3.7 Roadway Design Deliverables

A) Introduction

The majority of the roadway design elements are developed in CAiCE. Acceptable final formats for the different deliverables can be one or more of the following; CAiCE files, MicroStation DGN files, and/or Microsoft Word DOC files. The final formats should be discussed ahead of time during the early stages of the design process as specified in Appendix QQ of the *Project Development Procedures Manual* (PDPM) to ensure that all users are familiar with methods required to use the data in different formats.

B) CAiCE Files

1) Project Archive

A CAiCE project can easily be archived into a single file for distribution. A design project for final distribution in the Survey File Deliverables should contain the final objects used for quantities and in the development of the contract plans as specified in Appendix QQ of the *Project Development Procedures Manual* (PDPM). Update any "read me" files that are to be included in with the project. Remove extraneous design data and design files, and make sure the final cross sections are in agreement with the final horizontal and vertical alignments, slope stake listings, earthwork volumes and digital design models.

A CAiCE project can contain any combination of the following:

- Project Settings – units, datums, etc. (This information should also be documented in a "read me" file.)
- Existing Topography as points, survey chains, and DTM's
- Horizontal Alignments
- Vertical Alignments
- Superelevation definitions
- Digital Design Models and Design Contours
- Cross Sections, if *.EAR files are saved within the project directory
- Slope stake listings, if *.SSR and/or *.DOC files are saved within the project directory
- Other files
- The project should contain a "read me" file to document the project settings and which vertical alignments, cross sections, slope stake listings are associated with which horizontal alignments. See the Project Reference List found in Appendix QQ of the *Project Development Procedures Manual* (PDPM).

2) KCM File

The KCM file is a CAiCE format file that is also compatible with Microsoft Access. It can contain information from a CAiCE project including, survey data, alignments, profiles, and/or other geometry elements. Information about the project settings is not included in the KCM file; it is therefore recommended that the project units and horizontal and vertical datums be documented in a “read me” file that is transmitted with the file.

It is recommended that the KCM file name include information about the project and the data included in the file. For example the file containing the alignments and profiles of ramps MA1 – MA4 from a project named 34578 could be named *34578_MA1-4.kcm*.

A KCM file can contain any combination of the following elements:

- Existing Topography as points and survey chains

  Existing topography to be used in the design process is typically saved as a CAiCE archive file for distribution when a DTM is included. For situations where a DTM is not required or when updates are made to an existing project a CAiCE KCM file is suitable for distribution.

- Horizontal Alignments as geometry chains
- Vertical Alignments as design profiles

3) EAR Files (Cross Sections)

Cross sections are created and stored in CAiCE as EAR files. These files are an acceptable format for transferring cross sections between CAiCE users. Information about the project settings is not included in the EAR file; it is therefore recommended that the project units and horizontal and vertical datums be documented in a “read me” file that is transmitted with the file. When this file format is provided as a deliverable, it is also recommended that the associated horizontal and vertical alignments be provided at the same time because there are some routines that require all three objects. The alignments can be delivered in the project archive or in a KCM file.

It is recommended that the cross section file name include the horizontal alignment name followed by “exist” or “design” as appropriate. For example, the design cross sections for alignment MA1 would be named MA1_design.EAR.

4) SSR and/or DOC or PDF Files (Slope Stake Listings)

Slope stake listings are developed from the design cross sections. Surveyors utilize the slope stake listings to stake the project for construction. Construction engineers reference the listings to check grades throughout the construction of the project.

It is recommended that the SSR, DOC, &/or PDF file name be the same as the associated cross section.

a) Best Practices & things to think about

i) Slope stake listings shall be generated from the final cross sections with the same intervals, key stations and offsets.

ii) Cross sections, slope stake listings and earthwork quantities should be produced concurrently and based on identical design data depicted on the contract plans.

iii) Provide slope stake listings for interim construction phases when projects with stage construction require partial fills, cuts, or detour work.

iv) 1 or 2 stations per page (8 1/2" X 11") as indicated on the Survey File Checklist, Appendix QQ of the *Project Development Procedures Manual* (PDPM).

v) 0.01' accuracy for the horizontal and vertical labels

vi) Finish Grade

vii) Label the right of way when it is within 15' of the catch line

viii) Acceptable slope stake listings can be created from the final cross sections in CAiCE with one of two Caltrans developed macros, *SlopeStake.lib* and *RTFstakeout4SD-Modified.lib*.

(1) The *SlopeStake.lib* macro has the following capabilities:

- Creates slope stake listings with or without a display of the cross section at each station.
- Creates slope stake listings with or without the cuts/fills between every offset from catch point to centerline.
- Only recognizes marked points at the ends of cross section links.
- Includes R/W by offset key-in entry and/or the selection of a geometry chain.
- Option to select Finish or Sub grade of all selected surfaces.
- Saves one, two, three, or more stations per page.

- Saves the slope stake listings, with or without the cross section, as an SSR file that can be used by anyone working with the macro. The SSR file, when requested by the end user, is an acceptable format for delivery of the slope stake listings.
- Saves the slope stake listings, without the cross sections, to a Word DOC file. Currently the option to save a DOC file with the cross sections is not an available. However, if an Adobe PDF Writer is installed, the slope stake listing with the cross sections can be printed to a PDF file.

(2) The *RTFstakeout4SD-Modified.lib* macro has the following capabilities:

- Recognizes all marked points both at the ends of cross section links and in the middle of a link.
- Option for Landscape or Portrait layout.
- Saves one, two, three, or more stations per page.
- Saves the slope stake listings to a Word DOC file.

b) Format & Attributes

Annotation Attributes Table

All text for slope stake listings will use the font Times New Roman.

Feature	*Font Style*	*Text Size (pt.)*
Header & Footer	Regular	10
Alignment Name	Bold	10
Station	Bold	10
Key Point Feature	Bold	8
Key Point Data	Regular	8

See Chapter 2 of the *Plans Preparation Manual* for acceptable format examples

C) MicroStation Files

1) DGN file

A variety of MicroStation DGN file formats are acceptable. See section 4.1 for more information about the appropriate file format to use.

A DGN file can contain the following:

- Existing Topography

  The topographic maps of photogrammetric data are created directly as 3D DGN files. The topographic maps of survey data are saved as 3D DGN files from the CAiCE project.

- Horizontal Alignments

  Horizontal alignments are created in CAiCE and saved to a DGN file for use in the contract plans.

- Vertical Alignments

  Vertical alignments are created in CAiCE and saved to a DGN file for use in the contract plans.

- Superelevation Diagram

  Superelevations are created in CAiCE. The diagrams are displayed and saved to a DGN file for use in the contract plans.

- Design Contours

  Design contours are created in CAiCE from the DDM's. They are then displayed and saved to a DGN file for use in the contract plans.