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Chapter 11 - Survey Standards

CADD Production Criteria Handbook

11.1 GENERAL

This section will describe the minimum CADD requirements for survey operations.

11.2 STANDARD FILE NAMES

Florida Department of Transportation (FDOT) utilizes standard naming conventions for all of its files. Some of the automation implemented in various tools provided by FDOT depends on naming conventions being met. More importantly, the naming convention confers information to the downstream customer of the data.

Standard file names should follow this format: **AAAABB##.ext**
Where **AAAA** = *abbreviated file description*, **BB** = *Discipline Denotation*, **##** = *Sequence number*.

Note: Please see CADD Production Criteria Handbook (CPCH) Chapter 4 for more information.

The following table defines the Survey File Name Standards in regards to FDOT Projects with the understanding that each file name will include sequence numbering. MicroStation design files are typically produced representing the existing objects located during survey operations and for County Mapping operations.

File Type	File Name	Model Name	File Description	Rule File	Seed File	Critical File
Project Network Control	CTLSRD.dgn	Default	Survey Project Control Sheet	planrd.rul	\$(MX_SEEDIR)fdotseed2d.dgn	
Existing Drainage	DREXRD.dgn	Default	Graphics design file containing existing drainage features	drexrd.rul	\$(MX_SEEDIR)fdotseed2d.dgn	X
Existing DTM	GDTMRD.dgn	Default	Graphics files of ground surface digital terrain models	dtmrd.rul	\$(MX_SEEDIR)fdotseed3d.dgn	
Existing Topography	TREERD.dgn	Default	Tree Survey Sheet	topord.rul	\$(MX_SEEDIR)fdotseed2d.dgn	
Existing Topography	TOPORD.dgn	Default	Graphics design file containing existing topographic features	topord.rul	\$(MX_SEEDIR)fdotseed2d.dgn	X
Existing Topography for R/W Maps	TOPORW.dgn	Default	Right of Way Mapping file containing existing Topography for mapping purposes only	toporw.rul	\$(MX_SEEDIR)rwseed2d.dgn	
Existing Utilities	UTEXRD.dgn	Default	Graphics design file containing existing utility features	utexrd.rul	\$(MX_SEEDIR)fdotseed2d.dgn	X
Verified Utilities	UTVHRD.dgn	Default	Summary of Survey Verified Utilities (This is a 3D version of UTEXRD.dgn)	utexrd.rul	\$(MX_SEEDIR)fdotseed3d.dgn	

Additional geometry input files may also be created for delivery to design. (Example: files of existing profiles, chains, points, etc.) All data delivered to the Department, including necessary directories and survey files, should be placed under the Survey discipline folder, which the FDOT standard directory structure includes for this purpose. Additional sub-directories may be created under the \Survey discipline folder to segregate and organize data. (Example: the case where a CAiCE project is placed within the project directory structure under the \Survey discipline folder for delivery.)

Note: See Chapter 4 for requirements in creating additional sub-folders.

11.3 RESOURCE FILES

CAiCE and GEOPAK are the two principal applications used for processing survey data into MicroStation graphics files for FDOT. Each of these programs is feature driven for surveying operations. A feature table is utilized to look-up appropriate element symbology for given objects found in the survey.

The feature table provides the current standards data for Roadway Design and is loaded automatically to a default directory named **x:\CAiCE\FTB**, where “x” is the workstation drive letter where CAiCE is installed, when the FDOT2008 & FDOT Menu options are installed from the FDOT2008 Software Delivery CD. The naming convention for this table includes “E” for English and “08” for the 2008 standards.

11.3.1 CAiCE Feature table

The Department provides the CAiCE feature table called **FDOTE_08.ftb** that is required to implement the level numbers (200+ through 9xxx) for the levels corresponding to the MicroStation DGN library file. This table is placed in the \CAiCE\FTB\ directory.

Note: Earlier year’s standards may also be installed.

A corresponding feature table called **FDOTE_08.ftm** is also loaded to the x:\CAiCE\FTB\ directory to control symbology on alignment chains (Geometry Chains with stationing). This table is used by the *Settings > Object Display > Geometry Chains* command in CAiCE to control the proper symbology of alignment stationing, station tics, and station labels based upon scale.

Note: The name of the **.ftm** feature table must match the name of the active **.ftb** feature table in use during a CAiCE session.

11.3.2 List Files

Feature List files, **FDOTTOPO.lis**, **FDOTDran.lis**, and **FDOTUtil.lis**, are also installed into the x:\CAiCE\FTB\ directory to assist the user in creating the CAiCE screen graphics containing the appropriate data for producing the three typical graphics files supplied to design, **TOPORD00.dgn**, **DREXR00.dgn**, and **UTEXRD00.dgn**. These List files are listings of the feature codes that belong in the respective design files. Consult your CAiCE documentation on the use of List files.

11.3.3 CAiCE Cell Library

MicroStation Cell libraries cannot be used or attached by CAiCE directly. (CAiCE could attach a V7 cell Library). The MicroStation cell library was translated to CAiCE’s own version of a cell library (*.CCL versus *.CEL, hence **SYENG08.ccl** and **SURVEY08.ccl**). Note the differences in 11.3 for ROW Mapping. When creating a CTLSRD.dgn file, three MicroStation cells, **CTLDAT**, **CTLDETL**, and **CTLTAB**, have been provided to aid in the insertion of project control data if needed. All three cells can be found in the Right of Way cell library (row.cel).

11.3.4 Translation Table

A Translation Table, **Edgntype.tbl**, is another resource file provided for CAiCE that maps CAiCE line styles to MicroStation custom line styles. This table is loaded automatically by the FDOT2008 Software Install routine into the x:\CAiCE\DGN\ subdirectory and is automatically called by CAiCE when screen graphics are saved to MicroStation graphics.

Note: To have compatibility with MicroStation’s long name cells and levels, two files, **DGNCell.TBL** and **DGNLevel.tbl**, were introduced and must reside under your \CAiCE\DGN\V8 directory.

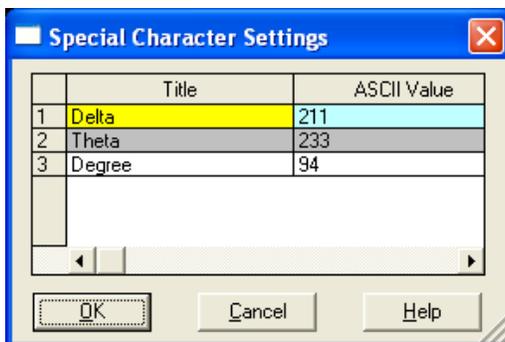
11.3.5 Additional Tables and Cell Libraries

Additional feature tables and cell libraries are also provided for existing topography files, created for Right-of-Way mapping purposes. Mapping uses additional consolidation of certain monumentation symbols and has other symbolization requirements. The tables and cell libraries included are:

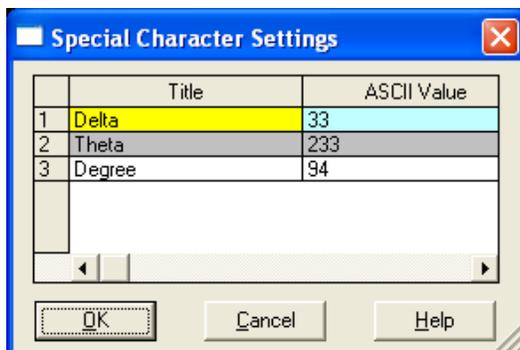
- **FDOTE_08RW.FTB**
Feature table containing the topography features used in ROW Mapping
- **FDOTE_80RW.FTM**
Corresponding table for controlling alignment / chain symbology and bearing / distance chain labeling (attaches automatically when FDOTE_80RW.FTB is attached)
- **Survey08.CCL**
CAiCE format of the cell library for use in ROW mapping
- **Survey08.CEL**
MicroStation format of the topo cell library for use in ROW mapping

11.3.6 CAiCE Special Characters

- **FDOT's font library 48 in MicroStation (roadway font)**
This does not use the standard ASCII table for all special characters. In particular, the degree symbol " ° " for MicroStation requires that CAiCE place the hat symbol " ^ " in text strings so MicroStation will look correct when data is translated to MicroStation graphics. To force CAiCE to substitute the " ^ " for " ° ", CAiCE needs to be set by selecting the menu options: *Settings > Special Characters* and set the ASCII value of 94 to represent degrees as shown below:



- **Right of Way project font 58 in MicroStation.**
If exporting to a Right of Way map, CAiCE needs to be set by selecting the menu items: *Settings > Special Characters* and set the ASCII value 33 to the Delta symbol as shown below:

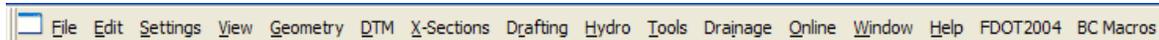


11.4 USING THEME VIEWER TO CREATE GRAPHICS

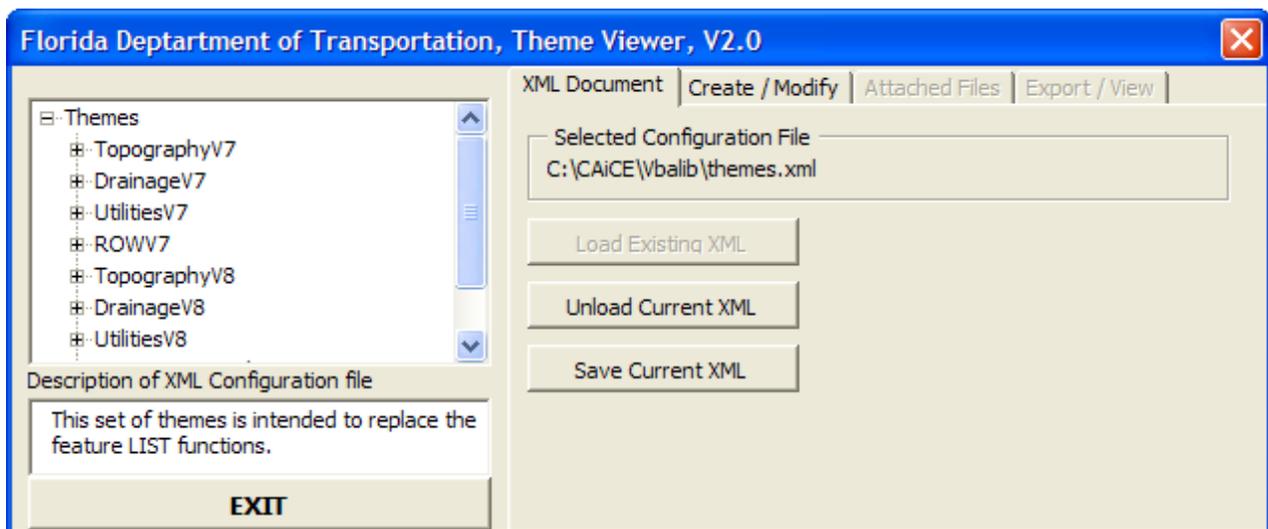
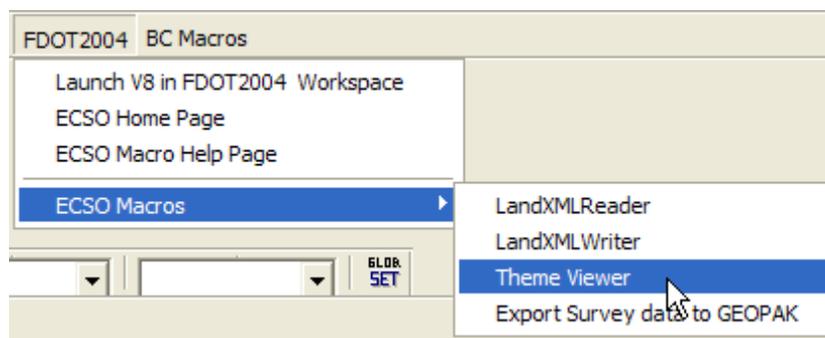
FDOT provides CAiCE VBA Macros that are accessible from the Menu Bar in CAiCE. When the FDOT2008 software is loaded, a folder \FDOT2008\CAiCE is created. The contents of this folder and all subdirectories should be copied to the root of the drive that contains the \CAiCE folder where the application is loaded. This is pointed to by Windows environment variable "KCDIR".

Once done, a custom FDOT2008 menu is added to the CAiCE Menu bar shown below:

Note: This is functional only for CAiCE Visual Transportation 10, Service Pack 6 and higher.



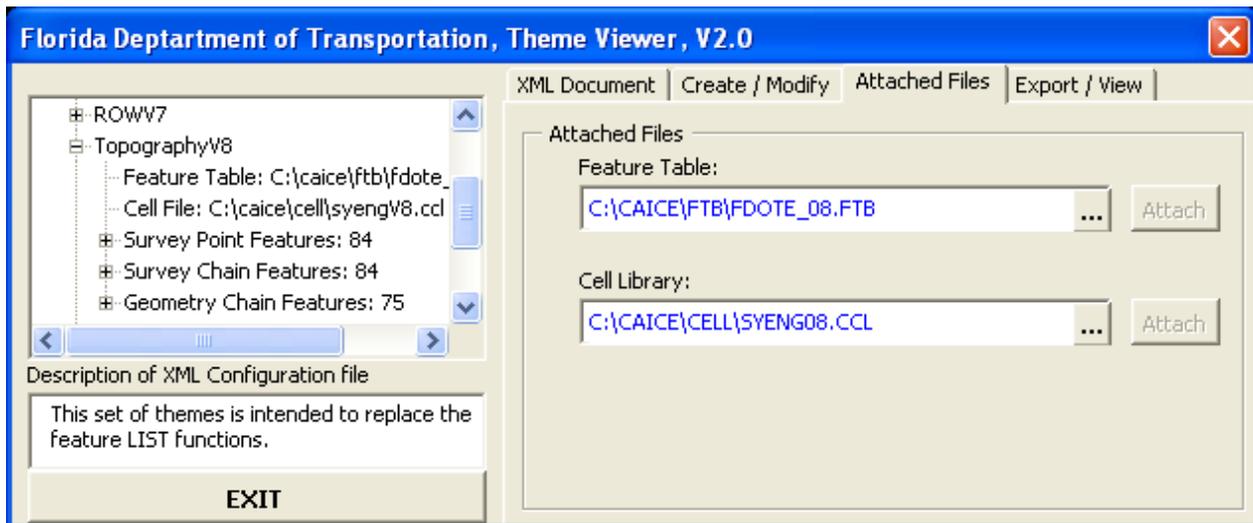
Select the *FDOT2008 > ECSO Macros > Theme Viewer* Macro as shown below:



The Theme Viewer application starts, ready to select a Theme (a series of view commands for Points, Survey Chains, and Geometry Chains to place on the Graphics screen BY Feature Code) from pane at the upper-left.

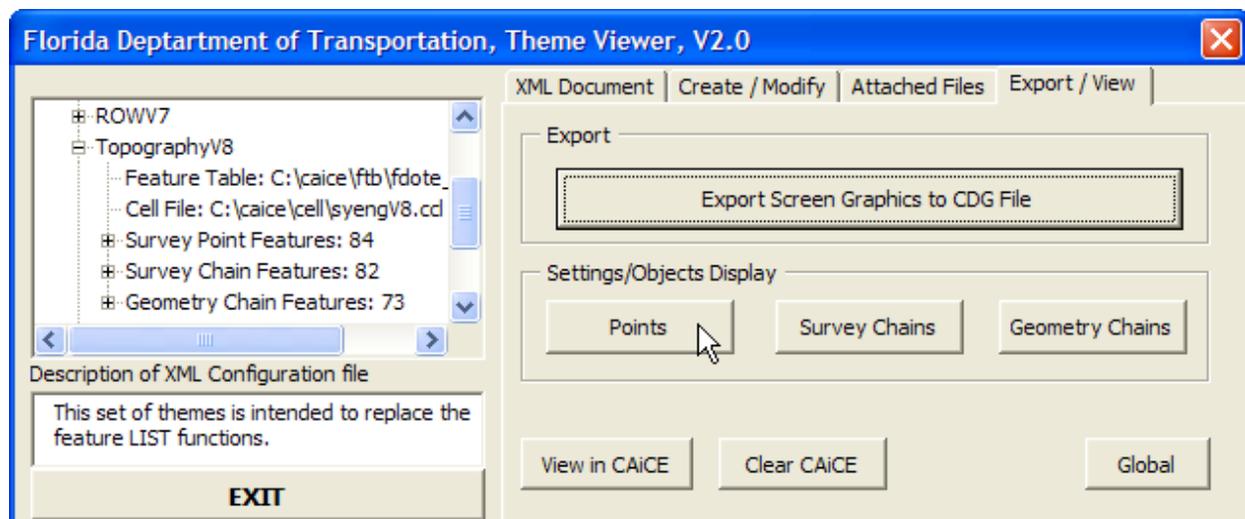
- **Attached Files Tab**

The **Attached Files** Tab sets the proper feature table and cell files for attachment. If CAiCE can find the files, they will be shown with blue text like shown below. If the files are shown in red text, you may need to select the [Attach] button to locate them, or the ellipses button [...] to navigate and attach the proper files.

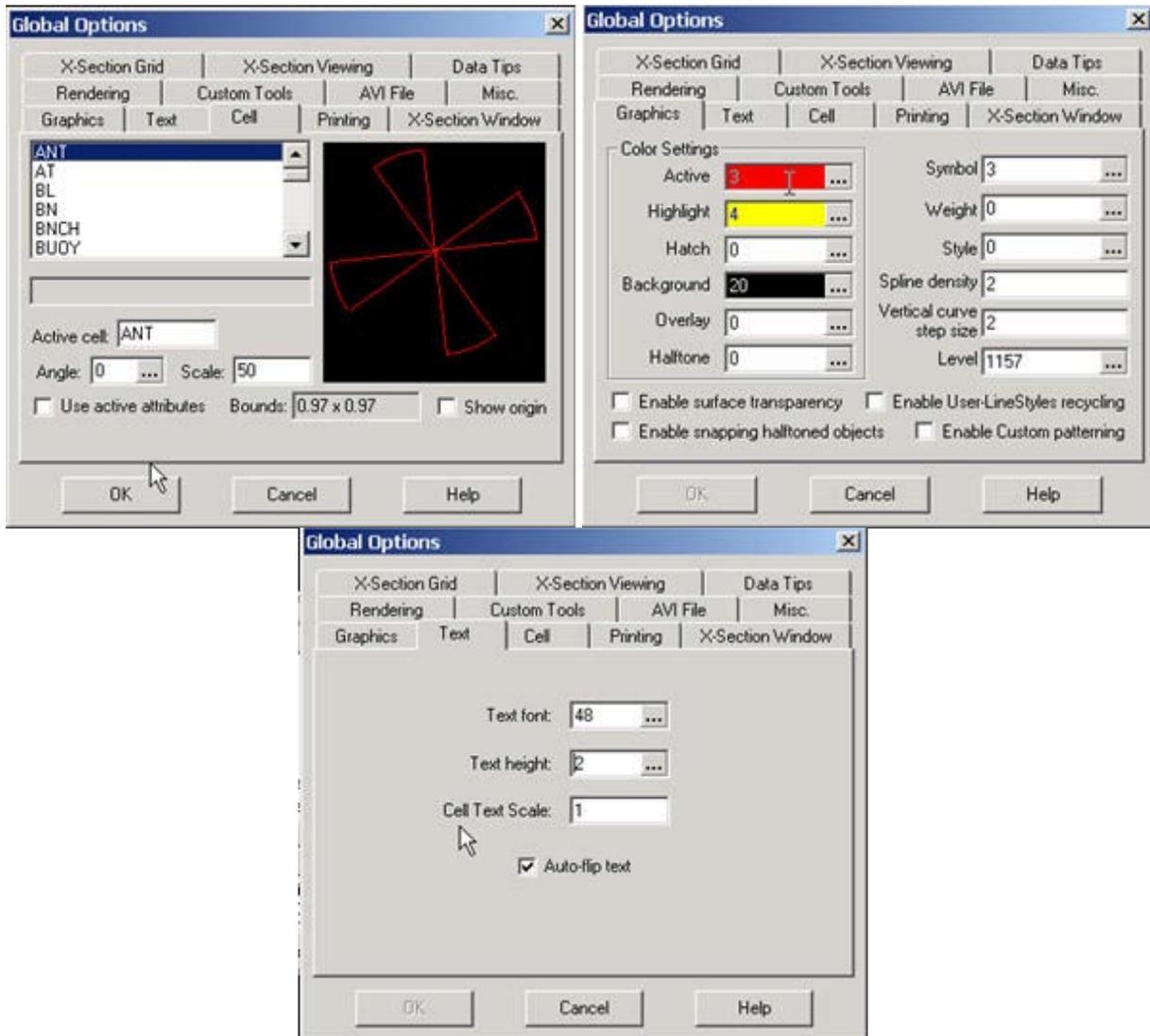


- **Export / View Tab**

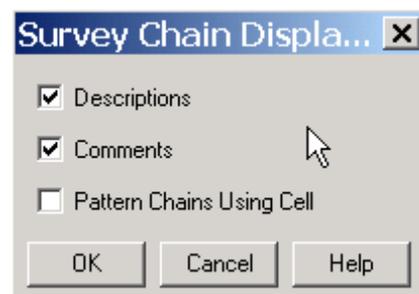
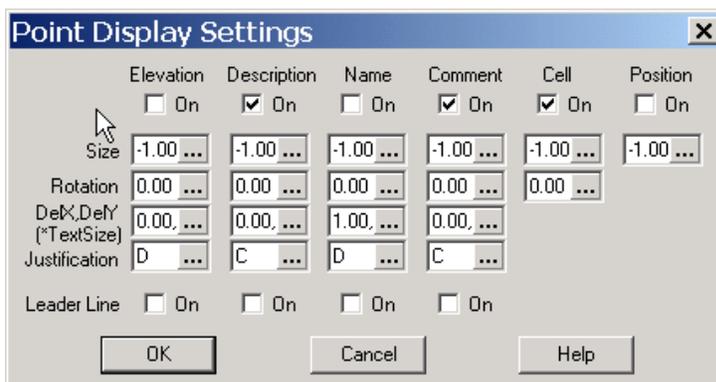
The Export / View Tab sets the Global Options for viewing and Object Display settings for Points, Survey Chains, and Geometry Chains. These settings control how those objects will appear and what additional graphics will be drawn when the theme is executed.



- **Global** - The Theme Viewer interface has the option to set CAiCE Global viewing options with the [Global] button. The following are typically set:

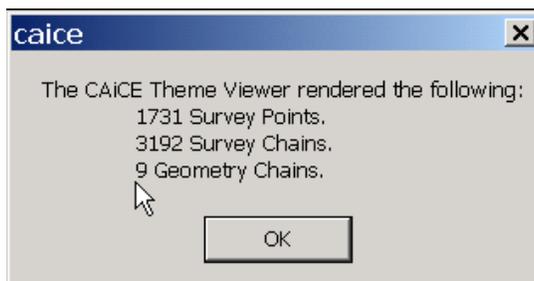


- **Settings / Object Display** buttons are also available to set graphics defaults for Points, Survey Chains and Geometry Chains:



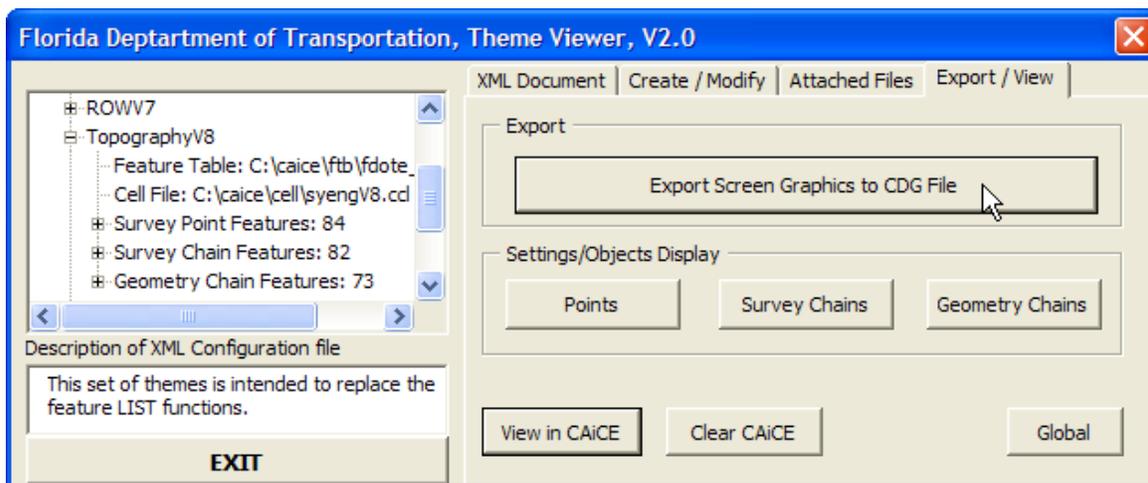
Note: The Size values are set to “-1” in the Point Display Settings dialog.

- The **View in CAiCE** button will display the graphics of the loaded theme. CAiCE will draw those objects at the sizes specified in the Global Options dialog Text tab shown previously, and cells at the scale specified by the scale at the Global Options dialog Cell tab. To change those settings to an absolute height each time you create views, change those "-1" values to override the defaults in Global Options. At any time, settings may be saved from the CAiCE Settings menu, for work in later CAiCE sessions. When CAiCE finishes drawing the objects to the screen, summary statistics are displayed:



- The **Clear CAiCE** button clears and expunges the graphics in the CAiCE display window, if the results of the graphic content inside CAiCE are not what was intended. Adjustments can be made to the display settings for Global Options or the element display settings, and the [View in CAiCE] button selected again to redraw the graphics using the new settings.
- The **Export Screen Graphics to CDG File** button exports and saves the graphics displayed on CAiCE's screen to a CAiCE Design Graphics (.cdg) file for the themes provided to draw existing topography, existing drainage, existing utilities which correspond to the files needed to create the design files: TOPORD00.dgn, DREXRD00.dgn, and UTEXRD00.dgn. The CDG file is an ASCII file which contains the commands to redraw the elements in CAiCE, and may also be read by a Macro running the FDOT2008 Menu to draw those same elements in MicroStation.

In the example, once the topo is drawn, the graphics are ready to export by selecting the [Export Screen Graphics to CDG File] button and saving the file name for the topography as TOPORD00.CDG. Clear the graphics, select the next theme (Utilities, Drainage, etc.) as described before and repeat the steps until you have separate CDG files for each theme.



11.5 USING CDG2V8 MACRO UTILITY

Translation to MicroStation files from CAiCE requires the user to save a CAiCE Design Graphics (CDG) file of the graphics displayed on CAiCE's screen using methods described earlier. The CDG file is an ASCII file that contains the primitive points, lines, arcs, text, cell references, etc. that can be converted to MicroStation file format using a utility provided in the FDOT2008 Menu.

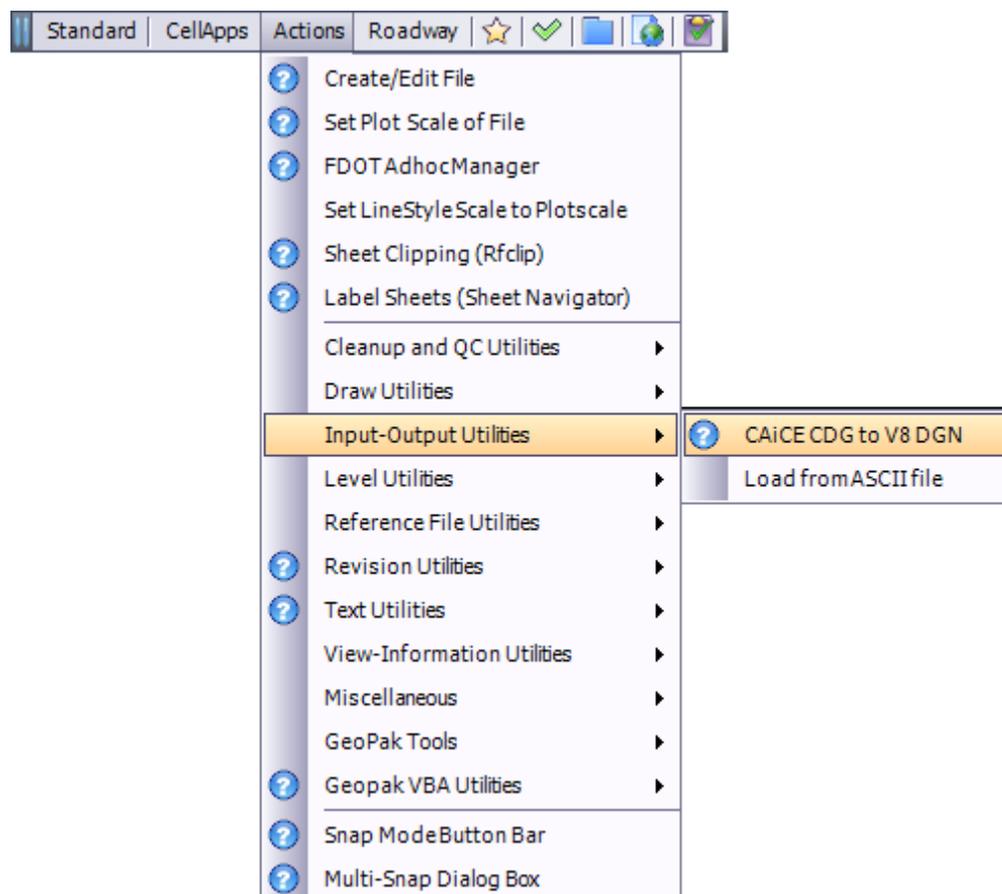
Once the CDG files are created, a design file is opened with MicroStation inside the FDOT2008 workspace for the graphics file you want translated. If the design file does not exist, it can be created from either MicroStation Manager (be certain to use the correct seed file for the type of DGN you are creating, that is a Roadway seed or a Right of Way Seed) or you may use the Create / Edit FDOT2008 Files application.

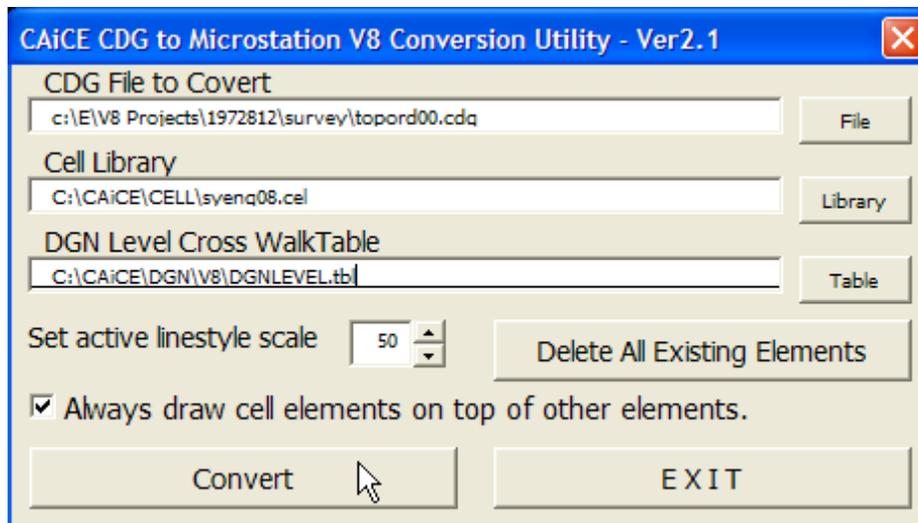
Note: The user should pay attention to the MicroStation working environment in which the design file is opened. The user may select an appropriate environment from the FDOT2008 Menu pull down: *Standard > Configuration*.

Example: a TOPORD00.DGN has been opened created from the *fdotseed2d.dgn* seed file since the TOPORD00.DGN is intended for design. (MicroStation was configured to use the Standard Roadway Menu.)

The Utility is run from selecting the FDOT2008 Menu pull down:

Actions > Input-Output Utilities > CAiCE CDG to V8 DGN as shown below:





- CDG File to Convert
The CDG you wish to import
- Cell Library
The MicroStation cell library you wish to use (typically
\FDOT2008\RESOURCES\cell\SYENG.CEL –or– \CAiCE\CELL\SYENG08.CEL)

Note: for the Right-of-Way themes use:
\FDOT2008\RESOURCES\cell\SURVEY.CEL –or– \CAiCE\CELL\SURVEY08.CEL)
- DGN Level Cross Walk Table
The Level mapping table (typically \CAiCE\dgn\V8\DGNLEVEL.TBL)
- Set active line style scale
The Scale for custom line styles
- Convert button
The Macro will read the CDG and begin using MicroStation to draw the elements in the CDG (If the conversion gives a VBA error the user needs to uncheck the box “Always draw elements on top of other elements”).
- Delete All Existing Elements
This tool deletes all elements in the open DGN file and must be used with caution.

Note: This tool currently works with ordinary CDG files for graphics like lines, arcs, text, etc. IF you are creating a DGN of a TIN model from CAiCE, the triangles are placed as individual shapes in MicroStation. Remember to create a different DGN.

11.6 GEOPAK SURVEY

For GEOPAK, the Survey application uses a feature table called *FDOT2008.smd*. This feature table is installed into the x:\FDOT2008\geopak\databases\ directory by the FDOT2008 Software Install routine (x is the drive letter where the FDOT2008 software is installed). Note that older versions of this feature table may also be installed for legacy project compatibility (i.e. *FDOT2004.smd*)

Both GEOPAK and CAiCE use the same cell libraries for survey graphics. The cell library should be referenced from the x:\FDOT2008\RESOURCES\Cell directory and is also called *SYENG.cel*.

11.7 SURVEYING DATA

The FDOT Surveying Procedure, Topic 550-030-101A and the Surveying Handbook governs the requirements for survey procedure and data deliverables to the Department. The Surveying Handbook is available at:

<http://www.dot.state.fl.us/surveyingandmapping/Manuals/surveyhandbook.pdf>

11.8 PROFESSIONALS' ELECTRONIC DATA DELIVERY SYSTEM (PEDDS)

PEDDS shall be used to Secure and Authenticate project data. When projects are received, the FDOT authenticates the data on the delivered CD. Each time data is transmitted to or received by FDOT the data shall be secured and authenticated. PEDDS shall also be used to authenticate any project specific data received as part of a delivery from an outside source or discipline. For example, an electronic delivery to Roadway from Survey or EMO should be secured and authenticated. Roadway shall electronically secure all files for delivery.

11.9 SYMBOLOGY STANDARDS

Symbology Standards that apply to FDOT Projects are set up under a listing of Standard Level Names with specific ByLevel Color, Style and Weight attributes. These levels are grouped under specific Rule Files which are associated to each valid Standard Filename of each Discipline for the purpose of performing the Quality Control check for FDOT Standard compliancy of each FDOT project design file. Section 11.2 of this chapter provides for the complete Standard File Name listing with associated Rule File.

Note: Refer to Chapter 3 FDOT Resource and Support Files to review the Level names listing for each associated Rule File.

Note: The generation of the TOPORW00.dgn will include all features listed under TOPORD, DREXRD, and UTEXRD. Those features exclusive to right of way are listed in the tables found in Chapter 3 under TOPORW.

The following are the basic level naming convention rules to follow to always know what level an element should be placed on:

- 1) Level Names have 18 maximum characters.
- 2) The format of the name is: **object_sv**

object (represents element type)	s (represents State)	v (represents View)
	<u>states</u>	<u>views</u>
	p (proposed)	x (cross section)
	d (drafting element)	r (profile)
	e (existing)	p (plan) (DTM is the same as plan)

Note: Level Names without including the “_sv” portion in the name are assumed proposed plan view elements.

Example: With this information one can determine the following about the Level names below:

gas	- Proposed Plan view elements for “gas” related items
gas_ep	- Existing Plan view elements
gas_px	- Proposed cross section view elements

11.10 QUALITY CONTROL

Quality Control (QC) of graphics files required with the survey delivery is the responsibility of the data producer. FDOT supplies the QC Software as an aid to check for compliance with filename and level/symbology standards of the Department for graphic files. Other quality control standards for Survey data may be applied from the FDOT Survey Procedure, Topic 550-030-101 and Surveying Handbook by the scopes of work developed between the parties.

11.11 COUNTY MAPPING

The production of County Maps is an internal function of the FDOT Surveying and Mapping Office. This document refers to the graphical symbology standards used for the production of those maps for reference. For information regarding file naming conventions and other standards in use during the production of FDOT County maps, contact the Geographic Mapping Office in the FDOT Surveying and Mapping Office at (850) 245-1555.

Files Type	Description	Color	Line Style	Weight	Cell
All	Adjacent County and State Text				
All	Airport Names				
All	Airport Runways			6	
All	Airports Commercial				cscapt
All	Airports Commercial				cap
All	Airports Landing Strip or Private Airport				cslstp
All	Airports Landing Strip or Private Airport				ldarsp
All	Airports Military				csmfld
All	Airports Military				milffad
All	Backdrop	30			
All	Backdrop	60			
All	Bay				2
All	Bay Text				2
All	Bayou and Harbor etc				3
All	Bayou and Harbor etc Text				3
All	Boundary Section Lines (hidden)	31			
All	Bridges			0	
All	Bridges			1	
All	Bridges Interstate	1			
All	Bridges and Drawbridges County Highways	4			
All	Bridges and Drawbridges County Highways Text	8			
All	Bridges and Drawbridges Local Roads				
All	Bridges and Drawbridges Local Roads Text	18			
All	Bridges and Drawbridges State Highways	3			
All	Bridges and Drawbridges State Highways Text	7			
All	Bridges and Drawbridges Toll Roads	5			
All	Bridges and Drawbridges Toll Roads Text	5			
All	Bridges and Drawbridges US Highways	2			
All	Bridges and Drawbridges US Highways Text	6			
All	Bridges Interstate Text	4			

Files Type	Description	Color	Line Style	Weight	Cell
All	Cities Incorporated Area			0	
All	Cities Incorporated Linear Boundaries			1	
All	City Streets			1	
All	Coastal Waterway				csicw
All	Coastal Waterway Text				10
All	College or University	71			
All	College or University Text	30			8
All	Communities and Subdivisions Names without Post Office				3
All	Communities Names with Post Office				2
All	Connecting Roads			2	
All	Coordinate ticks Lat Longs				csotic
All	Coordinate ticks State Plane				csstic
All	County Boundary		7	6	
All	County Parks	70			
All	County Parks Text	148			10
All	County Roads Related Text				
All	County Route Divided Highway Outline and Fill				
All	County Routes Highway Center Lines			3	
All	County Routes Ramps			2	
All	County Seat				cscose
All	County Seat Names			4	
All	County Seat Names			6	
All	Culture			0	
All	Culture			1	
All	Culture			2	
All	Culture Text				1
All	Cut Border				
All	Extended Township Lines	43	3	2	
All	Forbes Purchase		3	3	
All	Forbes Purchase Section lines		3	0	
All	Forbes Purchase Township and Range Lines		3	2	
All	Geographic Features Text			1	
All	Heliports				csheli
All	Intermittent Ponds				1
All	Intermittent Ponds Text				8
All	Interstate Divided Highway Outline and Fill				
All	Interstate Highway Center Lines			3	
All	Interstate Ramps			2	
All	Interstates Related Text				
All	Islands				
All	Islands Text Coastal (Keys etc)			2	
All	Islands Text Inland (Hammocks and Ridges etc)				1
All	Lakes and Ponds				
All	Lakes and Ponds Text				9
All	Land Grant Boundaries		4	0	
All	Legend				

Files Type	Description	Color	Line Style	Weight	Cell
All	Local Roads Divided Highway Outline and Fill				
All	Local Roads Improved	11		1	
All	Local Roads Paved	11		2	
All	Local Roads Related Cells				cslgf0
All	Local Roads Related Cells				cslgf1
All	Local Roads Related Cells				cslgf2
All	Local Roads Related Cells				cslgf3
All	Local Roads Related Cells				cslgf4
All	Local Roads Related Cells				csp1
All	Local Roads Related Cells				csp2
All	Local Roads Related Cells				cspnf1
All	Local Roads Related Cells				cspnf2
All	Local Roads Related Cells				cspsf1
All	Local Roads Related Cells				cspsf2
All	Local Roads Related Text				
All	Local Roads Unimproved	10		1	
All	Mangroves				mg
All	Mangroves				csman1
All	Mangroves				smg
All	Map Border				
All	Map Border Text and Cells				
All	Map Information Text and Cells				
All	Map Information Text and Cells				
All	Masks for Road Features				
All	Masks for Text				
All	Military Bases	66			
All	Military Bases Text	146			7
All	Narrow Canals		5		
All	Narrow Canals		5		
All	Narrow Canals		5		
All	Narrow Canals Text				7
All	Narrow River Creek and Branch and Slough	12		1	
All	Narrow River Creek and Branch and Slough	12		1	
All	Narrow River Creek and Branch and Slough	12		1	
All	Narrow River Creek and Branch and Slough Text				6
All	National Forest	65			
All	National Forest Text	44			1
All	National Park	69			
All	National Park Text	44			2
All	National Wildlife Refuge and Preserve	75			
All	National Wildlife Refuge and Preserve Text	144			3
All	Ocean and Gulf				1
All	Ocean and Gulf Text				1
All	Other Incorporated Names			2	
All	Other Incorporated Names			3	
All	Other Survey Related Text				3

Files Type	Description	Color	Line Style	Weight	Cell
All	Planning Number Interstates				cssir1
All	Planning Number Interstates				cssir2
All	Planning Number Interstates				cssir3
All	Planning Number US Highways				cssus1
All	Planning Number US Highways				cssus2
All	Planning Number US Highways				cssus3
All	Planning Number US Highways				cssus1
All	Planning Number US Highways				cssus2
All	Planning Number US Highways				cssus3
All	Populations				1
All	Quad Borders				
All	Railroad Stations				csrsta
All	Railroads	3			
All	Railroads Text				
All	Road shields County Roads				cs1crs
All	Road shields County Roads				cs2crs
All	Road shields County Roads				cs3crs
All	Road shields County Roads				cs4crs
All	Road shields Interstates				cs1irs
All	Road shields Interstates				cs2irs
All	Road shields Interstates				cs3irs
All	Road shields State Highways				cs1srs
All	Road shields State Highways				cs2srs
All	Road shields State Highways				cs3srs
All	Road shields Toll roads				cs1trs
All	Road shields Toll roads				cs2trs
All	Road shields Toll roads				cs3trs
All	Road shields Toll roads				cstps
All	Road shields US Highways				cs1urs
All	Road shields US Highways				cs2urs
All	Road shields US Highways				cs3urs
All	Road shields US Highways Alternate				cs1usa
All	Road shields US Highways Alternate				cs2usa
All	Road shields US Highways Alternate				cs3usa
All	Road shields US Highways Business				cs1usb
All	Road shields US Highways Business				cs2usb
All	Road shields US Highways Business				cs3usb
All	Seaplane facility				csseap
All	Section Lines		0	0	
All	Section Numbers				1
All	State Boundary		6	6	
All	State Capital				cscptl
All	State Forest	67			
All	State Forest Text	145			4
All	State Park	14			
All	State Park Text	145			5

Files Type	Description	Color	Line Style	Weight	Cell
All	State Prisons	124			
All	State Prisons Text	124			9
All	State Roads Related Text				
All	State Route Divided Highway Outline and Fill				
All	State Routes Highway Center Lines			3	
All	State Routes Ramps			2	
All	State Survey Lines		1	1	
All	State Wildlife Refuge and Preserve	72			
All	State Wildlife Refuge and Preserve	74			
All	State Wildlife Refuge and Preserve Text	147			6
All	Street Related Text				
All	Strip Mining Area	117			
All	Survey by Others		2	1	
All	Survey Correction Text within map				4
All	Swamps				sw3
All	Swamps	15			
All	Swamps Text	45			
All	Toll Divided Highway Outline and Fill				
All	Toll Highway Center Lines			3	
All	Toll Ramps			2	
All	Toll roads Related Text				
All	Town Centers				cscctr
All	Township and Range lines		0	2	
All	Township and Range Tics				csstic
All	Township and Range Text				2
All	Triangulation Station				cstria
All	Triangulation Station				trista
All	Triangulation Station Text	97			2
All	Uninventoried Roads and Features				
All	US Highways Related Text				
All	US Route Divided Highway Outline and Fill				
All	US Routes Highway Center Lines			3	
All	US Routes Ramps			2	
All	Wide Rivers and Canals	12		1	4
All	Wide Rivers and Canals Text				5
All	Wildlife Management Area Text	94			11