There are some places *only* Bentley can take you.

# Bentley Civil Guide

## *V8i SELECTseries 3*

**Best Practices**

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# Preface

In this guide, we will discuss a variety of best practices and review options, compare benefits and disadvantages, and offer various workflows.

The target audience is CAD support staff, CAD Managers or users.

This guide is equally applicable for the MX, InRoads or GEOPAK families of products. Each product contains the identical Bentley Civil Survey toolset and identical workflow. However, the transitioning tasks may vary, so the differences will be identified.

Keep in mind that there is no ONE best practice. This guide presents suggestions and best practices and it is the responsibility of each organization to determine how the Best Practices fits into your standard policies, procedures and operations.

| | |
|---|---|
| ***Note*** | Prerequisite Knowledge Level: Participant should have a basic understanding of design / engineering principles and be fluent in the use of one of the Bentley Power products or CAD and the native application (MX, InRoads or GEOPAK). |

You may also want to review our other (SELECTseries 3) documents, including Frequently Asked Questions and Known Issues. Extensive information can also be found in the product readme files and help.


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# Getting Started

## Overview

Now that you've completed the first step of loading your software, you're ready to begin work. Of course, this can be done by simply opening a DGN file, however, how can you become efficient at your work with the new software? This first chapter will help you get started, and subsequent chapters will provide best practices on a variety of different tasks and workflows.

## Getting a Jump Start

**Situation:** What's the fastest way to get everything set up so I can start working in (SELECTseries 3)? Do I need to develop all my resources from scratch?

### *Recommendations*

If you don't have a workspace already created, or need some of the resources, the easiest way to gain familiarity is to use the example Civil workspaces which are installed by default. You can use the entire workspace, or select various components. You can also modify them to fit your own needs, usually easier than starting from a blank slate.

***Note*** An example workspace has been delivered with V8i (SELECTseries 3). To access the example workspace, in MicroStation Manager, choose "examples" as the "User". Then for the "Project" choose either "Bentley-Civil-Imperial" or "Bentley-Civil-Metric". Lastly, optionally choose the Interface entitled "Bentley-Civil".

## How to Get Started

**Situation:** Aside from workspaces, what are recommended best practices for getting an organization up and running fairly quickly?

### *Recommendations*

In order to get your organization up and running, the recommended best practice is to link to native standards files (.DDB, .XIN, .PSS). This will setup the majority of your feature definitions and automatically link them back to your native styles.

***Hint*** If you utilize multiple standards for different clients you may want to consider setting up and using different workspaces.

- Make sure this is done in a DGN Library, which enables a single location where features can be stored and managed. The DGN Library is available across your organization by using the standard MS_DGNLIBLIST configuration variable.
- Next, you will need to make a decision on whether you want to use Auto Export and Auto Annotate (see Chapter 5 for details on these functionalities). If you do, then


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you will need to enable these for the specific linear features which are to be exported and annotated.

- You will also need to make a decision on which features you want to have geometry created for when you apply a template (see Chapter 7 for specifics regarding this functionality). You will need to enable this functionality for specific features as well.


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# Reference Files

## Overview

In SELECT series 3, all artifacts are stored within the DGN file, minimizing or eliminating the use of external files (such as TIN, DTMs, ALG, GPK, etc.). Therefore, the successful management of data within the DGN files is paramount to an efficient workflow, and hence, project.

Some of the various objects include:

- Terrain models
- Horizontal and vertical geometry
- Planametric graphics
- Survey data
- Corridors and other types of 3-D models
- Superelevation

## Single File vs. Multiple Files

**Situation:** Do I need to do keep all the data from my project in a single file or can I use reference files?

### *Recommendations*

You can keep all your data in a single file, which may be prudent if you have a very small project. However, if you have multiple users or a larger project, or you prefer granularity in your data, the use of reference files is encouraged.

Limitations include the requirement that each vertical geometry element must be in the same DGN file as its horizontal counterpart, but you can have multiple geometry files, if desired.

Superelevation can be in its own file, and referenced to the corridor DGN file. In order to assign the corridor, you must be in the corridor and reference super, as you are adjusting the pavement slopes on the corridor.

## Attaching Reference Files

**Situation:** Do I need to do anything special when attaching reference files?

### *Recommendations*

It has always been MicroStation Best Practice to attach a reference file with the Use Relative Path toggled on and that is still true for (SELECTseries 3) Civil projects. If you do NOT toggle on use relative paths, and then move the project to another folder structure, you may encounter problems when the software can no longer find the references.


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## USE OF REFERENCE FILES FOR GEOMETRY

**Situation:** What are the recommended best practices on efficient use of DGN files to distribute my geometry within my project?

If you are a single user on a project, then it's really a moot point whether you keep all of your geometry in a single file or divide it up into multiple files. So we'll assume for the purposes of these best practices that we have a team of designers that is working on a project with multiple centerlines and other geometric configurations.

### *RECOMMENDATIONS*

- It is not recommended to place all of your centerline geometry into a single DGN file, unless you have a very small project. Doing so would limit access to the geometry to a single team member at a time, limiting its efficiency.
- In order to allow multiple users the most efficient access to the geometry information, it is a recommended best practice to put individual centerlines (along with their associated profiles) into individual DGN files. For example, RampA would reside in RampA.DGN; RampB would reside in RampB.DGN, etc. This allows the most efficient use of the geometry within a team of designers.
- For the purposes of downstream workflows, go ahead and take the time to create an empty file (e.g. All_Geometry.DGN) that references each of the individual centerline geometry files, making sure you enable 'nested referencing'. This way, whenever you need to reference all the geometry, you can reference this single file.


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# 2-D vs. 3-D?

## Overview

A single MicroStation file may contain both 2-D and 3-D models. In addition, 2-D files may be reference to 3-D files and vice versa. Therefore, a discussion of 2-D versus 3-D MicroStation files and their management is a prudent topic of discussion.

## Geometry

**Situation:** Should I store my civil geometry into 2-D DGN models or 3-D DGN models?

Storing geometry in 2-D DGN model provides several advantages:

- The feature definitions allow for different 2-D and 3-D representations, so you could consider the 2-D as the planametric design and annotation and the 3-D as the visualization model.
- By embedding the 2-D geometry into a 3-D file the display of the 2-D is still graphical and so rotated 3-D views will show both sets of information. When at or around sea level this will become especially confusing.
- Selection of elements is simplified when separated in to 2-D and 3-D storage models as references can be turned off, or simply left on but snaps turned off.

### *Recommendations*

A best practice recommendation is to always store horizontal geometry in 2-D DGN models.

## Incorporating 3-D Concepts into Existing Workflows

**Situation:** I need to spread workload among the design team. We have a well-established procedure for creating different DGN files and referencing them together. What are recommended best practices for incorporating 3-D concepts into our workflows?

### *Recommendations*

The additional of 3-D modeling should fit into your established procedures with minimal change and disruption. But there are some guidelines which can improve your experience and provide best efficiency. These recommendations revolve around the best use of 2-D DGN models and 3-D DGN models.

- Use 3-D DGN models for Survey and keep survey in a file by itself. Survey data can be processed in a 2-D model, however Survey data is, by its nature 3-D and it is thus natural to use 3-D models. More importantly, by using 3-D models, the user can take advantage of visual cues to analyze blunders such as spikes in the terrain model.
- When making your DGN file for a corridor, start with a 2-D DGN model. This might seem a little counter intuitive at first, but remember that corridors will create a


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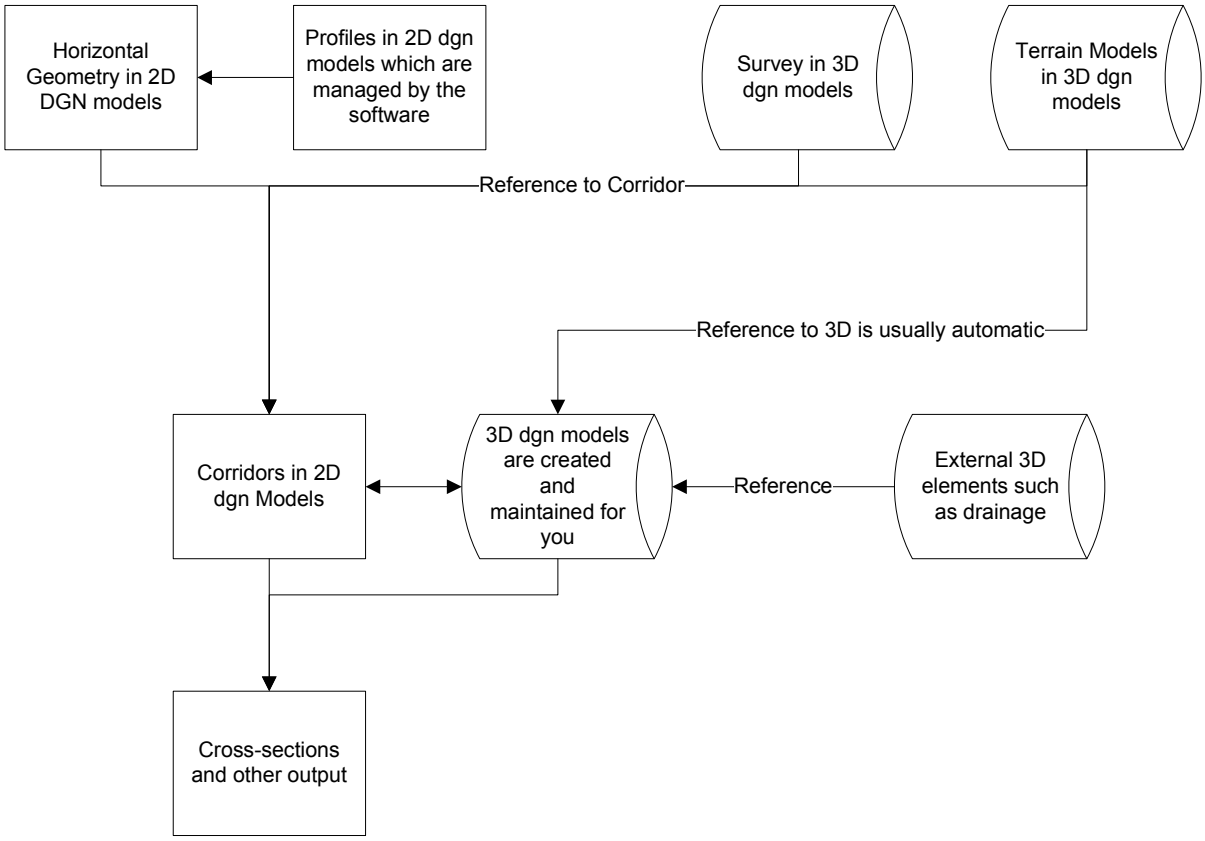
great amount of data that inherently consists of 2-D and 3-D elements. Starting with a 2-D DGN model provides much more efficient ways to isolate the 2-D from 3-D artifacts produced. As noted above, a 3-D model will be created automatically to construct and house the 3-D based elements from corridors.

- Terrain models are naturally 3-D elements and thus 3-D DGN models are recommended. 2-D models can be used, and there might be good reason in some situations for doing so. However, by starting in a 2-D model the actual terrain will be stored in an automatically created 3-D model and referenced to the 2-D model. This can be a valid workflow but may introduce a bit of confusion among your designers.
- When you start to create corridors, you will need to make sure that your alignment(s) and any targeted surfaces are referenced to the corridor DGN file.
- When making cross-sections, you may need to add additional references to the corridor 3-D DGN models to insure that all objects are correctly shown in cross-section. Most of these will already be referenced if you followed the guidelines above, but if there are 3-D designs which were created external to the civil toolset (such as drainage) then you will need to manually reference these in to the active 3-D model so that they will appear in cross-section.





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## SURVEY DGN FILES

**Situation:** When working with survey data, what's the best practice for 2-D or 3-D?

Generally, survey data can be placed in a 3-D MicroStation file or model. This facilitates the creation and placement of terrain models, drainage data, and other survey features where the elevation is important.

However, keep in mind the limitation if you are working with horizontal geometry. Horizontal geometry utilizes 2-D elements, therefore, if you are using existing alignments or edges of pavement, you may want to flatten your 3-D survey file into 2-D for usage of those particular elements.

## 2-D VS. 3-D MODELING

**Situation:** When modeling, what is the best practice recommendation with regards to whether I should work in 2-D or 3-D?

Keep in mind that when you are modeling, you will be creating both 2-D and 3-D elements. For example, if you are allowing your template to create your horizontal geometry, these elements would be created in 2-D. Other elements are also created as 2-D, such as the element handlers that delineate the outline of the corridor and template drops thus allowing you to pick and use of Context Tool bars. At the same time, we'll of course be creating 3-D line strings and mesh elements to represent our 3-D model.

At the same time, users have the option of working in a 2-D or 3-D DGN model. Let's take a look at the workflows with each.

2-D – When working in a 2-D DGN model, all 2-D elements would of course be displayed in this model. In order to display the 3-D elements, a separate 3-D model (e.g. Default-3D) would be created for the user automatically and the 3-D elements displayed there. This allows the user to work in a dual environment, so to speak. They can even have both views open at the same time and see how changes in 2-D are reflected in 3D.

3-D – When working in a 3-D DGN model, both 2-D and 3-D elements would be displayed in this same model. The 3-D would be displayed at their proper elevations, while the 2-D elements would be flattened and displayed at a "0" elevation.

### *RECOMMENDATIONS*

The use of the 2-D DGN models for modeling corridors allows the separation of elements and objects based on how they need to be depicted in the DGN. The 2-D DGN model contains the Corridor objects with its appropriate 2-D geometry, construction graphics, and access to selections and context menus, while the 3-D model containing the resultant 3-D breaklines, components meshes, and any other 3-D entities required for the basis on your design. The flexibility the 2-D and 3-D model approach provides will aid in view management and graphics selection, which benefits Visualization, Dynamic Cross Sections, and will aid in Cross Section Sheet generation by organizing the data via the DGN model.

The 2-D model that contains the corridor serves as an environment that the Engineer can construct the desired roadway facility with the Corridor tools. However, isolating the 2-D geometry , created from template points, has another important advantage. The new Civil Cell technology then can be used with the 2-D geometry artifacts created by the corridor. This allows dynamic interaction between Civil Cells and the Corridor. So for example if a civil cell used to create an intersection off the edge of pavement of a corridor and then the corridor lane width changes from 12' to 14', the


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template geometry would update from the corridor edit, thus triggering the Civil Cell used to create the intersection to also reprocess and heal to reflect this change to the corridor. The Geometry created from the corridor main purpose is to provide visual cues during design and more importantly support the use of Civil Cells.


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# Workspaces and Resources

## Overview

A workspace is a custom MicroStation environment or configuration. By selecting a workspace, you customize your Civil product (and MicroStation) for a specific discipline, project, or task. The workspace contains directories (or pointers) for DGN files and libraries, seed files, cell libraries, symbology resources, configuration variables, etc.

A fully functional workspace is essential to the success of the integration of our V8*i* (SELECTseries 3) line of Civil Products. Along with the release of our newest product line, we have introduced several new configuration variables to assist in managing a robust workspace.

## Getting a Jump Start

**Situation:** What's the fastest way to get everything set up so I can start working in SELECT series 3? Do I need to develop all my resources from scratch?

### *Recommendations*

If you don't have a workspace already created, or need some of the resources, the easiest way to gain familiarity is to use the *Examples > Bentley-Civil-Imperial* or *Examples > Bentley-Civil-Metric* workspaces which are installed by default. You can use the entire workspace, or select various components. You can also modify them to fit your own needs, usually easier than starting from a blank slate. In MicroStation Manager select the User entitled "examples" then select the Project "Bentley-Civil-Imperial" or "Bentley-Civil-Metric". Lastly, select the Interface "Bentley-Civil". Note in the "Bentley-Civil" Interface some of the function key settings you may find useful customized for this example workspace.

## Creating a Workspace

**Situation:** I need to use my organization's current workspace. What areas do I need to address?


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### *RECOMMENDATIONS*

Many new considerations must be taken into account when developing a workspace for V8*i* (SELECTseries 3) Civil Products.

Suggested considerations may include but not limited to:

| TOPIC | DESCRIPTION |
|---|---|
| Features | Features are discussed in Chapter 5 of this document. Features are to be created in a DGNLib. Features can either point to a Native style within a DDB, XIN, or PSS file or utilize Element templates or a combination of both. |
| Native Styles | Established by an InRoads XIN file, GEOPAK DDB File, or a MX PSS file, the intention is to enable the user to re-use prior product setup to establish drafting standards. A link is established through Project Explorer to these Native Settings. The Native Style file used for each product would use configuration variables specific to the particular product in question. |
| Element Templates | Element Templates are used to control the symbology of Features, establish settings for the display of Terrain Model elements, and control the symbology of components in the Template Library. Element templates are created in a DGNLib, and typically would reside in the same DGNLib as the levels used within the workspace, although this is certainly not mandatory. |
| Project Settings | Project Settings encompass several items relating to Corridors and Survey. Project Settings control the following primary categories:<br>• Corridor Design Stages<br>• Linear Template Design Stages<br>• Survey Settings<br>Within each of these primary categories, there are several individual settings to be established for the design workspace environment. All Project Settings should be created in a DGNLib. |
| Graphical Filters for Terrain Modeling | Graphical Filters are used to specify symbology and or Features to be included for creating Terrain Models. Using these filters greatly simplifies the end user experience in the development of project specific Terrain Models. Graphical Filters should be created in a DGNLib. |
| Design Standards | Typically stored in a DGNLib, Design Standards allow easy access to radii settings, curve lengths, etc. for both horizontal and vertical design. Some general Design Standard DGNLibs have been already created and delivered with the product. AASHTO 2004, AASHTO 2011, and UK DMRB TD 9-93 have been included as part of the install process. |
| Superelevation | Standards used for superelevation calculations are stored in SEP or SRL preferences files. Organizations may have several SEP and SRL files for their standards, however only one file is used for each processing. The configuration variable CIVIL_SUPERELEVATION_RULES_DIRECTORY should be used to point to the folder containing these preferences. It is recommended to set this variable to a location on a central server or in ProjectWise. |
| Seed Files | Special requirement for GEOPAK users shown below regarding seed file settings. |
| XIN File | Traditionally this file is used for InRoads to store a vast amount of drafting standards information. In V8*i* SELECTseries 3 however, it will be used in a limited capacity for GEOPAK and MX as well. Three new applications will be introduced to GEOPAK and MX users allowing the ability to create cross sections from a Terrain model as well as annotate and compute their end area quantities. The settings for each of these three dialogs will be stored in a delivered XIN file. The configuration variable CIVIL_XIN_FILE should be used to point to the XIN file to be used for the workspace. Note for GEOPAK and MX users, a default XIN file will be created during the install process. |
| Survey Style File | This file can be either an exported SMD (XML formatted) file from GEOPAK or a XIN file from InRoads or PSS file from MX. If a valid file is not defined with the configuration variable CIVIL_SURVEY_STYLEFILE, the user will be prompted each time a file containing field book or survey data is opened. It is recommended to set the configuration variable to a location on a central server or in ProjectWise. |
| Template Library | The template library is used to store all of the components and templates to be used in the development of Corridors. The configuration variable CIVIL_ROADWAY_TEMPLATE_LIBRARY should be set to point to the appropriate Template Library. A considerable effort has been made in the example workspace to include several new examples for templates. This is a culmination of components and templates used by several large agencies. |


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| | |
|---|---|
| Civil Cells | Civil Cells are a collection of previously stored Civil objects that are created using rules that are flexible yet well-defined to use repeatedly in many projects. Civil Cells examples are included in the example workspace. Civil Cells are typically stored in DGNLib files making the Civil Cells easily accessible to the end user. |
| Dimension Styles | Dimension Styles are a saved set of dimension settings. Dimension Styles are typically included as part of all workspaces. This is nothing new to V8$i$ (SELECTseries 3) but should be part of the workspace development. |
| Text Styles | Text Styles are a saved set of text settings. Text Styles are typically included as part of all workspaces. This is nothing new to V8$i$ (SELECTseries 3) but should be part of the workspace development. |
| Custom Linestyles | Custom Linestyles are typically included as part of all workspaces. This is nothing new to V8$i$ (SELECTseries 3) but should be part of the workspace development. |
| Geographic Coordinate Systems | A Geographic Coordinate System specifies the position of your design contents on the earth´s surface. Once that position is established, the design can be easily coordinated with other data for which the geographic location is known. While this is a MicroStation capability, it is utilized extensively by the "Open Roads" technology. |

### *RECOMMENDATIONS*

In the example workspace, all of the above items have been established. It is a recommended best practice all of these listed items be defined and located through configurations within all workspaces.

## ELEMENT TEMPLATES

**Situation:** I am creating element templates. When should I use them in lieu of an item in the native DDB, PSS, or XIN file?

### *RECOMMENDATIONS*

It is suggested to start out with a few element templates and not convert your entire native file over. Terrain Model Element Templates are a good option, as are those for an alternate profile display.

Element Templates Advantages:

- Element templates can provide some more advanced capabilities such as material assignments for visualization, element transparency, element class and priority, which are not possible using native styles.
- Element templates allow access to text styles.
- Element templates have the ability to control terrain models, which can be especially helpful for Surface Feature Definitions

Element Template Disadvantages:

- Element templates lack the functionality to handle station annotations and other similar linear referenced computations and annotation.


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## SEED FILES

**Situation:** Are there any settings unique to Civil that I need to set in my seed files?

### *RECOMMENDATIONS*

In addition to typical MicroStation settings users are accustomed to, additional Civil seed file settings should be set within the ***Design File Settings > Civil Formatting*** category. One setting in particular, ***Station Settings > Equation*** needs to be changed to "By Index" for GEOPAK users. InRoads and MX users would leave the default setting of "By Name".

Another useful but not required change would be to turn off Clip Volume in all of the views. By default Clip Volume is on and when viewing 3-D models this setting limits what a user will see in their model.

Lastly, a pre-determined drawing scale should be set to coincide with the native control of stationing; for example 1"=50'.

## GEOGRAPHIC COORDINATE SYSTEMS (GCS)

MicroStation V8*i* contains numerous Geo-Coordination features which interact with OpenRoads. These features let you specify the position of your design contents on the earth´s surface. Once that position is established, the design can be easily coordinated with other data for which the geographic location is known.

Some of the most common GCS are:

- Latitude / Longitude
- State Plane (SPCS)
- Universal Transverse Mercator (UTM)
- Military Grid Reference Systems (MGRS)

However, Bentley supports a wide range of international systems, in addition to the ability to customize your own.

Historically, GCS were infrequently used, however, there are now numerous advantages to setting the GCS in your DGN files:

- DGN files based on different GCS (where the GCS is defined within the file) can be referenced and re-projected on-the-fly so the data is in sync.
- Interface with Google Earth and other widely available data regardless of the source data GCS.
- MicroStation interface with GPS devices.
- Survey and terrain data can have one GCS for source data and another for the created objects without additional steps needed for transformation / reprojection.

**Situation:** Should I set the GCS in my seed files, so the user doesn't have to do it?

### *RECOMMENDATIONS*

The best practice for setting GCS in seed files is based on the number of GCS systems used by your organization. If the organization utilizes a single system, then it should be set in the seed file. Edit on One example would be if your organization utilizes a state plane coordinate system. However, if your organization utilizes several systems, you would have to set up one for each system thereby


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increasing the number of seed files. In this case if you have several systems, you may want to not set it in your seed files and so your users how to set up themselves, minimizing the number of seed files based on GCS.

**Situation:** If I set the GCS in my seed files, should I make it transparent to the user?

### *RECOMMENDATIONS*

Even if you set your GCS in your seed files so the users don't have to, it is still prudent for them to understand what the GCS is and how to use it. This is so when they bring in different types of data they know how to get them all in sync. For example, their survey data may be in one GCS while drainage information may be in another and external data such as Google Earth may be in the third GCS. If they understand how GCS works, they can bring all the data together and it will overlap properly. If they don't understand how to bring the data in, they may have issues with the data not lining up properly.

**Situation:** There are many projections I never use. How can I streamline the list, so my users only have to look at the ones that are pertinent to our organization?

### *RECOMMENDATIONS*

Since you can't delete the unwanted GCS, the best practice is using favorites. There are two options:

- The simplest approach is to simply right click on the top level of the Favorites file icon and select "Create New Subgroup" to create a folder beneath it. You can make further subgroups in the hierarchy as well. This option is the best if the organization has numerous GCS and wants to organize them.
- The other is to put multiple favorites files in the MS_GEOCOORDINATE_FAVORITESFILES configuration variable, with the file names separated by a semicolons. This may be the better option if there are only a few GCS used, or by a consultant who wants to set the GCS for a particular customer in their workspace.

## CONFIGURATION VARIABLES

**Situation:** Are there new configuration variables for SELECT series3? Where can I find them? Do I need to use them all? What are the most common variables, or where I can see the most important ones?

### *RECOMMENDATIONS*

There are more than 20 new configuration variables for the V8*i* (SELECTseries 3) release. A list of the configuration variables and appropriate settings can be found in the online help. You may want to begin by reviewing the example workspace as many of the variables are utilized there. Note that it is not necessary to define all 20, you may only use half a dozen. Therefore, the best practice recommendation is:

- Review the variables in the example workspace, and add those that are appropriate to your organization.
- Review the help file to determine if any additional configuration variables are needed.
- During your pre-deployment testing, review the list with your beta testers to determine any additional variable needs and add accordingly.


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## DESIGN STANDARDS

**Situation:** Can I set up my design standards in any DGN Lib? Do working units impact design standards?

### *RECOMMENDATIONS*

Yes, you can set up design standards in any DGN Lib, however, it is recommended to set up your design standards in their own DGN Lib. Working units do impact design standards, therefore, the DGNLib containing design standards should utilize the same working units of the seed file of your users. If the working units are different, the numbers will have slightly different values. For example, if the design standard has a radius of 500 master units, and it's utilized in a file with different working units, the radius may be 500.1 master units. Therefore, it is recommended that the design standards DGN Lib file utilize the same working units to avoid these slight deviations. It is also highly recommended that you set the working units prior to adding in any design standards. If not, the values are automatically adjusted when you change the working units.

**Situation:** Can I set up more than one set of design standards in a single DGN Lib?

### *RECOMMENDATIONS*

Yes, more than one set of design standards can be located in a single DGN Lib. Each set of standards would have their own set of folders underneath the vertical or horizontal folders. Keep in mind, however, that the vertical standards must all use the same Vertical Curve Parameter Format setting, either K-value or R-value. If you need standards that require both of these settings, each must be stored in a separate DGNLib. This is due to the fact that the Vertical Curve Parameter Format setting is based per file, not per standard.

**Situation:** Can I use my SELECT series 2 horizontal design standards, or do I have to re-create them?

### *RECOMMENDATIONS*

You can reuse your horizontal design standards, just open the file and you are prompted to upgrade. Once the file is upgraded, you can add your vertical design standards and then link to the previously created horizontal design standards.


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# Features

## OVERVIEW

Feature Definitions can be created either manually or by linking to a native standards file (.DDB, .XIN, .PSS). When created, a Feature Definition can be defined as one of three types; a Point Feature, a Linear Feature or a Surface feature. Depending on its type, each Feature Definition allows itself to be symbolized differently based on where it will appear and what it represents. For example, a linear feature can be symbolized one way in a plan view, another way in profile and a completely different way when appearing in 3D.

Below is a list of the different symbolization options allowed for each feature type.

*Linear* Feature

- Plan
- Projected Profile
- Intersected Profile
- Profile
- Cross Section
- 3D

*Point* Feature

- Plan
- 3D

*Surface* Feature

- Profile
- 3D

In order to define the symbolization for each of these options, the user is allowed to designate either a native style or a MicroStation Element Template (the only exception to this is the Surface > 3-D definition, which only allows an Element Template).

## CREATE FEATURE DEFINITIONS

Situation: When should I consider using element templates instead of linking to a native style?

### *RECOMMENDATIONS*

A good rule of thumb is if the Element Template provides you all the functionality that you need for a particular feature definition, by all means feel free to use it. However, if the native style gives you extended functionality that is required by a particular feature definition then you will need to use the native style until such time as that functionality is added to the Element Templates.


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- For example, any feature definition which provides for automatic annotation of alignments must always link to a native style for plan view setting, as the Element Templates do not contain stationing functionality at the present time.
- Template Geometry setting of <True> allows creation of 2-D geometry when a Feature Definition is applied to template point that is used in a Corridor or Linear Template. This geometry can then be used as references with placement of Civil Cells.
- For a linear feature definition in the 3-D setting, there will probably be an immediate advantage for exploring the use of an element template instead of using the automatically linked native style. The automatically linked entry will usually be the same item linked for plan. Consider a feature definition for an edge of pavement. The plan view display will probably be a middling line weight and more or less vibrant color because the edge of pavement is usually quite important in our designs. But in a 3-D model, you may not want the 3-D line string to be so bold. Thus, this would be an excellent quick change to create an element template of muted color and weight so the 3-D model is not dominated by the 3-D line string. As a first quick fix, you could create a single muted element template and assign this to the 3-D setting for pretty much every feature definition.
- The intersected profile setting of a linear feature definition might also be a candidate for early consideration for an element template, because you can define a cell to be placed by the element template, which will be more easily visible in profile space when line weights are turned off.

***Note*** When importing a MX PSS the intersected profile automatically creates and uses a default element template that defines a cell.

## TERRAIN MODELS

**Situation:** Is there anything related to terrain models that impact whether I use element templates or linking to a native style?

### *RECOMMENDATIONS*

Terrain model feature definitions must use an element template since element templates are the only way to configure settings for contours, triangles and etc. Depending on your native product (GEOPAK, InRoads or MX) you may get some surface feature definitions as a result of linking to the native file. If you do, then for those which correspond to usage in actual terrain model elements, create and assign element templates so that you can display contours and such. If you do not get any surface feature definitions (GEOPAK users will not) then you will need to create the feature definition manually and designate the appropriate element template to be used.

## MESHES

**Situation:** Is there anything related to meshes that impact whether I use element templates or linking to a native style?

### *RECOMMENDATIONS*

When modeling and applying templates, 3-D surfaces will be created as Mesh elements. You can use the linked surface feature definition or element templates. As mentioned above, best practice will depend on what you get from the link process. For example, InRoads and MX # will get some surface feature definitions from linking that will work straight-away after linking. GEOPAK users will not and


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will need to manually create the feature definition and designate the appropriate element template to be used. Element templates are especially beneficial in this area since material definitions and assignments can be automatically created as part of the template. Thus, when the mesh element is drawn as part of the modeling process, the materials will automatically be visualized in the 3-D model.

***Note*** # MX triangulation stylesets (pts) will create Element Templates for any group codes or general features and will use the styleset table header to define the basic style properties used by the element template.

## CHANGING NATIVE STANDARDS FILES

**Situation:** What are recommended best practices regarding changes to my native standards file?

### *RECOMMENDATIONS*

When your native standards file (DDB, XIN or PSS) changes, do not start over by deleting the feature definitions and then re-linking.

- If you have added new items in the native file, simply open the DGN library and click Link again. New items will be added as feature definitions and existing feature definitions will remain intact.
- If you deleted items from the native library, simply delete the corresponding feature definition in the DGN library.
- If you merely changed symbology settings in the native file, you need do nothing else. The changes will be reflected in all new elements. Existing elements will need to be edited to force symbology redraw.


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# Civil Geometry

## OVERVIEW

In V8i SELECTseries 3, both the horizontal and vertical geometry no longer live in an external database but now reside in the DGN file. This of course means that users now have options of how to use those DGN files to separate their geometry.

In addition, although Civil Geometry functionality is extremely robust in V8i SELECTseries 3, the native geometry database files will have to exist for a period of time in order to integrate with older functionality such as Labeling, Plan & Profile Generation, etc. Therefore, it will be necessary to export to the native formats sometime within the design process. As such, the users need to be aware of the recommended best practices when it comes to importing from and exporting to the native database formats.

Consideration should be given to the active DGN model when importing native Geometry.

## IMPORTING LEGACY COORDINATE GEOMETRY

**Situation:** What do I need to be aware of when importing certain geometry from native COGO databases (ALG, GPK, FIL)?

There are some limitations when importing geometry. These include:

- Can't bring in extremely complex geometry. See the Known Issues document for specifics.
- Can't bring in profile only (must be associated with a chain).
- You can only import within a product; GPK can only be imported with GEOPAK or Power GEOPAK, ALG can only be imported with InRoads or Power InRoads and the FIL can only be imported with MX. To utilize the data within a different product, export to XML, and import into the desired product.

### *GEOPAK RECOMMENDATION (GPK)*

Featurize your geometry within the classic GEOPAK COGO Navigator prior to importing. Then use the COGO Feature (matching your (SELECTseries 3) feature definitions) to draw in the desired symbology.

### *INROADS RECOMMENDATION (ALG)*

No recommendations at this time.

### *MX (FIL) RECOMMENDATIONS*

MX geometry is provided in two linked parts - the M and G Strings. When importing MX geometry, only the G-String is imported since this holds the true horizontal and vertical geometric representations. The M-String is treated as a 3-D linestring on import, just in the same as any other


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feature string in MX, so if a modified profile has been applied to the M-string then it will need to be imported as separate element.

***Note*** When creating feature definitions only the MString is required to be mapped and the associated G String is created Automatically when exported back to MX.

All geometry import / export options are recorded to the MX project log.

By default MX operates in its own MSTN model and manages its own graphics. The user may redefine this by changing the variable MX_ACTIVE_MODEL = ?? in the MX.cfg or in pcf. The default seed files shipped with MX provide a separation between the MX design model (ideally 3D) and the civil models. The default seed files that MX provides include DGN model structure that is suited to maintaining the MX design model separately by referencing to the 2-D planametric geometry model and its associated 3-D model.

Given that it may not always be possible to create 'Ruled' geometry on import, an option has been provided to import the native ASCII geometry files used in MX – Halgn, Valgn Verat. With AutoExport enabled for these files will create Civil Geometry, write to the MX Log create associated M & G Strings in MX model.fil.

## IMPORTING COMPLEX GEOMETRY

**Situation:** Some of the horizontal and vertical geometry I imported doesn't have edit handlers. What not? What then is the recommended best practice on editing this information?

### *RECOMMENDATIONS*

There are instances when the geometry is too complex to import. Specific information can be found in the Known Issues document. The horizontal and/or vertical alignments will still be imported. However, the alignments will not contain 'civil rules' and therefore will not have the element handlers that allow the user to graphically edit the data.

## EXPORTING HORIZONTAL AND VERTICAL GEOMETRY

There are two options available to the user when exporting geometry to a native database; Manual and Automatic. Using the Manual method, you simply identify the elements, either individually or using a selection set, that are to be exported. The Automatic method is based on the feature definition. You can enable the "Auto Export" option for particular features definitions. Then any civil element that is assigned this feature definition will automatically be exported to the designated native database. For example, you may choose to have all elements with feature definition = "CL" automatically exported, while any elements with feature definition = "EOP" may not be.

**Situation:** What are the recommended best practices on what should be exported?

### *RECOMMENDATIONS*

You do not need to export everything. What is exported will vary organization by organization based on their workflows and even how much of V8i SELECTseries 3 functionality is implemented. But a good rule of thumb is that you should only export civil geometry elements that will serve a purpose in the native database.

Below is a list of possible options of what types of civil geometry should be considered when choosing what to export:

- Centerlines and Baselines


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- Right of Way when needed for plats, parcels and other geometry layouts
- Survey data needed for the GEOPAK export to drainage application
- Data needed for staking when using GEOPAK as the native application

**Situation:** Are there any 'foundational' issues to be aware of when exporting civil geometry data to a native database and are there any recommended best practices in dealing with these issues?

### *RECOMMENDATIONS*

The main issues to be aware of when exporting civil geometry are any limitations that may exist in the native database. Below are potential issues and recommended best practices.

In civil geometry, horizontal and vertical geometry can exist without a name. However, this is not true in the native databases. So a best practice is to always name your civil geometry in order to ensure that it can be exported properly to the native database.

Also, depending on the civil product being used, the native database may have naming limitations, either in the length of the name or characters which are not allowed in names. Depending on the limited characters set, a best practice is to make sure users are aware of these naming restrictions and name their civil geometry accordingly.

## AUTO EXPORT OR MANUAL EXPORT?

**Situation:** What are the recommended best practices on whether I should use Automatic or Manual exporting?

This is not a "one size fits all". The best practices can and will vary by organization and by need, so let's first examine the advantages and disadvantages of each method.

| | ADVANTAGES | DISADVANTAGES |
|---|---|---|
| Auto Export | No additional steps are required. The element is persisted (exported) to the native database immediately as it's created. Other than choosing the native database to be used, the process is fairly invisible to the user.<br>Allows for horizontal station annotation as the element is created.<br>The civil element is immediately available in the native database for other workflows that may require it.<br>The element in the native database is always updated with every modification to the civil element. In other words, the native database is kept "in synch" with the civil geometry in the DGN file. | An inattentive designer could delete or modify civil elements and thus create unintended changes in the native database.<br>The process is not design file specific. If you make a copy of civil geometry elements that are persisted to a native database and then delete or modify those elements in the new DGN file, those changes will be reflected in the native database.<br>The process is not bi-directional. Changes made to civil geometry elements are automatically updated in the native database, but changes made in the database are not automatically reflected in the civil geometry. |
| Manual Export | User chooses exactly which elements are exported and when so they are in full control. Unintended or accidental changes are virtually eliminated<br>Does not depend on feature setting. Elements are exported based on their selection and regardless of their feature definition. | Changes to civil elements are not automatically updated in the native database, requiring extra step to export.<br>Manual export is a snap-shot of the current state of the civil model. Therefore additional changes to an element that was already exported would require an additional export to move these changes into the native database.<br>Auto annotation is not supported. |


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### *RECOMMENDATIONS*

Keep in mind that this is not an "either/or" proposition. You may choose to use Auto Export for certain feature definitions, but this does not prohibit you from manually exporting civil geometry whenever you choose.

Our best practices recommendation would be as follows:

- If you want to use Auto Annotation in order to station your centerlines and baselines when they are created, then you have no choice but to use Auto Export for these particular feature definitions.
- Minimize the usage of Auto Export. Only use Auto Export for feature definitions that you know for sure you will need in the native database. Although an automatic method may seem a more elegant solution than a manual export, certain workflows can cause unintended changes in the native database, as seen in the disadvantages listed in the above table. The manual method may seem more ungainly, but it leaves the user in complete control.

## USING EXISTING DATABASES

**Situation:** What are the recommended best practices on using an existing native database? For example, I have an existing geometry database that I'm using to import civil geometry … should I export back out to that same database?

### *RECOMMENDATIONS*

No, it is not recommended that you export back out to the same database. If a user is not careful, this could inadvertently cause original geometry elements in the database to be overwritten. Therefore we recommend that you create an empty or new native database and use this new database to export to.

## AUDIT TRAILS IN MX

**Situation:** My MX deliverable to clients requires I maintain an audit trail, how can this be achieved with the SELECTseries 3 tools?

### *RECOMMENDATIONS*

MX input file workflows are recognized as being common practice and a requirement. To assist in transitioning to the new tools, import and export history for Civil Geometry and Terrains is maintained in the MX project Log file. The commands used can also be used to drive Civil Geometry and Terrains from input files so that the benefits of the new tools can be utilized in conjunction with leagacy tools.

Complementing the import / export log entries for geometry, the associated linemode code for Halgn, Valgn and Verat are also written to the log. Additionally the most current Halgn, Valgn and Verat files are written to the MXData folder whenever horizontal and vertical geometry is exported back to MX.


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# Terrain Models

## Overview

In SELECT series 3, the terrain model is stored in a DGN file, not in an external file. Therefore, the management of terrain models differs from previous versions. The DGN file containing the terrain model can be referenced to other DGN files or models. Different types of data can be combined into a single terrain model using the Complex Terrain tool.

## Using Legacy Digital Terrain Models

**Situation:** Can I use legacy Terrain Models from earlier versions directly or do I have to convert?

### *Recommendation:*

The Import Terrain tool supports the native products file formats GEOPAK TIN/DAT, Inroads DTM and MX .Fil as well as a variety of other file formats. No conversion is needed.

## Importing Large Amounts of Data

**Situation:** I have been provided with a large amount of data. How should I initially import it for review?

### *Recommendation*

When initially working with potentially large data, it is advisable to minimize the overhead of graphical display to help maximize performance. In these situations it is a good idea to use a feature definition that initially just displays the boundary as this will be the quickest display method.

## Create Terrain Model from Graphics – Link or Not?

**Situation:** I create a terrain model using Terrain Model by Graphic Filter. Should I use Link or Don't Link options?

### *Recommendation*

The link option maintains a rule from the elements to the terrain and automatically updates the Terrain if the element changes. So whether to link to features or not depends on whether you expect the extracted data to change and the size of the dataset.
For example, in many workflows, this command will be used to make a terrain model from graphic data supplied from aerial survey workflow. In these situations, the graphic data is unlikely to ever change since the aerial survey team has finished and moved on to other projects. In this situation, it is better to not link since the terrain will perform faster without it. If the external data file does change the Terrain itself, it can be updated by 'Updating from source file'.
In the same aerial survey scenario, though, you may sometimes be faced with a situation where some of the aerial graphics get deleted and replaced by survey data. If you link the features, then when you delete the break lines in question the terrain model will update. However, depending on


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the size of the terrain, it might still be faster to re-extract the new set of break lines rather than carry the overhead of the linked features.
If the graphic dataset it large, then it will usually be better to not link and rely on the external file rule update option.
Even if the overall size of the resulting terrain is relatively small, if the total number of graphical elements is large, then it will be better to Not Link.

***Note*** The 'Add element to Terrain' command automatically uses the 'link' option. This is especially useful in dealing with local / detail level geometry as the terrain will dynamically update to reflect geometric changes. This principle is utilized in the production of Civil Cells representing the complete 3-D model – Geometry, terrain, area templates and linear templates.

## CREATE TERRAIN MODEL FROM DTM FILE – IMPORT FEATURES OR NOT?

**Situation:** I created a terrain model by importing an InRoads DTM file, should I import features?

### *RECOMMENDATIONS*

Whether to import features depends on whether you need those features for downstream design process and the size of the dataset.
The DTM file might contain features that you need for the design process, such as edges of pavement that are to be targeted by a corridor. If this is the case, then you might consider importing the features. However, if the features are available in a form apart from the DTM, such as DGN graphic elements, then it might be preferable to use the graphic elements instead of import features because the import features process can be processor intensive.
If it is known that the number of features in the DTM is large then it will be preferable to avoid import features since the process to import many thousands of features will be very long.

## CREATE TERRAIN MODEL FROM MX.FIL FILE

**Situation:** I want to create a terrain model by importing existing data from the model.fil. Should I import the string model or the Triangulation?

### *RECOMMENDATIONS*

Both MX model types can be imported. When importing a MX string model, support is provided for MX string masking to exclude certain features. When importing MX Triangulations the triangulation structure is preserved through into the resulting terrain.


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# Modeling

## Overview

With V8i SELECTseries 3, for the first time modeling becomes modeling. What we mean by that is whereas in previous versions corridor and non-corridor modeling workflows were distinct and separate, with the new OpenRoads technology they are now integrated for the first time. Whether you use corridor related tools or non-corridor related tools, the end results is that you are working on the same DGN model. In effect, you are enabled to use the tool that best fits the modeling situation.

The model becomes the focus of your design, and cross sections are now cut directly from the DGN model. This process is literally a WYSIWYG, in that if you draw it or reference it into the 3-D model, then it can be displayed on the cross sections.

The power behind the above mentioned workflows is the fact that all civil elements – the terrain, the corridor, the geometry, the 3-D model - do not exist externally but only in the DGN file. This allows us to not only integrate modeling methods and cut sections from a final DGN model, but it also allows us to federate our data into reference files and even target and clip against MicroStation and Civil elements in other DGN files.

## Use of Reference Files

**Situation:** What are the recommended best practices with regard to my corridor in relation reference files and project setup?

### *Recommendations*

Since corridors and models now reside in a DGN file, this allows us to break up our projects into multiple sections. For example, if you had a project that was 20 miles long, you could break it up into 4 separate DGN files of 5 mile sections. Whether you do this or not depends on two parameters; the size/complexity of the project and the number of users who will be working on it.

Just because a project is long does not necessarily make it large and complex, just as a shorter project does not necessarily mean that a project is small and simple. The complexity of the geometry and the templates has a large impact. In any case, using shorter sections makes the corridor easier to use and more efficient in processing, something to be taken into account when determining how to set up your project.

Another consideration is the number of users who will be working on the corridor. If you are a single user on a project, then this would not be a factor in whether you break up the corridor into multiple DGN files. However, if you are working on a team where multiple users will be working on the corridor, breaking it up into sections will allow multiple users to work on it at the same time.

Again, you can see that there is no “one size fits all” recommendation that fits all projects. With that said, our best practices recommendation would be as follows:


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## LONG PROJECTS

Situation: Is there anything I need to be aware of for lengthy projects?

### *RECOMMENDATIONS*

Turn off color fill for superelevation and use the boundary only option. It is not sufficient to turn off the display in View Attributes. This setting can be found in the Project Modeling

## SUPERELEVATION

Superelevation calculations use either a SEP file or a SRL file. In lieu of calculations, a comma separated values file (*.csv) can be imported, which contains station and transition data. Examples of both of these formats are delivered as part of the install process. In the workspace, the variable (CIVIL_SUPERELEVATION_RULES_DIRECTORY) should point to the folder containing the superelevation configuration files. Superelevation lanes can be edited dynamically or via table. Once the superelevation lanes are developed, they can be assigned to the corridor. It is important to note that a new superelevation setting must be toggled on within the template library for points to be considered for superelevation.

**Situation:** Do my superelevation lanes need to be in the same DGN file as the corridors?

### *RECOMMENDATIONS*

No, superelevation lanes do not have to be in the same file as the corridors. In fact, on larger projects it is desirable to have the superelevation data in its own file and then referenced to the geometry and corridors.

**Situation:** I have my superelevation lanes completed; however, I can't attach them to the corridor. Any suggestions?

### *RECOMMENDATIONS*

Keep in mind when attaching superelevation to corridors, you must be in the corridor DGN file and have the superelevation lanes referenced. This is because when you assign the corridor, you are changing the corridor by adjusting the pavement slopes. Therefore you must write capabilities during this process.

**Situation:** How can I remove superelevation from a corridor without actually deleting the superelevation lanes?

### *RECOMMENDATIONS*

To delete superelevation from a corridor without deleting the lanes, delete the point controls associated with the superelevation lanes. This can be done from the Point Control or Corridor Objects tool.


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## DYNAMIC CROSS SECTIONS

**Situation:** Why can't I see my temporary dimensions lines sometimes?

### *RECOMMENDATIONS*

Temporary Dimension lines only work in dynamic sections created from corridors, and will only work on the selected corridor, not other corridors. It will not work if the user selects an alignment to open the Dynamic Sections, Corridor Only.

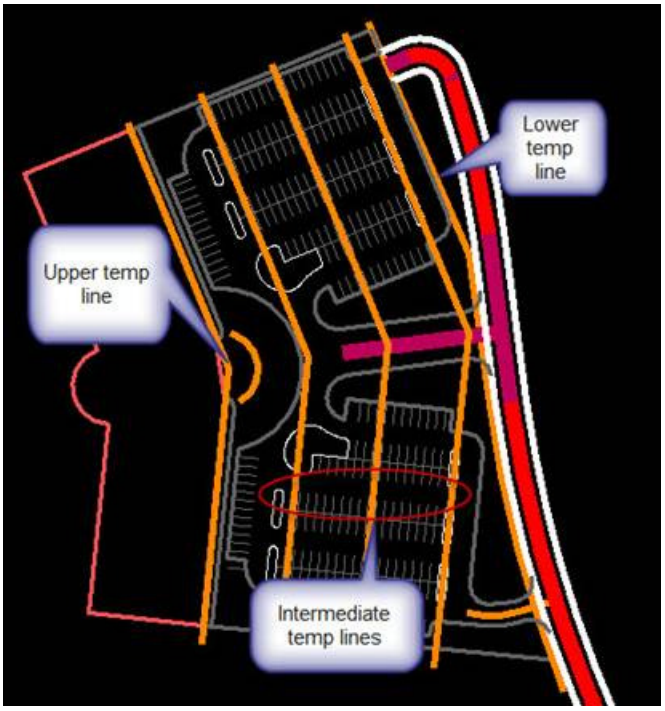
## SITE MODELING

**Situation:** Are there any limitations using temporary terrain models when doing site work?

### *RECOMMENDATIONS*

There is a limitation that will affect site modeling workflows and probably some road workflows as road designers increasingly embrace site modeling workflows for intersections, ponds and such.

My goal is to design a parking lot. I am developing a temp terrain model so that I can drape parking lot elements onto it.




1. The upper line for the temp terrain is defined as a vertical offset form the build pad. The lower temp line is defined as a slope from roadway.
2. Theoretically these two lines will define a surface onto which I can drape parking lot elements. But, as is often the case, the resulting terrain will exhibit jags in the contours because of the differences in horizontal and vertical geometry and thus the stroked points on the lines will not line up exactly and jags result. This is normal.
3. So, what I do is add the intermediate lines so that you can add more data points and thus smooth the surface. The intermediate lines are defined as an extension slope between the upper and lower temp lines. This results (as expected) with a jaggy profile. It is expected because the extension slope method will theoretically result in more or less identical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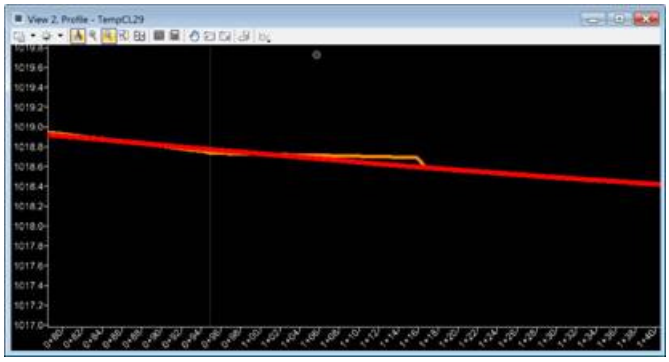
elevations as would result from the original triangulation where only two lines were used to form the terrain.

Thus the next step is to use the intermediate extension slope as a guide to define a smooth profile and thus smooth the terrain. Below is a segment of the jaggy profile (orange) which has been smoothed (red).



4. This is where the limitation is found. When you build the smooth profile, intuition suggests that I would snap to key points in the jaggy profile and add some curves and thus make a smoother profile. But you can't do this, if you snap to **<u>any</u>** element in the jaggy profile or any other projected profile from the roadway, then when you try to add the smooth 3D element into the terrain you get a cyclic redundancy error. This is because:
    a. The lower temp line is derived from the centerline and added to the terrain.
    b. The jaggy line is derived from the lower temp line
    c. The smooth line is derived (by way of snap) to the jaggy line.
    d. Thus the terrain rejects the smooth line because it thinks there is a redundancy with step a.

5. Theoretically, there is a redundancy but it means that I must be very careful to define the smooth line without any sort of snaps and without any other relationship back to either the upper or lower temp lines. Thus, if anything ever changes with the upper and lower temp lines (i.e., if the road profile changes or if the building pad elevation changes) then my terrain model will never update properly because there is no relationship, design intent is absent. I must be careful and remember to go back and edit the red smooth line for the intermediate temp lines.

    There is an alternate workflow whereby I would create the intermediate temp lines by "tracing" horizontal alignment overtop of a jaggy contour, then assign a fixed elevation to the horizontal element. This is a somewhat easier workflow but still is absent design intent, because if I snap to any part of terrain or use the terrain in any way to define either horizontal or vertical geometry, then a similar cyclic redundancy error will occur.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# Civil Cells

## Overview

A civil cell is a new geometric concept that allows the use of pre-configured, commonly used 2-D and or 3-D geometric layouts to efficiently create new layouts. The process preserves and carries forward all the design intelligence used in the initial civil cell creation to the new implementation. This is achieved by combining the standard graphical repeatability of MicroStation Cells with OpenRoads Intelligent Geometric Design capabilities. Civil Cells are stored in and distributed by DGNLib files for re-use across multiple projects.

MicroStation Cells provide a means of repeatedly drawing the same objects from a library. In Civil Design we have predefined geometric standards / layouts that we typically redesign for each use, but in reality often they only require minor modifications for each new instance.

Wizards are inherently limiting and only capable of handling the pre-programmed situations. Once a situation is encountered that a wizard can't address, then its use becomes mute and alternative manual methods are required to create the address the need. Civil cells address this primary limitation and allow greater flexibility than a standard wizard approach.

Civil Cells capture the designers' decisions from the outset and reuses these in the placement and allow for real time geometric modifications to create another instance of the objects that can be reused later.

## Civil Cell Make Up

Situation: Civil Cells are new, where do I start?

### *Recommendations*

Civil Cells are a new Bentley technology powered by OpenRoads. They combine all aspects of OpenRoads technology and are aimed at improved productivity through delivery of commonly repeatable geometric constructions required in infrastructure delivery as 2D geometric layouts through to full 3D visualization ready geometric layouts and can be considered as an intelligent visual geometric macro.

Consider where time is spent on repetitive geometric tasks and initially invest in building 2D civil cells to speed up the layout process. Time invested here getting to grips with the rules and relationships governing civil cells will pay dividends the complexity of the civil cells grows by the addition of vertical geometry, terrains, area templates, linear templates. In essence start small to gain an appreciation of the basic building blocks.


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Situation: I have an existing design that was created using civil geometry, can I make a civil cell from it?

### *RECOMMENDATIONS*

Civil cells capture the rules and relationships built from horizontal and vertical civil geometry, and associated terrains, linear / area templates. Insitu designs are typically built to solve that situation only and consideration on how they could be used and updated when applied elsewhere. Insitu designs may provide additional fixity through snaps to survey or other design elements that will translate as an unresolvable XY location in other situations.

Consider building the base geometry in a separate file.

Situation: I have a civil cell placed in a live design that I've modified. How can I create a new deployable civil cell including the modifications?

### *RECOMMENDATIONS*

As long as the rules and relationships are intact and have not been unlinked to give unresolvable geometry, the modified civil cell can be referenced into a new or existing DGNlib and placed on corresponding new reference geometry. The new instance can then be renamed and subsequently modified for general distribution.

Situation: I have multiple clients that require different symbology and features. How can I cater for this with civil cells ?

### *RECOMMENDATIONS*

The civil cells carry their feature definitions with them. If new symbology is required each feature will need to be remapped to the new feature or style.

Situation: Are there any constructions that should be avoided when building civil cells ?

### *RECOMMENDATIONS*

The most common constructions that will fail when applied in new situations are those relating to elements start / end / length properties. While they are located on the element they provide fixity that works in that instance only as the values are arbitrary according to the original element. If the new reference length is shorter or longer this will impact the placement.

Consider using Civil Accudraw to build in fixity that is portable to new situations ie Delta Station / Offset

Try to use constraining construction snaps like-

- Endpoint, Centre and Midpoint – All provide sufficient fixity that allow recreation when placing in new situations.
- Intersection, Perpendicular, Tangent – All provide sufficient fixity that allow recreation when placing in new situations but there may be tolerance issues in some situations with geometry containing spirals.

Avoid using Snaps which provide insufficient fixity


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- Nearest, XY – While perfectly valid in individual situations when drafting, these snaps do not maintain any re-creatable fixity that a civil cell could use.

| | |
|---|---|
| Situation: | How can I constrain / limit the range of the civil cell on reference geometry to limit the range of construction or tie into a corridor? |

### *RECOMMENDATIONS*

Civil cells are constrained by the reference geometry they are placed on. To limit the range of construction a control element placed concurrent with the reference element but constrained in some way to limit subsequent geometry required. This is best achieved using the horizontal geometry command 'Partial Offset' and applying 0 horizontal and vertical offsets. This feature can then be used to constrain all other constructions from.

To avoid duplication in features the constraining element can be set as a construction class so that it can be turned off / hidden, or it could remain in the design and possibly have a different feature applied to represent a construction seem at a junction.

These constraining elements should ideally be created using fully definable fixity like that provided using Civil Accudraw – Delta Stan / Offset and or End point or intersection snaps.

| | |
|---|---|
| Situation: | Can I merge two or more civil cells to make a single civil cell with all the contents included? |

### *RECOMMENDATIONS*

Civil cells prevent at creation time the nesting of other civil cells in them to avoid making them overly complex to use. However multiple cells may be placed, dropping and then rebuilt as a new, bigger civil cell.

In merging civil cells in this way consideration should be given to

- the resulting complexity, it may be that discrete individual cells provide more flexibility
- feature naming, dropping a civil cell removes the unique naming the cell provides and so element renaming may be required.
- Multiple construction elements may exist. These will need to be rationalized so simple editing may occur with the new cell later. Ie a control line running on the reference element may exist in the left and right half of a junction, when both are placed the each create a control line for their respective constructions. Consider moving the relationships to a single reference to allow easier editing.

| | |
|---|---|
| Situation: | I want to include construction notes on how I built the civil cell, what standards I used and how it should be used and edited later. How can I do this ? |

### *RECOMMENDATIONS*

Civil cells are created in the DGN / DGNlibs so all the standard drafting functionality is available to help document them when creating. This could be in the form of annotation in the drawing itself, reference files or rasters attached in the drawing, links to external documents or even videos explaining the makeup ie consider as a standard detail library drawing for a specific construction that needs to outline the constructions / rules and relationships so that others can easily understand


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them later. This type of documentation information is not carried forward as part of the civil cell, only the rules stemming from the reference geometry through the Openroads model will be carried forward.

Situation: When building a civil cell is it necessary to have a terrain that end conditions can interact with?

### *RECOMMENDATIONS*

It is not necessary to include a Terrain in the library file the Civil Cells is created in. End conditions are evaluated when placing against the active terrain. The original cell by not having a terrain will not show a touch down from the end conditions and this may be disconcerting when testing, if so consider adding a notional terrain to act as a test for the end conditions to see they are well formed. Ideally the end conditions templates will have been built and tested using the Corridor Design > Edit Template option. However as a check for the civil cell this can be achieved by creating a terrain from 2 lines with profiles assigned, the profiles of which can store multiple scenarios that can be set active to simulate various terrain situations that would require different end condition.

Situation: I need to build a civil cell that includes a transition between two different pavement constructions how can this best be achieved.

### *RECOMMENDATIONS*

Civil cells allow the use of area templates to define the layered construction relative to the terrain. These layers are applied vertically about a terrains hull or interior boundary feature. Using multiple terrains in the civil cell will allow the representation of the different layered constructions with a vertical interface at the boundary between them.

Situation: Can I include variables in the civil cell to cater for different scenarios or do I need to build multiple versions of a civil cell for each instance?

### *RECOMMENDATIONS*

At the initial release Civil cells do not support variable parameters. The values used are explicitly provided by the rules captured at creation and then subsequently applied during placement to create the new instance.

In situations where parameters would affect the construction consider building all the variations of the civil cell in a single dgn model by placing a base civil cell and then changing to create the new instance, in each case with consider appropriate naming to identify the variation and ensure standards are maintained.


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| | |
|---|---|
| Situation: | When building the base geometry should I make it as complex geometry or leave it as the elements? |

### *RECOMMENDATIONS*

Both element and complex methods are valid and supported in civil cells. The decision here is influenced by the use case, with consideration being given to subsequent modifications that may be required and the resulting complexity of the model for documentation purposes.

In a simple situation like a median island or pedestrian crossing, the geometry will typically be a complex element made up of potentially many lines / arcs that build the closed shape. The profile for the closed shape will most likely be driven by draping on a terrain. In this case a complex element will be considerably simpler as it will be a single drape option to provide the profile and probably a single linear template representing say a mountable kerb. So it would be far more efficient to model as complex geometry.

In more complex design situations like a dedicated turn lane. The crossfall from the approach and departure may need to be constrained differently to provide more flexibility in editing to react to crossfall changes due to superelevation or longitudinal drainage requirements, different end condition or constructions that may be required to be detailed later etc. In these cases it may be worth considering retaining the elements and treating each as individuals by constraining the linear templates along each element.


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# Plans Production

## Overview

For any plans production work, existing drawing production tools available in SELECTseries 2 will be used. The general workflow is to export geometry to the native application (if it is not automatically being done), then generate sheets in your current manner.

## Generating Plan / Profile Sheets

**Situation:** I don't see any tools for generating plan/profile sheets in SELECTseries 3. How do I accomplish that?

### *Recommendations*

Export your alignments / profiles to your native application, then utilize the same tools / workflows you used in your SELECT series 2 native product.

**Situation:** What about labeling the profiles?

### *Recommendations*

Export your alignment/profiles to the native application (if it is not being done automatically), then plot and label the profile using your current native tools.

## Generating Cross Section Sheets

**Situation:** What options are available for generating cross section sheets in SELECTseries 3?

In V8i SELECTseries 3, the cross sections are cut directly from the 3-D DGN based model using the new Create Cross Section application, including any 3-D models referenced in from other disciplines and packages. When cutting the sections, the application gives the user the option to either 'stack' the sections or the user can choose to go ahead and lay them out directly onto sheets. All civil products have this application and this optional workflow. Whether other options are available depend upon which civil product is being run.

### *GEOPAK Recommendations*

Users running the GEOPAK versions of V8i SELECTseries 3 do have another option. They can choose the option mentioned above to have the new Create Cross Section application 'stack' the sections. Since they are being cut from GEOPAK, the XS Cell will be automatically placed on each cross section, effectively making them a "GEOPAK" cross section.

At this point, GEOPAK users can choose to use the native Sheet Layout application provided with GEOPAK. If you already have established cross section sheet libraries / workflows, continue with them to minimize impact to the users.


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### *InRoads Recommendations*

No recommendations at this time.

### *MX Recommendations*

It is our best practice recommendation that MX users adopt the new Create Cross Sections sheet layout functionality if at all possible.

If dynamic section of the 3-D model is not required or if there are customized reporting or drawing production process carried out in MX that are not feasible in the SELECTseries 3 tools, then it may be necessary to export the appropriate geometry, string features and surfaces required for the process and to use MX sectioning methods. The significant disadvantage to this route is that it will not react to model changes and requires management of data back to the MX model for sectioning.

## Computing Earthwork Quantities

**Situation:** What options are available for earthwork quantities in SELECTseries 3?

In V8i SELECTseries 3, end area earthworks are calculated using the End Area Volumes application. All civil products have this application and this optional workflow available to them. Whether other options are available depend upon which civil product is being run.

### *GEOPAK Recommendations*

Users running the GEOPAK versions of V8i SELECTseries 3 do have another option. When the sections are cut using GEOPAK, the XS Cell will be automatically placed on each cross section, effectively making them a “GEOPAK” cross section. At this point the GEOPAK user can choose to use the native end area earthwork application provided with GEOPAK.

### *InRoads Recommendations*

It is our best practice recommendation that users attempt to use the new Create Cross Sections sheet layout functionality if at all possible.

### *MX Recommendations*

No recommendations at this time.


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# Miscellaneous

## REPORTS – CARDINAL POINTS ABBREVIATIONS

**Situation:** Can I change the Cardinal Point abbreviations used in reports? If so, how?

### *RECOMMENDATIONS*

Yes, it can be done. Points like P.C & S.C. are hard coded in the reports for SELECT series 3 folders: *C:\ProgramData\Bentley\Civil\ReportBrowser\8.11.9\en\CivilGeometry.*

To change, navigate to *C:\ProgramData\Bentley\Civil\ReportBrowser\8.11.9\en\format.xsl* and edit as needed by changing the return value.

```
// Converts the point type to a user defined type, modify the value after the return, not the
case value
// As an example case "POB" : return "P.O.B."; will change the POB to P.O.B.
// If in doubt, contact Development
//
   function pointType( pointSubtype )
   {
   switch ( pointSubtype )
   {
   case "POB" : return "POB";
   case "POE" : return "POE";
   case "PC"  : return "PC";
   case "PT"  : return "PT";
   case "PI"  : return "PI";
   case "CC"  : return "CC";
   case "PRC" : return "PRC";
   case "PCC" : return "PCC";
   case "TS"  : return "TS";
   case "SC"  : return "SC";
   case "CS"  : return "CS";
   case "ST"  : return "ST";
   case "SPI" : return "SPI";
   case "SS"  : return "SS";

   case "POT" : return "POT";
   case "POC" : return "POC";
   case "POS" : return "POS";

   case "PVC"   : return "PVC";
   case "PVI"   : return "PVI";
   case "PVT"   : return "PVT";
   case "PVCC"  : return "PVCC";
   case "PVRC"  : return "PVRC";
   case "VHigh" : return "HP";
   case "VLow"  : return "LP";
   case "POVT"  : return "POVT";
   case "POVC"  : return "POVC";

   default: return pointSubtype;
```


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