsc*.

6.1.3.8 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.

6.1.3.9 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.

6.1.3.10 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.

6.1.4 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 Section 6.1.

6.1.4.1 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.

6.1.4.2 Preparation of Archives Subfolder

The following must be provided in the **DESIGNARCHIVES** folder:

- Completed InRoads Designer Checklist (for form template and sample, see Section 8.8)
- PostDesign Archive – This archive file should include the final design and all alternatives considered in the design process. It should contain all of the files necessary for a future designer to understand the design and to edit it if necessary. This normally is achieved by including the project's Design folder in its entirety. The PostDesign Archive's name is prefixed with the project name and appended with "_INROADS_POSTDESIGN."
- ForConstruction Archive – This archive is a subset of the PostDesign Archive. It contains only the information from the PostDesign Archive that is needed by the construction office. Generally, this means removing all data relating to considered (but not selected) alternates, to permit applications, or to any other data not specifically needed in the construction of the project. The Construction Archive's name is prefixed with the project name and appended with "_INROADS_FORCONSTRUCTION." The unzipped InRoads project data should be identical to the Construction Archive's contents at the time of turnover to construction.

6.1.4.3 Delivery of Final Package

General requirements for the transfer, review and acceptance of the data are detailed in Section 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 CADD data sets. However, if the InRoads design data is independent of other project data relating to CADD and survey, then access to just the Design 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, or a DVD).

6.1.4.4 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.

6.2 CAiCE Design Data

6.2.1 Data Organization

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

6.2.2 General Requirements

6.2.2.1 CAiCE Project Spreadsheet

The CAiCE Project Spreadsheet contains all pertinent information regarding the various database elements that make up a CAiCE project. The CAiCE Project Spreadsheet is the guide to what is in the project, how the various pieces relate to one another, and what the necessary components are for any given design feature.

The major categories of design elements to be documented in the project spreadsheet are shown below. Specifics required for each general category can be seen in the sample CAiCE Project Spreadsheet (see Section 8.4).

- Project Information
- Monumentation Information
- Alignments
- Drainage
- Structures
- Survey Segments
- Surfaces

The CAiCE project spreadsheet will be named **projname_CAiCE.xls** and will be stored in the **Design/DesignDocumentation** project folder

6.2.2.2 Project Journal

The designer will create and maintain a project journal which is a living document to record the project's design progress. The project journal will provide sufficient detail so that anyone reviewing it 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 **Design/DesignDocumentation** folder.

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. Below are a few examples of project journal file entries though not all potential types of entries are covered.

- The creation of a project-specific feature table, its file name, and any subsequent modifications
- The creation of project-specific zones and their uses
- The importation of any new datasets into the project, their sources, and any manipulation of the data done for use with the project
- 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 (see Section 8.5) will be copied to the **Design/DesignDocumentation** project folder at project creation. The copied template file will be renamed to *projnameKCJournal.xls*. 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.

6.2.2.3 WSDOT Standard Resources

Designers will use the most current WSDOT resources for CAiCE including feature tables, super tables, macros, and roadway fragments.

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

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

<http://www.wsdot.wa.gov/eesc/cae/>

6.2.2.4 Project-Specific Feature Table

The current WSDOT feature table will be copied to the *caice_proj\STANDARDS* folder for use in the CAiCE project. After copying the file, the designer shall rename the table to match the project name.

Example:

Design\L1234\Standards\L1234.ftb – CAiCE project L1234's feature table

All permanent project elements will have a feature assigned. Whenever possible, a feature from the standard WSDOT features will be used. If a project-specific or other nonstandard feature is needed, it will be added to the project feature table and documented in the CAiCE Project Spreadsheet (See Section 8.4).

6.2.2.5 Zone Designations

CAiCE zones are a method of segregating data within a design project. Zones can be set up to facilitate the selection of information for viewing, editing, reporting, etc.

Survey data will automatically be assigned the WSDOT standard survey codes as defined in the feature table. Use of zones with the design data will be determined by the engineer and documented in the Project Database Spreadsheet. Possible scenarios for zone use in design include:

- Classifying data by function using WSDOT Standard Zones. Example: Zone 40 is Drainage, so designer may want to use 41 for proposed ditches, 42 for proposed culverts, and so on.
- Classifying data by design element. Example: All elements related to WALL 1 have Zone 101, elements related to WALL 2 have Zone 102, and so on.
- Classifying data by designer to make multidesigner project collaboration easier. When more than one designer is working on the same project, it may make combining data easier if each designer uses a distinct zone identifier. Naturally, rules would also need to be created that would ensure there was overwriting of data.

The zone schema used and the rationale behind it will be documented in the CAiCE Project Spreadsheet.

6.2.2.6 Descriptions

Most of the CAiCE commands that create database elements provide an input field for a description that will be associated with that element. The designer will use these input fields if additional information is needed to describe an element beyond what is required by the element-naming conventions described later in this document. Descriptions can contain information such as alignment references, DTM names, stations, dates, and links to other files.

6.2.2.7 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 the WSDOT *Highway Survey Manual*, Chapter 6. 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 are acceptable formats. This report will be stored in the project network file structure in **Survey/SurveyDocumentation**.

The report should use a projname_description naming convention.

Example:

L1234_State Plane to Project Datum.rpt

6.2.2.8 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 **SurveyDocumentation** 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.

6.2.3 Requirements for Specific Data Types

There are many CAiCE database elements and files required to complete the design project. Those that have specific requirements are detailed throughout Section 6.2.3.

6.2.3.1 Survey Points and Chains

Survey database elements are automatically assigned prefixes that are the same as the feature code when importing the survey data with standard WSDOT procedures.

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

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

6.2.3.2 Photogrammetry Points and Chains

Photogrammetry database elements can be imported into CAiCE so that the feature is used as the prefix, or so that all photogrammetry elements have the prefix **PH**. The translation table used in the import process controls this option. For large photogrammetry imports, it is recommended to use the PH prefix for all elements so that the data is easily selectable and project prefixes aren't fragmented.

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

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

6.2.3.3 Geometry Chains

Horizontal Alignment Geometry Chains

CAiCE horizontal alignments will have names that match those used within the contract drawings whenever possible. This will ensure consistency between CAiCE designs and the resulting contract drawings.

A CAiCE horizontal alignment geometry chain has a 10-character limit. Working within this limit, designers will follow these naming conventions:

- Final roadway alignments will have a three character prefix that identifies the alignment. The prefixes used for each alignment will be documented in the CAiCE Project Spreadsheet (see Section 8.4).
- Alternate alignments will have the appropriate prefix appended with the character "A."
- For final alignments, the number portion of the name will always be 1. The number portion of alternate alignments will correspond to the alternate number.

Examples:

LL1 – LL Line

LLA1 – Alternate 1 LL Line

LLA2 – Alternate 2 LL Line

LM1 – LM Line

BLN1 – B-Line

HP1 – Highpoint Road

Horizontal Alignment Elements – Points, Curves, Spirals, Spiral Curve Spirals

Alignment elements will have the same prefix as the alignment of which they are a part.

Ditch Geometry Chains

Alignment chains that control ditches will have the prefix of the related horizontal alignment followed by the character "D." An odd number indicates a ditch to the left of the alignment and an even number indicates a ditch to the right.

Examples:

BLN1W1 – First wall used in the design of the B-Line

LR1W3 – Third wall used in the design of Alternate 1 of the LR Line

Wall Geometry Chains

Alignment chains that control walls will have the prefix of the related horizontal alignment followed by the character "W." An odd number indicates a wall to the left of the alignment and an even number indicates a wall to the right.

Examples:

BLN1W1 - First wall used in the design of the B-Line

LR1W3 - Third wall used in the design of Alternate 1 of the LR Line

Fragment Hook Chains Related to Alignments

Geometry chains related to the alignment, including all hook chains used in the compilation of the final endarea file will have the same prefix as the alignment. Though not a strict standard, it is useful to number the chains so that odd stations are on the left and even stations are on the right, ideally in increasing order as you move out from the alignment itself.

Right of Way Geometry Chains

The basic naming convention for proposed right of way geometry chains is to prefix the geometry chain name with "ROWP." An odd number indicates a chain left of the controlling alignment and an even number indicates one to the right. The designer assigns the geometry chain a feature of ROWP. 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 element-naming convention.

6.2.3.4 Superelevation Lines

The basic superelevation line element-naming convention is to append the alignment name with "E." Superelevation lines will always start at 1.

Example:

LL1E1 through **LL1Exxx** – Supers for LL Line

6.2.3.5 Profiles

Each profile used in the final design will have its own grid settings stored in the project. Grids will be set up near but not overlap the project data and will not overlap one another.

The basic CAiCE **terrain profile** file naming convention is to make the file name the same as the horizontal alignment name with an indication of what DTM was used.

Example:

L1A1EXIST – Terrain profile of LL1 alignment and EXIST DTM

The basic CAiCE **design profile** element-naming convention is to prefix the name with the horizontal alignment name as described earlier in this section and append the prefix with the design profile alternative indicator.

Examples:

LL1A1P1 – First profile for alternate 1 of LL1 alignment

LL1A1P2 – Second profile for alternate 1 of LL1 alignment

6.2.3.6 Temporary Design Elements

The prefixes TEMP and KC will be reserved for temporary or trial elements. Elements that have these prefixes should be renamed before acceptance into the final database.

6.2.3.7 Other Design Database Elements

Outside of the requirements above, there are no set standards for what prefixes to use on design data, provided that the total number of characters used in the database element's name is nine or less.

6.2.3.8 Existing Ground Cross Sections

Scanlines

For final alignments, cross section scanlines are created for all stations required for construction as follows:

- All roadway width change stations
- All superelevation change stations
- All roadway template change stations (surface depths, ditch widths, slopes, etc.)
- Any odd cut and fill zero stations that have been generated and used by the designer in the calculation of final design volumes not entered as exception stations using the Advanced Endarea Volumes command
- All abrupt stations for cutoffs
- All structure stations (bridge abutments, retaining walls, subdrains, guardrail, barrier etc.)
- All high and low point break stations

- All intersection stations (curb returns, abrupt stations for cutoffs, etc.)
- Any other miscellaneous odd stations generated and used by the designer in the calculation of final design volumes

The basic scanline element-naming convention is to append the alignment name with “X.” Scanline will always start at 1.

Example:

LL1X1 through **LL1X1xxx** – Scanlines for LL Line

Odd Station Text File

For each final alignment, the designer creates and maintains an odd station text file that identifies stations that fall outside the even station interval used when generating the cross section scanlines.

The file naming convention for this file is to prefix the file name with the name of the associated horizontal alignment and “PLUS_STATIONS.”

Example:

LLA1_PLUS_STATIONS.LIS – LL1A1 odd station list

Existing Condition Cross Section EAR Files

Existing Condition cross section EAR files contain cross sections at all stations required for construction, as detailed earlier in this section.

The basic naming convention for creating a base cross section EAR File is to prefix the EAR file name with the horizontal alignment name and the DTM name(s) with multiple names separated by dashes.

Examples:

LL1A1_EXIST.EAR – Horiz. Align: LL1A1, Surface used EXIST

LR1_EXIST-SUB1.EAR – Horiz. Align: LR1, Surfaces used EXIST and SUB1

6.2.3.9 Design Cross Sections

EAR Files

Final design cross section EAR files contain cross sections at all stations required for construction as detailed earlier in this section. Standard WSDOT fragments will be used in compiling all finished endarea files.

The basic naming convention for creating a design cross section EAR File is to prefix the EAR File name with the profile name (which also indicates the horizontal alignment) used in the endarea. The name ends with a description if additional information is needed to describe the file’s contents.

Examples:

LL1A1P1_EXIST_STAGE1.EAR – Input file: LL1A1Exist, Horiz Align: LL1A1, Vert. Prof: LL1A1P1, Output Desc: Stage1 cross sections

LR1P2_EXIST-SUB1_FINISH.EAR – Input file: LR1_EXIST-SUB1, Horiz Align: LR1, Vert. Prof: LR1P2, Output Desc: Finished cross sections.

Surface Names

The basic design endarea surface naming conventions are defined by WSDOT’s standard fragment input parameter defaults. Renaming the design cross section surfaces by changing fragment input parameter defaults will only be done if there are legitimate design requirements necessitating deviation from WSDOT standard conventions.

If a designer deviates from the standard defaults, the design cross section surface names will be descriptive, have a maximum of seven characters, and will be added as new line features into the project feature table.

Fragment Hook Chains

WSDOT design fragments provide the capability to define roadway widths and the location of design items such as walls and ditches using longitudinal geometry chains. This functionality will be used to define roadway edges and tapers where there is variation in roadway width.

Fragment hook chains will have the same prefix as the controlling alignment with an odd number indicating a chain to the left and an even number indicating a chain to the right.

Fragment Hook Profiles

WSDOT design fragments provide the capability to define specific elevations in endarea files using a longitudinal profile. Examples of where such profiles may be useful:

- Profile to control the depth of ditches in cut
- Profile to control the elevation of berms in cut and fill

Fragment hook profile names will be prefixed with the controlling horizontal alignment's name, followed by the character "P" and then the profile number.

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

Design Template VRD Files

The basic design template VRD file-naming convention is the name of the endarea file for which the template was developed, followed by the beginning station of the station range for which the template is to be applied. The examples below indicate two templates for the LL1A1P1_EXIST_STAGE1.EAR file. The first template is for the station range 113+00 to the last station before 115+25 in the original ground EAR file. The second entry indicates a template to be applied at station 115+25 to either the end of the construction or to the station indicated in the next VRD file for that EAR file.

Examples:

LL1A1P1_EXIST_STAGE1_11300.VRD

LL1A1P1_EXIST_STAGE1_11525.VRD

Design VRS Files

The basic design VRS file-naming convention is to give the VRS file the same name as the endarea file with which it is associated. There must be a VRS file to recreate every finished EAR file in the final design.

Design Earthwork Classification Table Files

The basic design earthwork classification table file naming convention is to name the table the same as the endarea file for which it was created followed by a description of the type of table.

Examples:

LL1A1P1_EXIST_STAGE1_EW.TBL – Cut/fill table for LL1A1P1_STAGE1.EAR

LL1A1P1_EXIST_STAGE1_SURF.TBL – Surfacing table for LL1A1P1_STAGE1.EAR

6.2.3.10 DTM Surfaces

Documentation for DTM Surfaces

Documentation for DTM surfaces will be stored in the **Design\DesignDocumentation** folder. The CAiCE Project Documentation spreadsheet (see Section 8.4) contains a tab for documenting the surfaces in the CAiCE project. All the steps necessary to recreate the existing surface from the original data sets will be documented in this file including which datasets to use, any areas that need to be clipped, any transformations necessary, and any edits done in design to the original survey data.

Existing Ground Surface

The DTM surface that best models the existing condition for the project will have the name EXIST and the feature code EXIST. Other existing surface models will start with the characters "EX."

Finish Surfaces

The DTM surface that best models the finished condition for the project will have the name FIN and the feature code FIN. Other finished surface models will start with the character "F."

Staged Surfaces

Names of surfaces created for work with staged construction will start with the character "S."

Pond Surfaces

Names of surfaces created for work with ponds will start with the character "P."

Volume Computation Surfaces

Delta volume surface name will start with the characters "DV." The description of the surface will contain information on which surfaces were used in the volume computation.

Clip Boundaries

Clip boundaries for limits of construction that are used in the process of cutting out existing data and replacing it with data from finished EAR files will have the same name as the finished endarea file from which it is derived.

Clip boundaries that define the limits of a supplemental survey will have the same name as the SRV, SDR, or KCM file that contains the original survey data to be clipped in.

Since clip boundaries have no descriptions associated directly with them, designers are encouraged to use descriptive names for them (other than those listed above). All clip boundaries and their uses will be documented in the appropriate DTM History file.

6.2.3.11 Report Files

For each alignment in the final design, there will be a description report and a superelevation report located in the alignment subfolder.

For each profile in the final design, there will be a description report located in the appropriate alignment subfolder.

For each endarea file in the final design used to calculate volumes, there will be an endarea volume report located in the alignment subfolder.

Examples:

LR1.RPT – Description report for alignment

LR1_SUPER.RPT – Superelevation report for alignment

LL1A1P1_EXIST_STAGE1_EW.RPT – Earthwork endarea volume report for LR1P1_STAGE1.EAR

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

6.2.3.12 CDG Files

Designers will create CDG files of the final design to document the finished product and to make it easier to view. This practice provides the construction staff and other reviewers with an easy method to produce views of all design elements that directly relate to specific final design elements.

■ Project CDG Files:

- Alignment/RW CDG – Displays all project alignments and project R/W limits.

- Alignment/Hook CDG – Displays all project alignments and their related geometry chains.
- Existing Condition CDG – Displays the survey data points, survey chains, and surface of the existing condition.
- Design Element-Specific CDG Files:
 - Alignments – For each alignment in the project, there will be a separate CDG of just that alignment and all its related chains.
 - Profiles – For each profile in the project, there will be a CDG file of that profile and its grid.

The basic CAiCE design CDG file-naming convention is to prefix the name with the horizontal alignment profile or surface followed by a description.

6.2.4 Project Closure and Transition

The following requirements will apply after the designer has prepared all the appropriate electronic information for a CAiCE design package as described in Section 6.2.

6.2.4.1 Project Cleanup

The final version of the CAiCE design data should contain design data and all supporting information necessary for the construction office and/or future designers to understand and use the dataset in CAiCE. All data not necessary for construction of the project or of use to future designers should be deleted from the project.

6.2.4.2 Preparation of Archives Subfolder

The following must be provided in the **DESIGN/ARCHIVES** folder:

- Completed CAiCE Designer Checklist (see Section 8.6).
- PostDesign Archive – The PostDesign archive is a zip file created through CAiCE's Project Management System and contains all the CAiCE data and files. It also contains all the resources needed for preparing them including cell files, fragment libraries, feature tables, super and runoff tables and any other files or resources needed to reproduce the design. This is normally achieved by including the project's Design folder in its entirety. Most of these resources are either already in the project folder or can be added easily to the archive by checking the appropriate boxes on the Project Management dialog. The folder containing the fragment library will need to be copied to the project folder by the designer just prior to the Design Archive compilation. The PostDesign Archive's name is prefixed with the project name and appended with “_CAICE_POSTDESIGN.”
- ForConstruction Archive – The ForConstruction archive is a zip file created through CAiCE's Project Management System and is a subset of the PostDesign Archive. It contains only the information from the PostDesign Archive that is needed by the construction office. All data relating to non-selected alternates, permit applications, or any other data not needed to construct the project should be removed. The Construction Archive's name is prefixed with the project name and appended with “_CAICE_FORCONSTRUCTION.”

6.2.4.3 Delivery of Final Package

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

Delivery will be accomplished by providing the customer access to the project folder if both the designer and 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 CADD data sets. However, if the InRoads design data is independent of other project data relating to CADD and survey, then access to just the Design 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, or a DVD).

6.2.4.4 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.

