Roadway

Design

Assistant

Manual

Civil Engineering Smart Solutions (CESS) LLC.

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TABLE OF CONTENTS 3

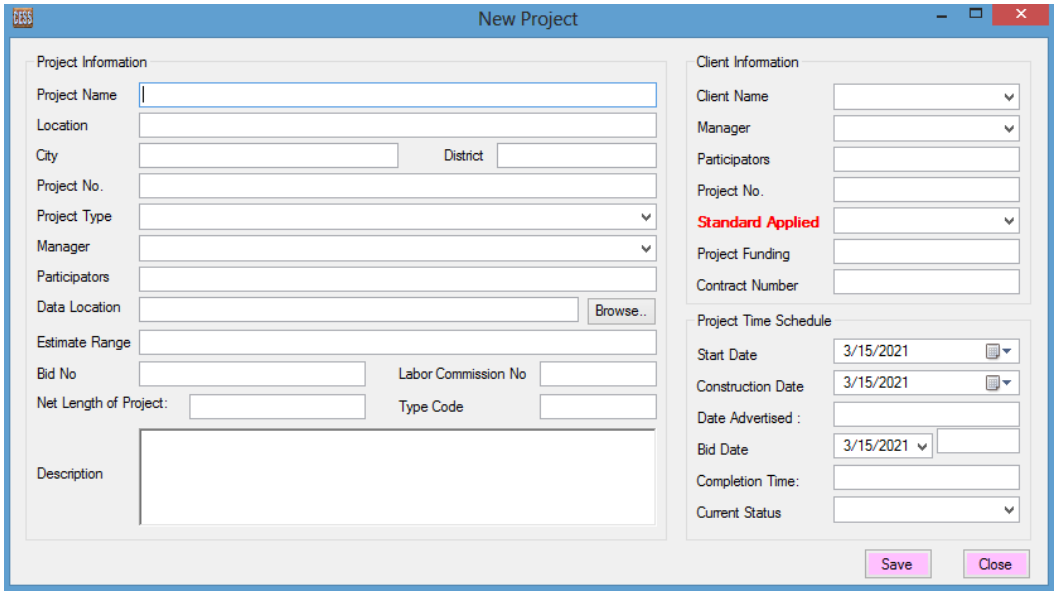
1. File 5
   1.1 New Project 5
   1.2 Project List 5
   1.3 Project Setting 6
   1.4 New Agency 6
   1.5 Agency List 6
   1.6 Roadway In Project 7
   1.7 Point Description 9
   1.8 Point Table Setting 9
2. Geometry 11
   2.1 New Alignment 11
   2.2 Alignment List 12
   2.3 Draw Geometry Table 13
   2.4 Geometry Table Setting 13
   2.5 Generate Superelevation 15
   2.6 Draw Superelevation 18
   2.7 Superelevation Drawing Setting 18
   2.8 Set Default Alignment 19
   2.9 Profile 20
   2.10 Alignment and Profile Validation 21
3. Curb Ramp Design 22
   3.1 New Curb Ramp Template 22
   3.2 Curb Ramp Template Summary 27
   3.3 New Curb Ramp 27
   3.4 Curb Ramp Design 28
   3.5 Curb Ramp Setting 35
4. Pothole Table Design 36
   4.1 New Pothole Item 36
   4.2 Pothole Items Summary 36
   4.3 Pothole Table Design 37
   4.4 Auto Finder 38
5. Guardrail Design 39
   5.1 New Guardrail Design 39
   5.2 Guardrail Summary 40
   5.3 Report 41

5.4 End Treatment Summary 41
5.5 Guardrail Setting 43
6. Typical Section Management 44
6.1 New Typical Section 44
6.2 Typical Section Summary 44
6.3 Typical Section In Project 45
6.4 New Template and Component 46
6.5 Template and Component Summary 47
7. Criteria Management 49
7.1 Parameter 49
7.2 Criteria 51
7.3 Criteria Group 52
7.4 Search Criteria 53
7.5 Criteria Applied in Roadway 54
8. Roadway Calculation 56
8.1 Set Working and Backup Folder 56
8.2 Set Roadway Information for Calculation 56
8.3 Vertical Clearance 57
8.4 Horizontal Stopping Sight Distance 59
8.5 Intersection Sight Distance 61
8.6 Profile Grade Break and Cross Slope Break at Gore 63
8.7 Tie-in to Existing 67
8.8 Sight Distance at Undercrossings 69
9. Tools 71
9.1 Spell Check 71
9.2 Batched Station and Offset 72
9.3 Point Location at Multiple Alignments 73
9.4 Station Matching 74
9.5 Batched Replace Levels 74
9.6 File Management 75
9.7 Slope Labeling 77
9.8 Create Cell 78
9.9 Interpolation Calculation 78
9.10 Drainage Labeling 78
9.11 Station Format 80
9.12 Cross Slope Calculation 80

1. File

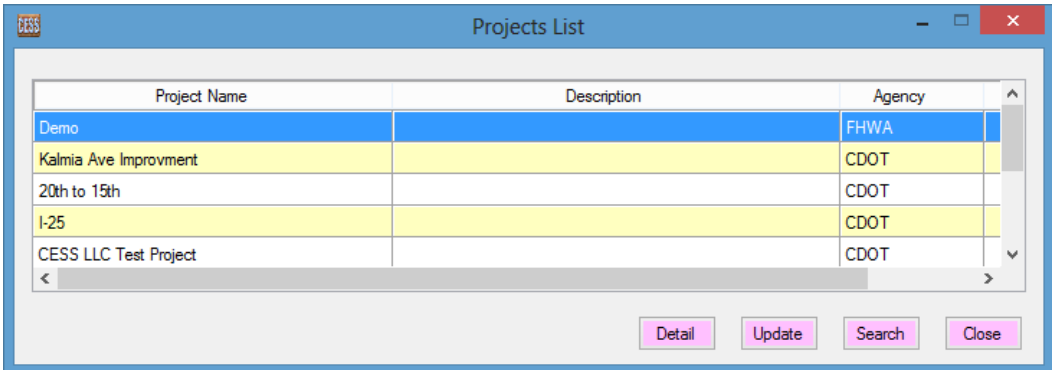
1.1 New Project

Figure below is the interface to create a new project. After inputting project information, click ***Save*** to save the project to the database.



1.2 Project List

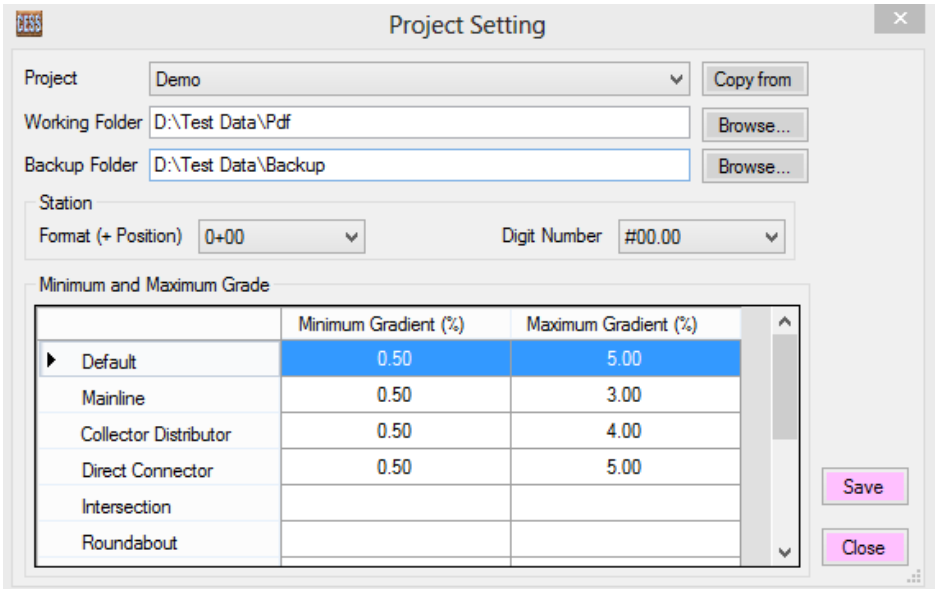
Figure below is the Project List interface, and all projects are listed in the data grid.



Select a project and click ***Detail*** to see the project information. To edit the information, click ***Update***, to find a specific project, click ***Search***.

1.3 Set Project Folder

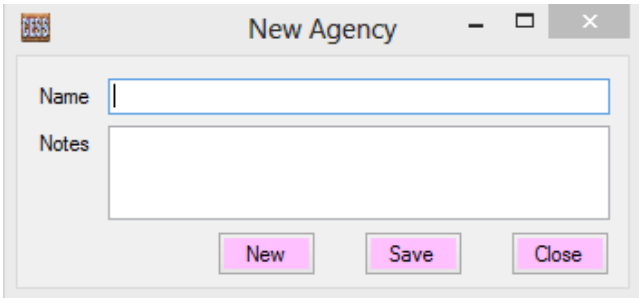
In this module, user can setup working folder and backup folder, station format and digit number, and minimum and maximum grade of each category of the road.



Click ***Copy from*** button, settings of the project can be copied from other project.

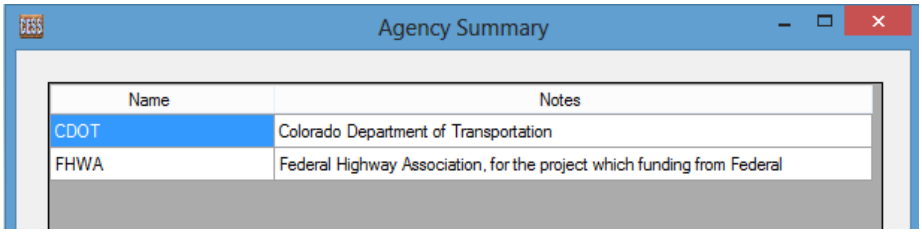
1.4 New / Edit Agency

Figure below is the interface for adding a new agency. After inputting agency name and notes, click ***Save*** to save the agency.



1.5 Agency List

In this interface, all registered agencies are listed in data grid.



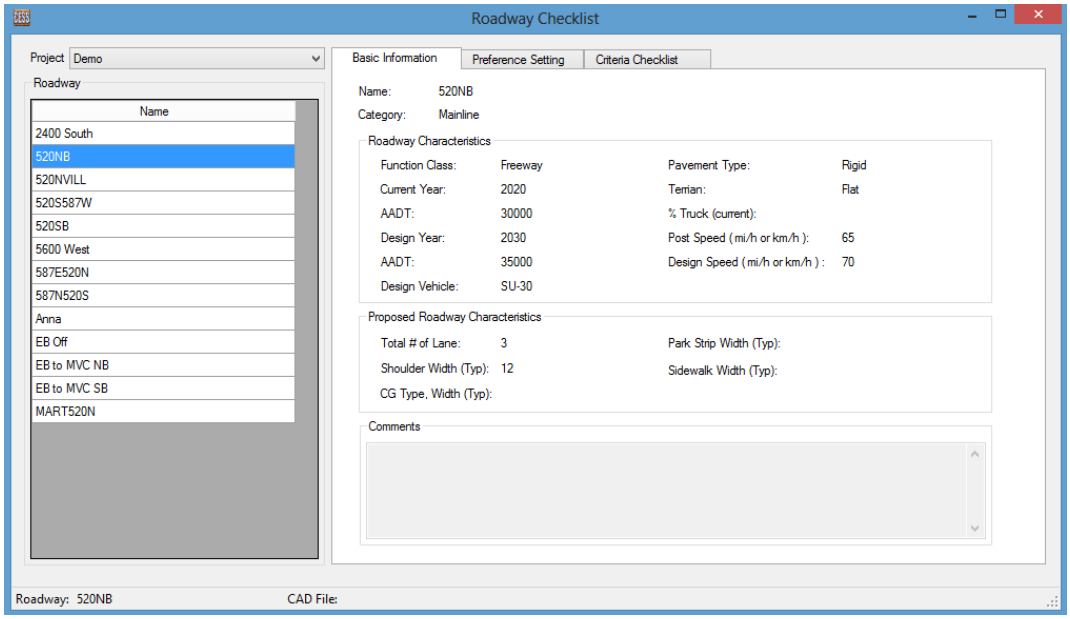
Right click on the data grid, a menu with two sub menus displays:

Edit: Update selected agency.

Remove: Delete the selected agency. Agency cannot be deleted if it is applied for a project.

1.6 Roadway in Project

Figure below is the Roadway in Project interface.



There are three tabs included: Basic Information, Preference Setting, and Criteria Checklist. The first two are introduced in this chapter, and the last one is introduced in Criteria Management.

Select a project and all roadways in the project are listed in the roadway data grid. Select a roadway, the roadway information is retrieved and shown on the three tabs.

Right click on the roadway data grid, a menu with six sub menus displays:

New...: Creates a new roadway (details introduced later).

Edit: Updates the selected roadway, similar to ***New*** function.

Delete: Removes the selected roadway, cannot be removed if the roadway is being used.

Open Plan File: Opens Plan working dgn file of the selected roadway.

Open Profile File: Opens Profile working dgn file of the selected roadway.

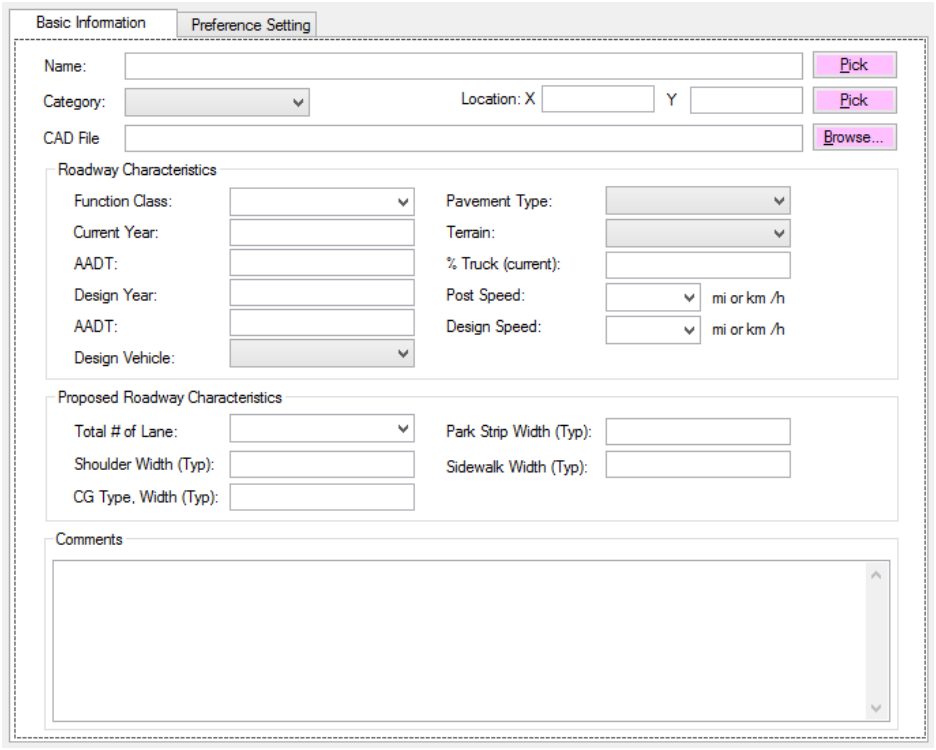
Open Cross Section File: Opens cross sections working dgn file of the selected roadway.

Create a New Roadway

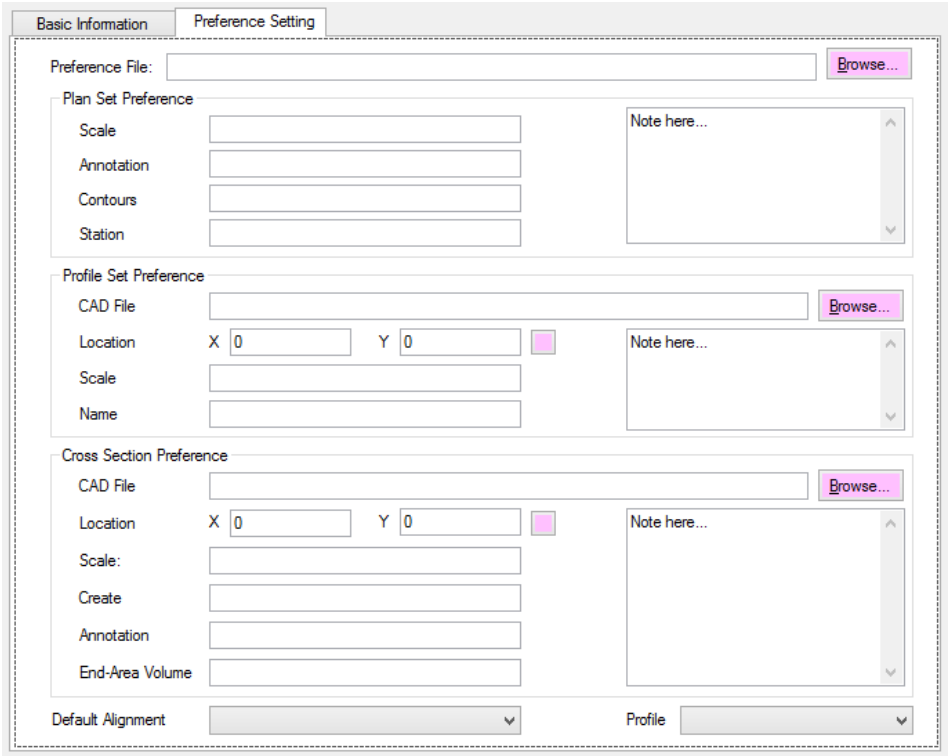
Figures below are the two tabs of adding a new roadway.

***Tab 1: Basic Information*:** In this tab, roadway general information are included, and Name, Category, and Design Speed are required to specify.

***Tab 2: Preference Setting*:** In this tab, CAD Setting and Inroads settings of the roadway are included; default alignment and default profile of the roadway should be provided if they exist.



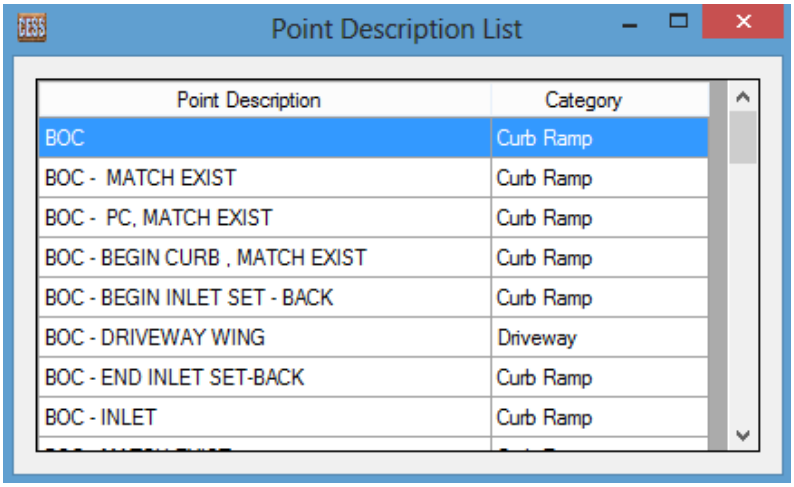
Tab 1: Basic Information



Tab 2: CAD Setting

1.7 Point Description

Figure below is the interface of Point Description list.



All Points Descriptions are listed in the data grid. Right click on the data grid, a menu with three sub menus displays:

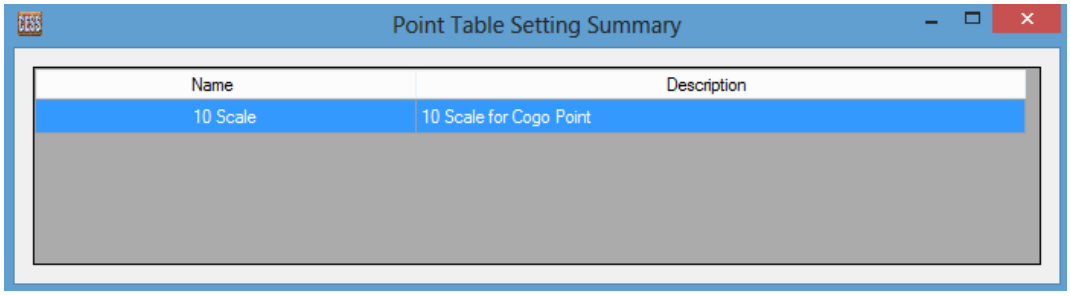
New...: Creates a new Point Description. Specify Description and Category and then click ***Save*** button, a new Point Description is saved.

Edit: Updates an existing Point Description.

Delete: Removes an existing Point Description.

1.8 Point Table Setting

Figure below is Point Table Setting interface, and all settings are listed in the data grid, which can be used to create geometry table, curb ramp data table, pothole table, etc.



Right click on the data grid and a menu with three sub menus displays:

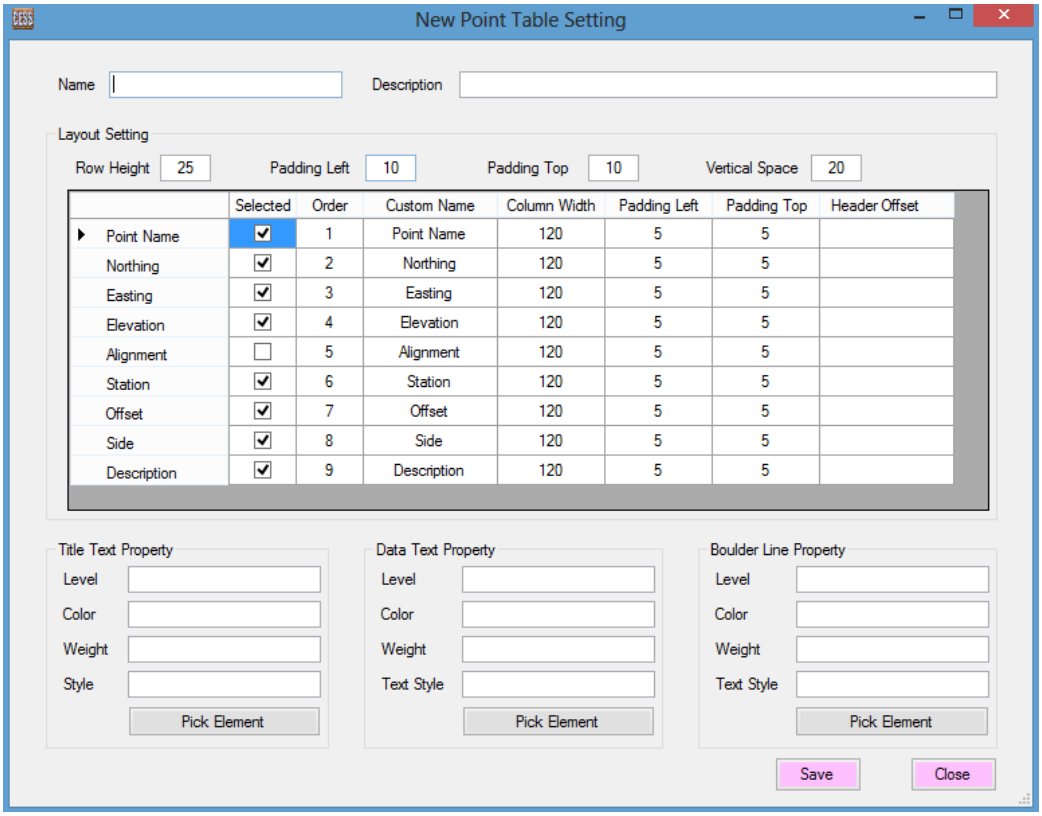
New...: Creates a new point table setting (details introduced later).

Edit: Updates an existing point table setting, similar to ***New*** function.

Delete: Removes an existing point table setting.

Create a New Table Setting

Figure below is the interface to create a new table setting.

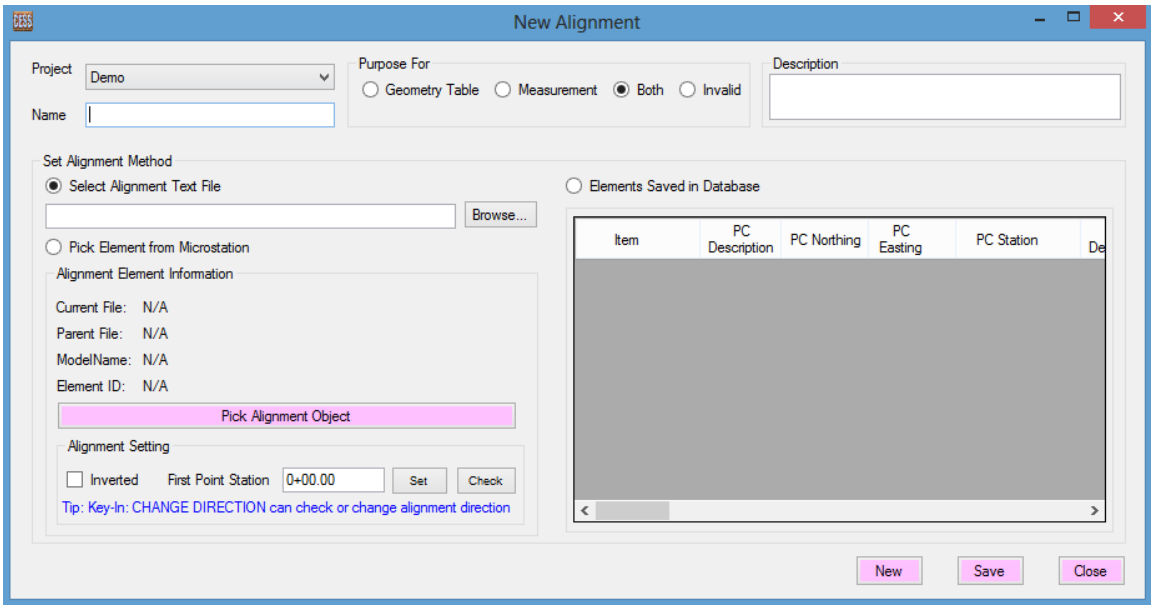


Specify name and description of the setting, set the layout, properties of the title, data and boulder line of Microstation, then click the ***Save*** button.

2. Geometry

2.1 New Alignment

Figure below is the interface for adding or editing an alignment.



Project: Select project of an alignment.

Name: Specify name of an alignment.

Description: Description of an alignment.

Purpose For: There are four purposes for an alignment:

A. **Geometry Table**: Alignment is applied for geometry control table and its Superelevation.
B. **Measurement**: Alignment is applied for point's station and offset.
C. **Both**: Alignment is applied for both Geometry Table and Measurement.
D. **Invalid**: Alignment is invalid and is not applied in the project.

Set Alignment Method: There are three methods to save new alignment data.

A. **Select Alignment Text File**: Specify an alignment text file that exports from Inroads, Openroads, or Geopak.
B. **Pick Element from Microstation**: Click ***Pick Alignment Object*** button, pick an alignment in Microstation, then specify beginning station. If element direction is opposite from alignment direction, either click ***Inverted*** check box or use "***Change Direction***" Key-in to change element direction in Microstation. Once alignment element is selected, input station of first point or click ***Set*** button, click a point on the alignment, then input the station of the point. The station of the beginning can be calculated automatically. To check whether the setting is correct or not, click ***Check*** button, click a point on the alignment, and the station of the select point is calculated based on current setting. This can be used to check whether the setting is correct. It is important to note that dgn file including the alignment should always be attached as reference.
C. **Elements Saved in Database**

Alignment Data is saved in the database, and share with all people anytime and anywhere. Right click on the window, a menu with five sub menus displays. Using those menus, user can import alignments from text or excel files which export from Inroads, Openroads, or Geopak.

Create New Alignment and Element from Excel File: Select an Excel file and an alignment can be created and saved to database with its elements.

Create New Alignment and Element from Text File: Select a Text file and an alignment can be created and saved to database with its elements.

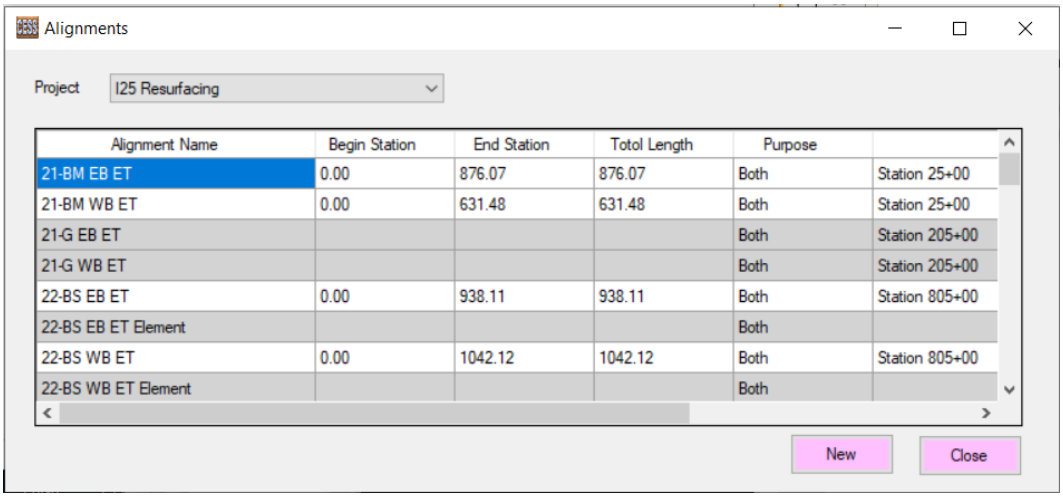
Refresh: If the alignment changes, the alignment information updates in database using this function. (Make sure that alignment file, including name and location, doesn't change)

Import from Text File: If alignment exists and need to save the elements into the database, use this function and select Text File to complete.

Import from Excel File: If alignment exists and need to save the elements into the database, use this function and select Excel File to complete.

2.2 Alignment List

Figure below is interface of Alignment List.



Select a project and all alignments in the project are listed in data grid. Begin Station, End Station, Total Length, Purpose, and Description of each alignment are retrieved. Right click on the data grid, and a menu with seven sub menus displays:

Alignment Details: Details of the selected alignment.

Edit Alignment: Updates the selected alignment.

Remove Alignment: Deletes the selected alignment from project.

Display Alignment: Shows and highlights the selected alignment in Microstation.

Check Alignment: Checks whether the alignment is valid.

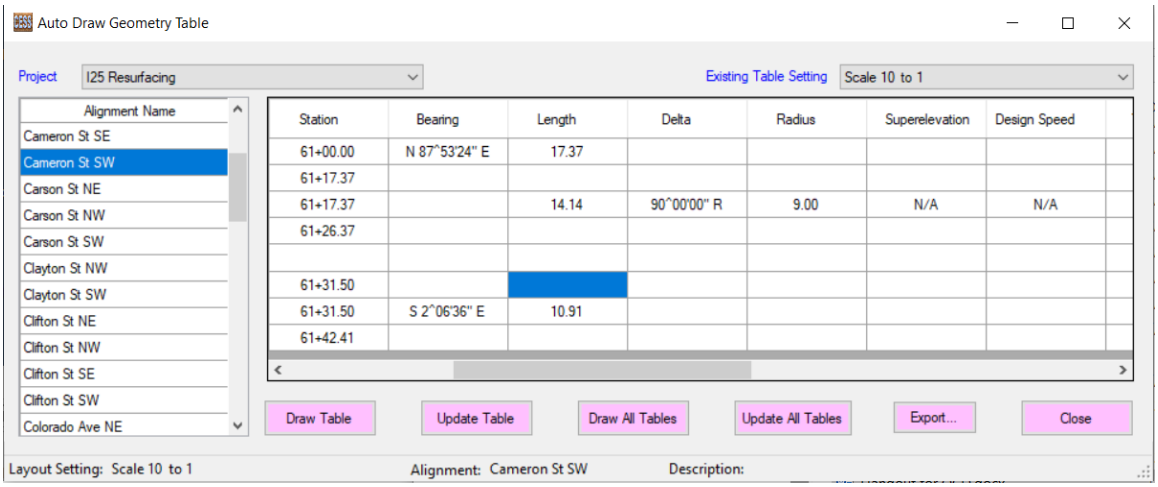
Refresh: Reloads all alignments of the selected project.

Check Overlap: Checks whether stations overlap along all alignments.

2.3 Auto Draw Geometry Table

Figure below is the interface for auto draw geometry table. Select a project, and all alignments for geometry table are listed in the left data grid. Click an alignment, and geometry information is shown on the right data grid.

Before drawing or updating geometry table of the alignment, select an existing table setting.



Draw Table: Geometry table of selected alignment is drawn in Microstation automatically.

Update Table: Geometry table of selected alignment is updated in Microstation automatically.

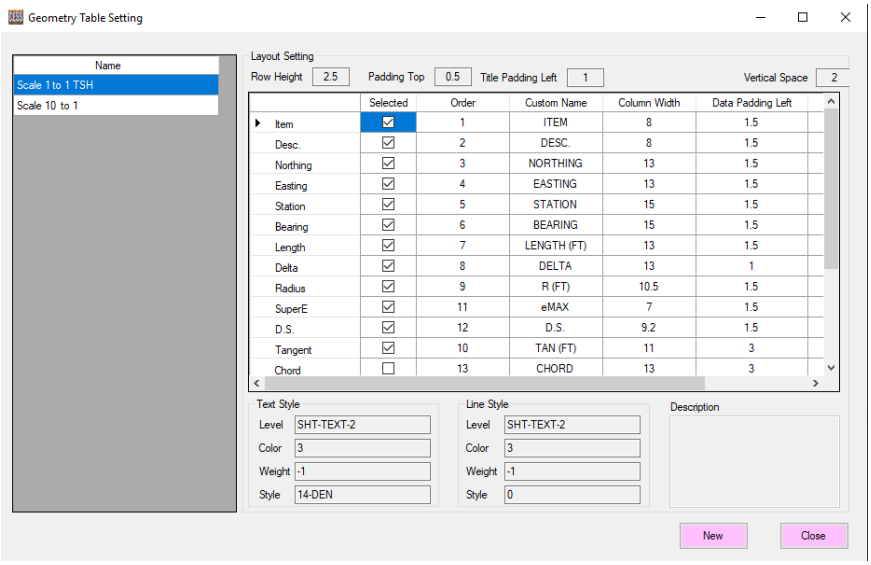
Draw All Tables: Geometry table of all alignments in the project are drawn in Microstation.

Update All Tables: Updates all geometry tables of the alignments in Microstation.

Export…: Exports geometry table data to spreadsheet.

2.4 Geometry Table Setting

Figure below is the setting management interface.



All existing settings of the company are listed in the left data view. Click a setting and the details are shown in right data grid. Right click on the left data grid, a menu with three sub menu displays:

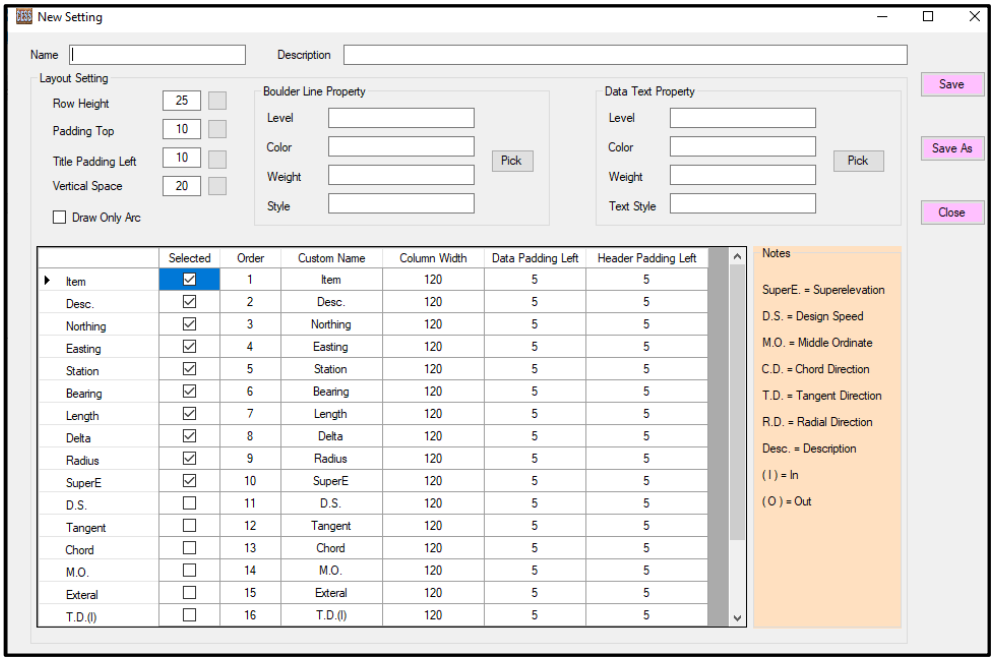
New: Creates a new geometry table setting (details introduced later).

Edit: Updates an existing setting, similar to ***Add*** function.

Refresh: Reloads all existing geometry table settings of the company.

Create a New Geometry Table Setting

Figure below is the interface to create a new setting.



Name: Geometry Table Setting name.

Description: Description of the Setting.

Layout Setting: Sets layout for geometry table

Row Height: Sets row height of the geometry table.

Padding Top: Sets space between text and line above.

Title Padding Left: Sets space between text and line to the left.

Vertical Space: Sets vertical space between text and line.

Boulder Line Property: Sets properties of table lines in Microstation such as level, color, weight, and Style. Selecting a sample element in Microstation and clicking ***Pick*** button, the properties can be set automatically.

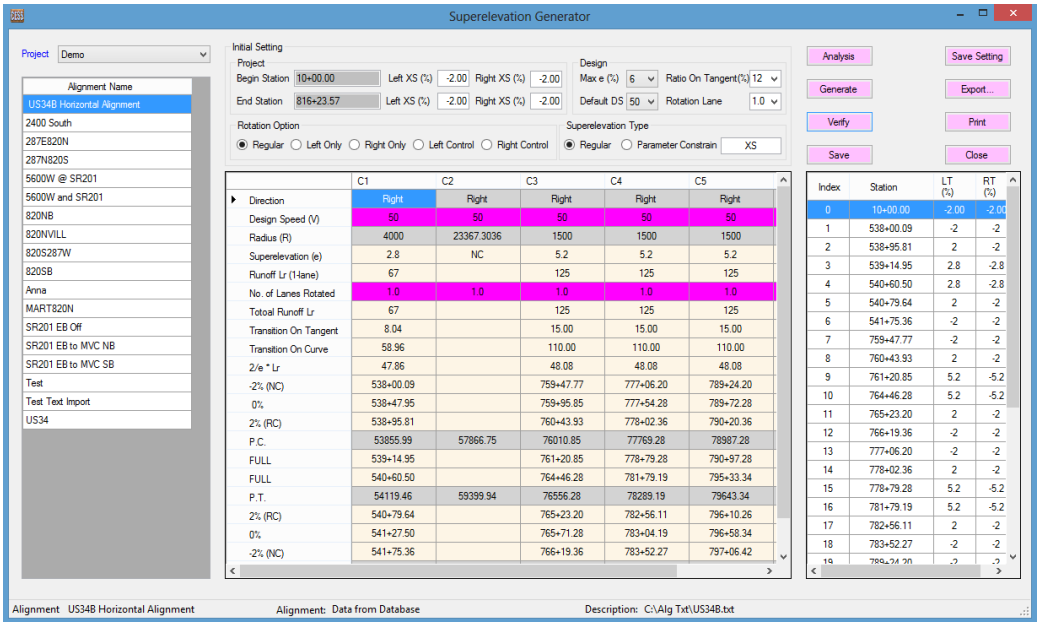
Data Text Property: Sets text properties of geometry data, similar to line properties introduced above.

Draw Only Arc: Only Arc data included in geometry table if checked. Otherwise, all data are included.

Data order, custom name, column width, padding left, and header padding of all data items can be directly set in the data grid. Only Items are included in the geometry table with checkbox checked in "Selected" column.

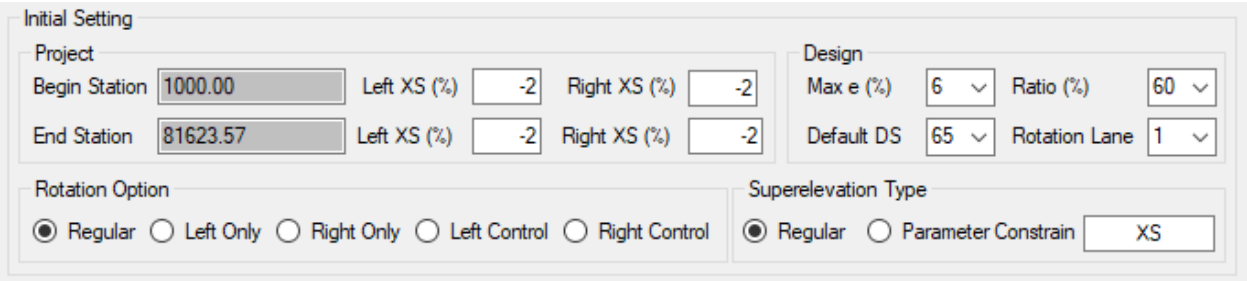
2.5 Generate Superelevation

Figure below is the interface to generate Superelevation.



Select a project, all alignments of the project are listed in the left data grid. Clicking an alignment, curves in the alignment are shown in the median data grid. All parameters are introduced below:

A. ***Initial Setting***



Project Parameters

Begin Station: First station of the Superelevation.

Left XS(%): Left side cross slope of the beginning.

Right XS(%): Right side cross slope of the beginning.

End Station: Last station of the Superelevation.

Left XS(%): Left side cross slope at end station.

Right XS(%): Right cross slope at end station.

Design Parameters

Max e (%): Max Superelevation of the alignment. When it changes, e max in datagrid will change automatically. For some curve with different e max, User can input and change directly in the data grid.

Ratio on Tangent (%): Proportion of runoff length on the tangent. Ratio will change in the datagrid when this parameter is changed.

Default DS: Default of Design Speed for entire alignment. Design Speed of each curve can be changed in the data grid.

Rotation Lane: Number of lanes for rotation.

Rotation Option: There are five rotation options:

Regular: Rotation happens at both sides.

Left Only: Rotation happens only at left side. (One-way road or ramp)

Right Only: Rotation happens only at right side.

Left Control: Rotation happens at both sides but control by Left rotation.

Right Control: Rotation happens at both sides but control by Right rotation.

Superelevation Type

Regular: Generates text file in regular format (can be applied in Inroads or Openroads).

Parameter Constrain: Generates text file in parameter constrain format (applied in Inroads).

Design Speed (V) and ***Lanes Rotated*** can be changed manually in data grid, see figure below:

	C1	C2	C3	C4	C5	C6
Direction	Left	Right	Left	Right	Left	Right
Design Speed (V)	25	40	45	50	55	60
Radius (R)	4000.0000	23367.3036	1500.0000	1500.0000	1500.0000	4000.0000
Superelevation (e)	NC	NC	4.6	5.2	5.6	3.6
L (1-lane)			102	125	143	96
Lanes Rotated	1	1.5	2	3	4	5

Curves with "yes" in ***Included*** row are included in superelevation, otherwise curve is not applied for superelevation. See figure below. Notes are input for each curve in note row.

Included	Yes	Yes	Yes	No	Yes	Yes
Note	None	None	None	None	None	None

Once all parameters are setup, Superelevation can be generated. See more functions below:

Analysis: Analyzes and calculates all data of Superelevation.

Generate: Generates Superelevation and shows in the data grid.

Verify: Checks whether there is overlap in Superelevation.

Save Setting: Saves alignment setting(s).

Save: Saves Superelevation data of the alignment into database.

Export…: Exports the data to a text file which can be applied in Inroads directly.

Print: Prints Superelevation data as PDF format for review.

Right click on the right data grid, a menu with nine sub-menus displays:

Verify: Same function as introduced above.

Export…: Same function as introduced above.

Move Up: Moves current row up.

Move Down: Moves current row down.

Add New Row: Adds a new row to the data grid.

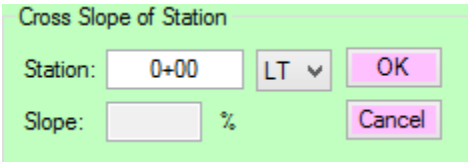
Insert Row: Inserts a row to the data grid.

Remove current Row: Deletes current row.

Remove All Selected Row: Deletes all selected rows.

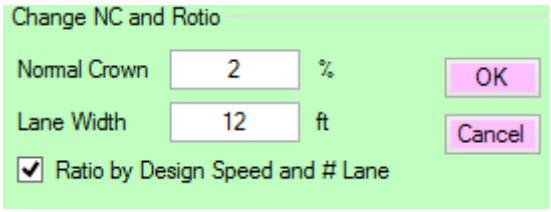
Remove All Overlapping: Deletes all overlapping rows.

XS of Station: Calculates cross slope of specified station. Input Station, select Side, then click ***OK*** button: cross slope of the station is calculated. Click Cancel to quit.



Change NC and Ratio

Right click on Superelevation Detail data grid and a menu displays. Using this function, user can change normal crown cross slope, Lane Width, and determine whether ratio on tangent varies by Design Speed and Number of Lanes for each individual curve.

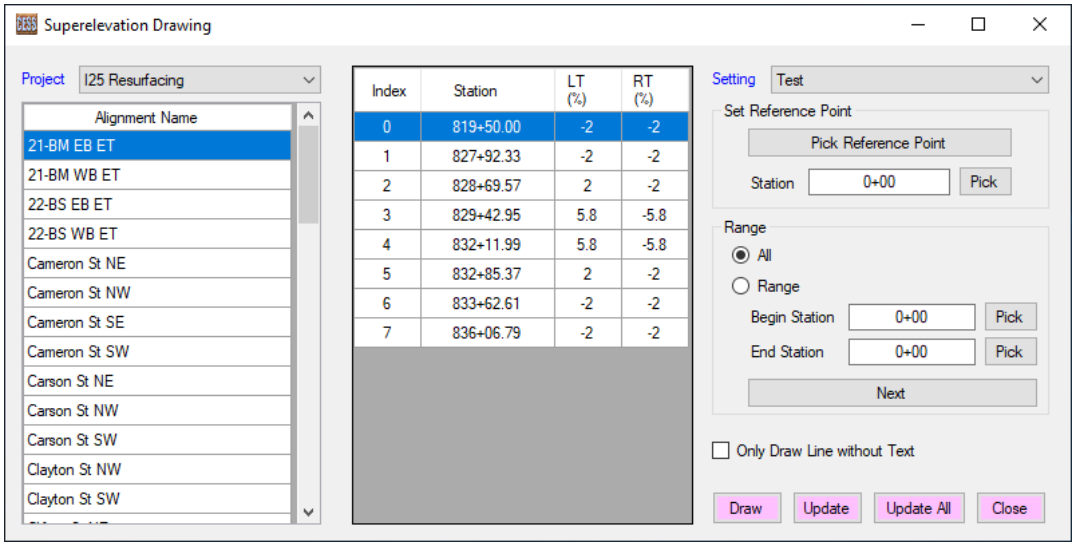


Print All

Right click on Alignment data grid and ***Print All*** menu displays. Using this menu, Superelevation data of all alignments are printed out as PDF format once.

2.6 Draw Superelevation

Figure below is the interface of Superelevation drawing.



Step 1: Select a project and all alignments are listed in the right data grid. Click an alignment and its Superelvation data will show in the right data grid if it exists.

Step 2: Select ***Setting*** from combo box.

Step 3: Click ***Pick Reference Point*** button, pick a point in Microstation as the reference point, and then specify its station.

Step 4: Set range of profile from the two range types: All and Range.

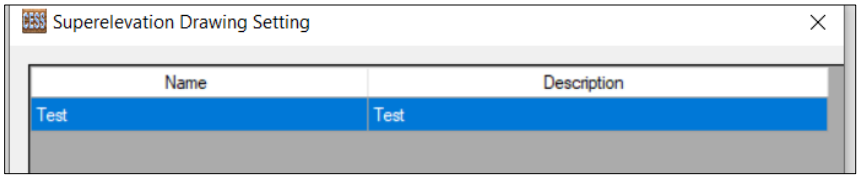
Step 5: Click ***Draw*** button, Superevation can be drawn automatically.

Step 6: Click ***Update*** button, Superelevation can be updated automatically.

Step 7: Click ***Update All*** button, Superelevation can be updated automatically.

2.7 Superelevation Drawing Setting

Figure below is the interface for all Superelevation settings:



Right click on the data grid, and a menu with three sub menus displays:

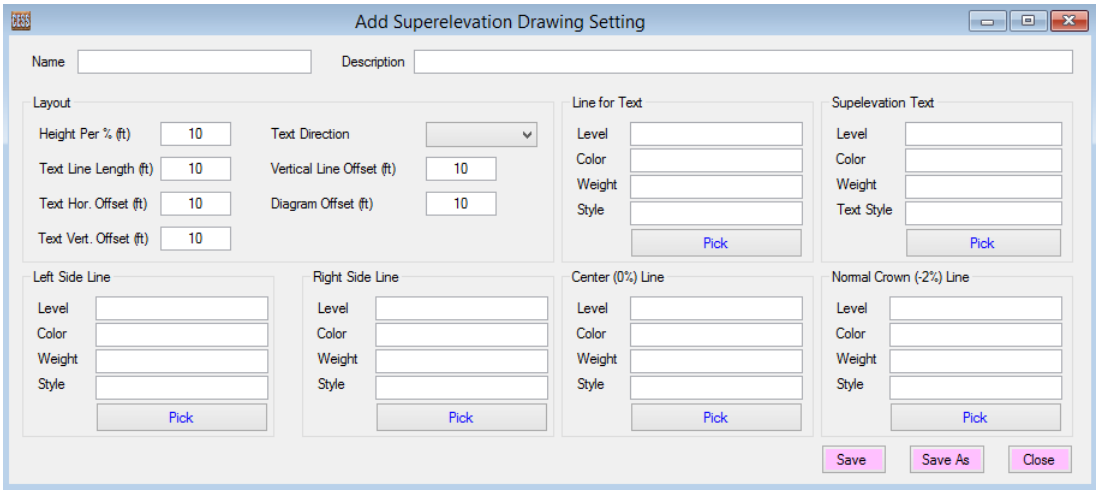
New: Creates a new setting, more details are introduced below.

Edit: Updates an existing Setting.

Remove: Deletes an existing Setting.

Create a New Setting:

Figure below is the interface to create a new setting with all parameters listed below:



Name: Specify name for Setting.

Description: Description of the Setting.

Layout Setting:

Height per %: Height of each cross slope percentage.

Text Line Length: Length of line for cross slope text.

Text Hor. Offset: Horizontal offset of Superelevation Text.

Text Vert. Offset: Vertical offset of Superelevation Text

Text Direction: Direction of text, vertical or horizontal.

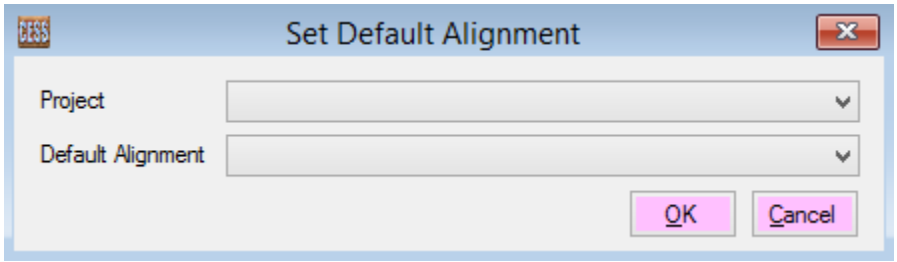
Vertical Line Offset: Offset of vertical line.

Diagram Offset: Distance between Superelevation diagram and Profile diagram.

Click ***Pick*** button in each group to set Microstation properties to other items.

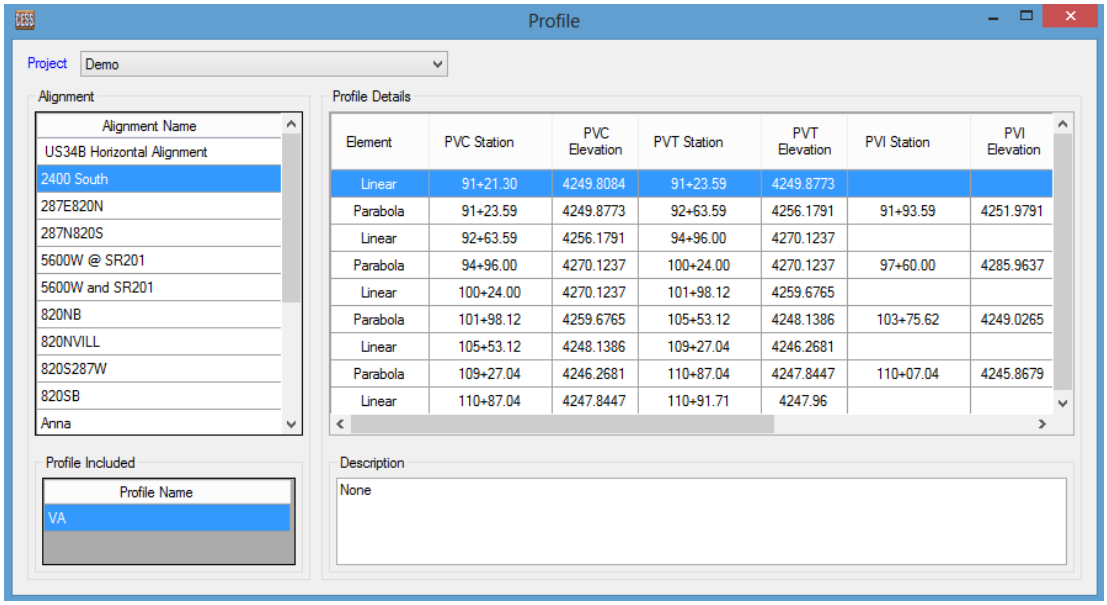
2.8 Set Default Alignment

Figure below is the interface to set default alignment of each project: select Project and alignment, then click ***OK*** button to save.



2.9 Profile

Figure below is the interface to set profiles for alignments. Select a project and all alignments of the project are loaded in Alignment data grid.



Select an alignment, all profiles of selected alignment are loaded and shown in the profile grid. Select a profile, all elements of the profile are loaded.

There are **three** methods to create a profile:

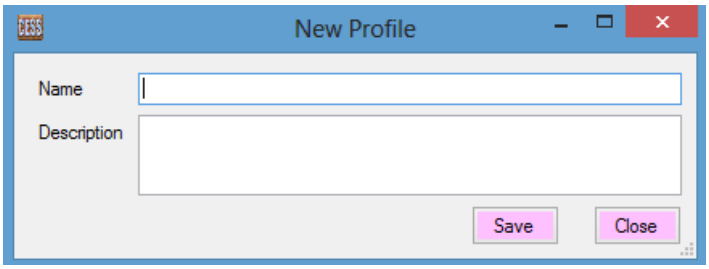
Method 1: Right click on Alignment grid, a menu with two sub-menu displays:

Import Profile from Excel File: Select an Excel file which exports from Inroads/Openroads/GeoPak, the profile can be imported including the profile and its elements.

Import Profile from Text File: Select a Text file which exports from Inroads/Openroads/GeoPak, the profile can be imported including the profile and its elements.

Method 2: Right click on Profile grid, a menu with five sub menus displays. Using this method, Profile need be created first, and then create its elements separately.

New...: Figure below is the interface to create a new profile. Input name of profile and description, then click ***Save*** button.



Edit...: Updates existing profile, similar to ***New*** function.

Remove: Deletes a profile, including its elements.

Update Profile from Text File: Similar to Import Profile from Text File introduced above, this function is applied for existing profile.

Update Profile from Excel File: Similar to Import Profile from Excel File introduced above, this function is applied to existing profile.

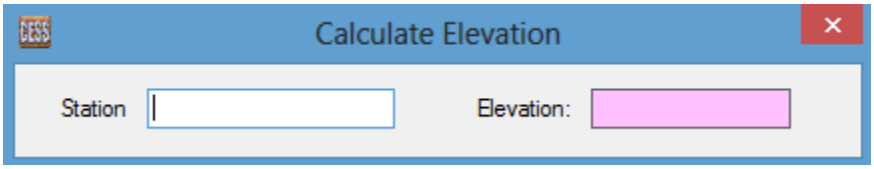
Method 3: Right click on the profile detail grid, a menu with four sub menus displays:

New...: Creates a new element for the selected profile

Edit...: Updates an element of the selected profile

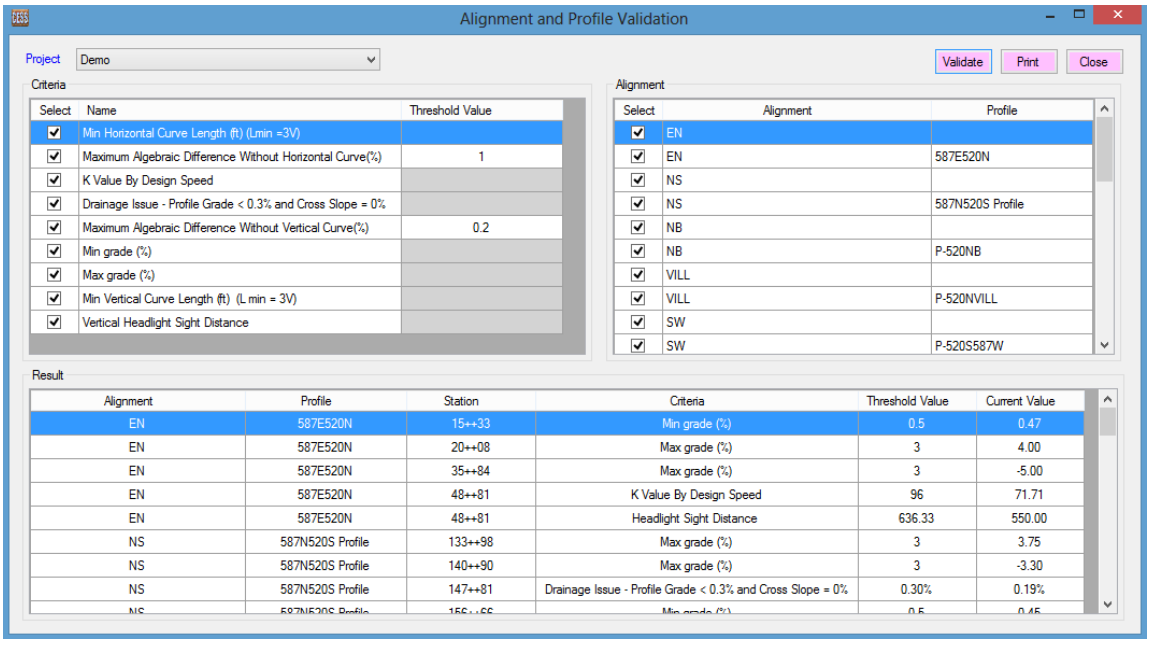
Remove: Removes an element of the selected profile.

Calculate Elevation: Using this function, elevation of a specified station can be calculated. Input station and click Enter key.



2.10 Alignment and Profile Validation

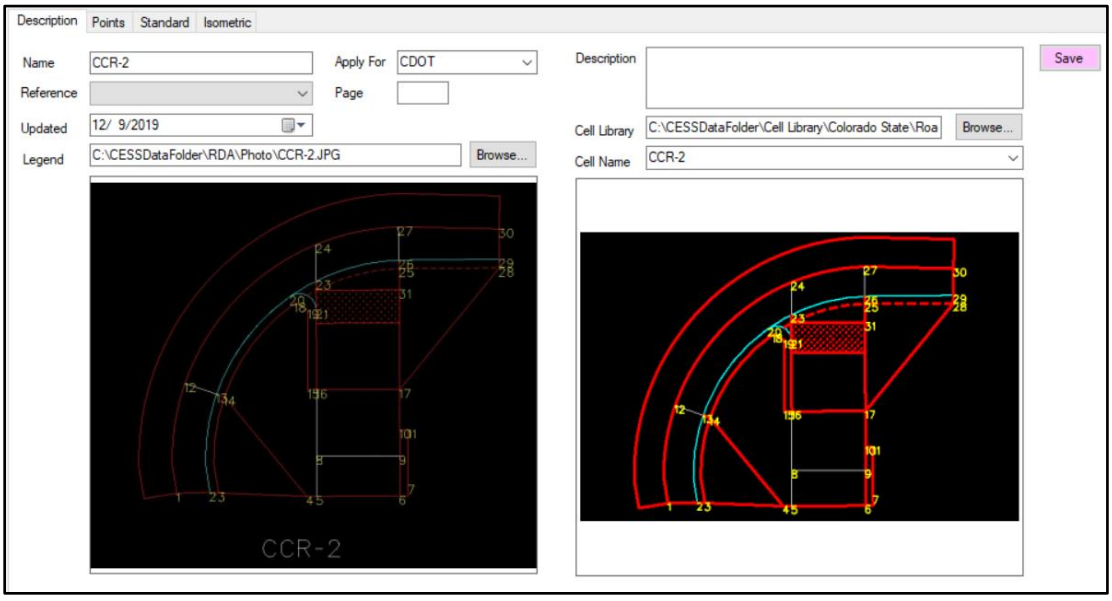
Figure below is the interface of Alignment and Profile Validation. Using this module, user can check alignments and profiles whether they meet specific criteria.



3. CURB RAMP DESIGN

3.1 New Curb Ramp Template

The figure below is the interface of New Curb Ramp Template. Four tabs are included: Description, Points, Standards, and Isometric.

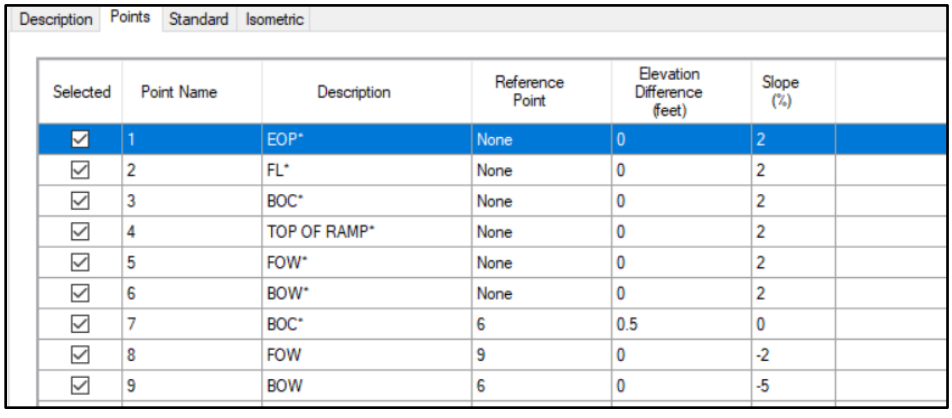


Tab 1: Description

In this tab, the user must input the basic information for the new curb ramp template, including Name, Apply For, Description, Reference and Page, Legend, and Cell of the curb ramp. Click the ***Save*** button, all information are save into the database.

Tab 2: Points

The figure below is the Points tab, and all points in template are listed in the data grid.



Right click on the data grid and a menu with seven sub menus displays.

Add Point: Add a point to curb ramp template, details are introduced later.

Edit Point: Update an existing point, and similar to ***Add Point*** function.

Remove Point: Delete a point from the template.

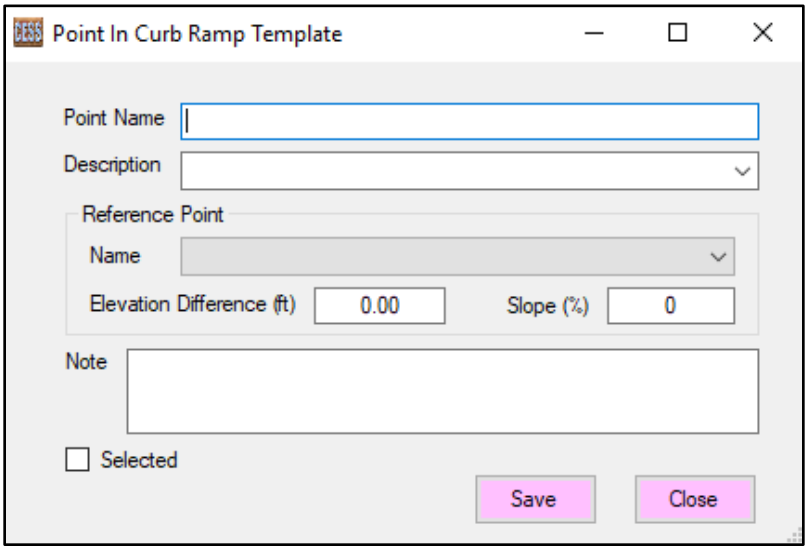
Refresh: Reload all points in the template.

Select All: Select all Points.

Unselect All: Unselect all points.

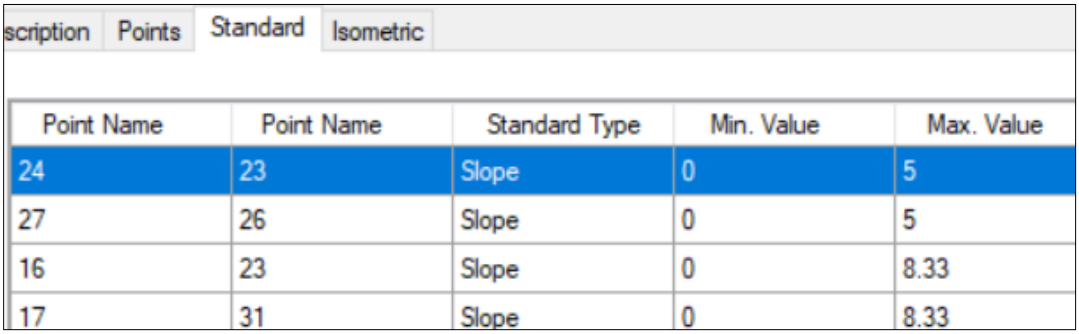
Unti-Select: Select all unselect point and unselect other.

Add Point: The figure below is the interface for adding a point to the template. Input Point Name, Description, select Reference Point, Elevation Difference between the point and the reference point, and Slope of the Point and reference point, and then click ***Save*** button.



Tab 3: Standards

The figure below is the Standard tab, and all standards in the template are listed in data grid.



Point Name	Point Name	Standard Type	Min. Value	Max. Value
24	23	Slope	0	5
27	26	Slope	0	5
16	23	Slope	0	8.33
17	31	Slope	0	8.33

Right click on the data grid and a menu with four sub menus displays.

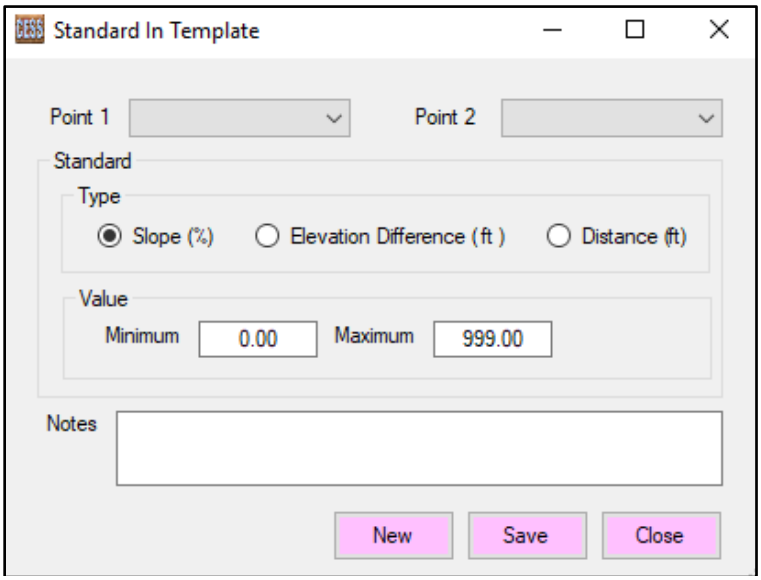
Add Standard: Add a new standard, and see details below.

Edit Standard: Update an existing standard, similar to ***Add Standard*** function.

Remove Standard: Delete standard from the template

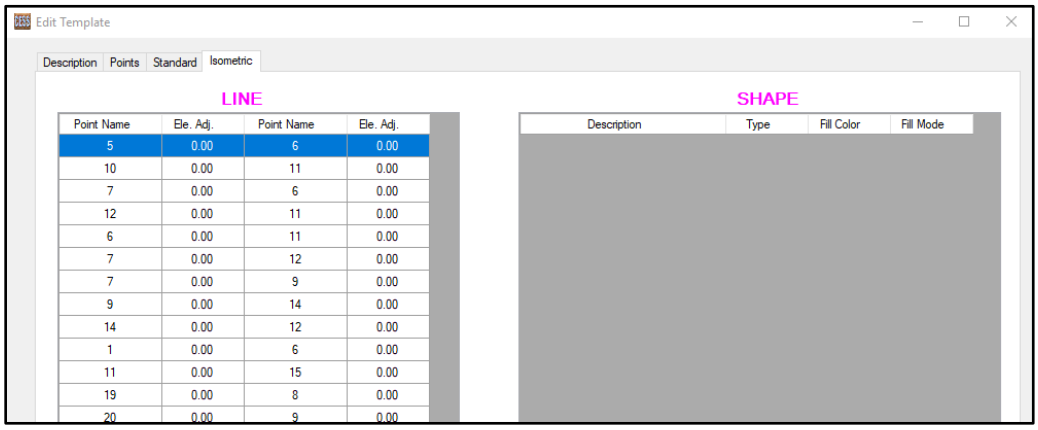
Refresh: Reload all standards

Add Standard: The figure below is the interface for adding a standard. Firstly, select point 1 and point 2, choose the standard type, input minimum value, maximum value, and Notes, and then click ***Save*** button to save the standard.



Tab 4: Isometric

The figure below is the Isometric tab, which includes Line and Shape aspects.



Right click on left data grid, a menu with five sub-menus displays.

Add Line: Add a new line for isometric by selecting two points.

Edit Line: Update an existing line, similar to ***Add Line*** function.

Remove Current Line: Delete current line from isometric.

Remove All Lines: Delete all lines from isometric.

Import from Standards: Import lines from Standards.

Right click on right data grid, a menu with five sub menus displays.

Add Shape: Add a new shape to isometric, and the details introduce below.

Edit Shape: Update an existing shape, and similar as ***Add Shape*** function.

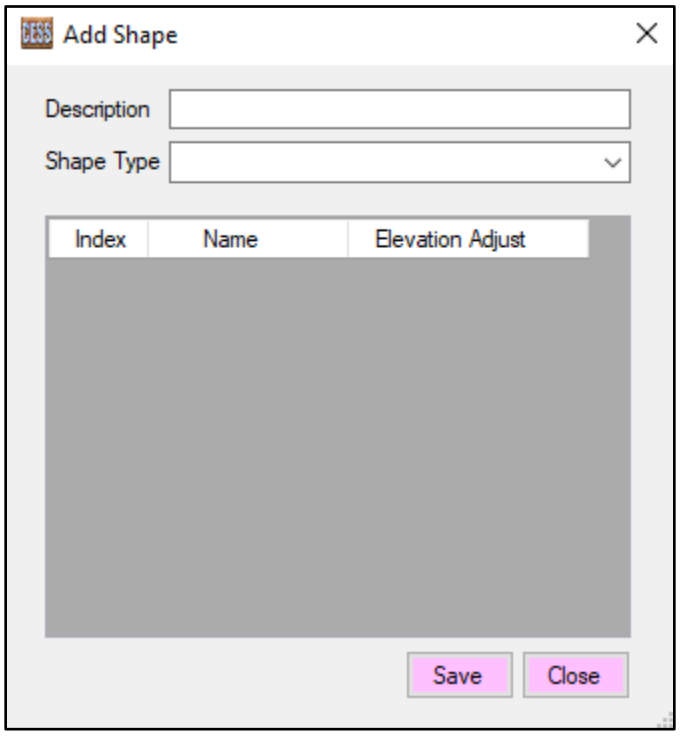
Remove Shape: Delete current Shape from isometric.

Remove All Shapes: Delete all shapes from isometric.

Shape Setting: See details below (**B**)

Add shape

The figure below is the interface for adding a new shape.



Input the description and select shape type, then add points for the shape.
Right click on the data grid, and a menu with five sub menus displays:

Add Point: Select a point and input the Elevation Adjust Value and Index of the shape.

Edit Point: Update an existing point, similar as ***Add Point*** function.

Add Points on Top: New points are above or under the existing points. To above point, elevation is Positive, and to under point, elevation is negative.

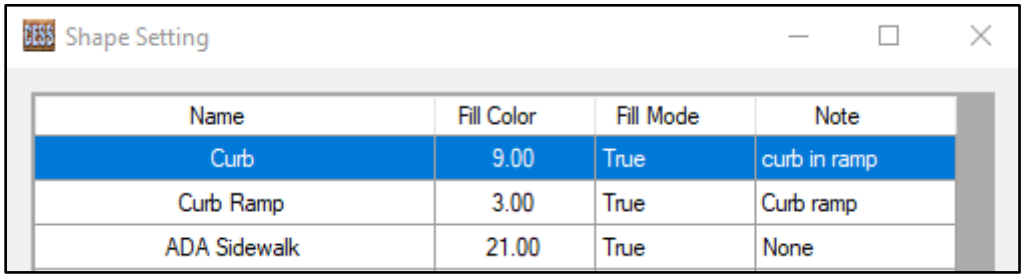
Remove Current Point: Delete current point from shape.

Remove All Points: Delete all points from shape.

Click ***Save*** button, the shape is saved for the curb ramp.

Shape Setting

Figure below is Shape Setting interface.



All shape types are listed in the data grid, and right click on data grid, and a menu with three sub menus displays:

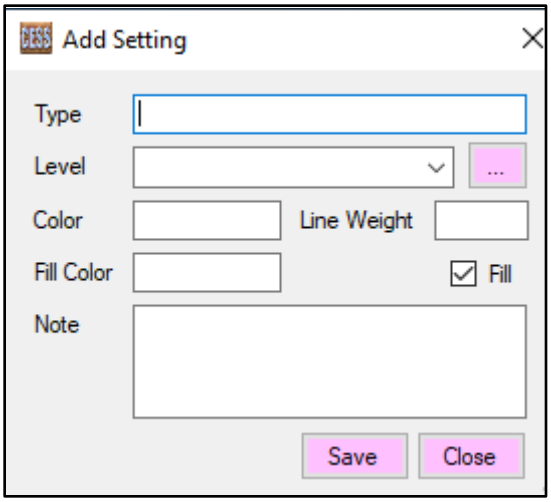
Add Setting: Add a new Setting, and see details below

Edit Setting: Update an existing Setting, similar to ***Add Setting*** function

Remove Setting: Remove an existing Setting

Add Setting

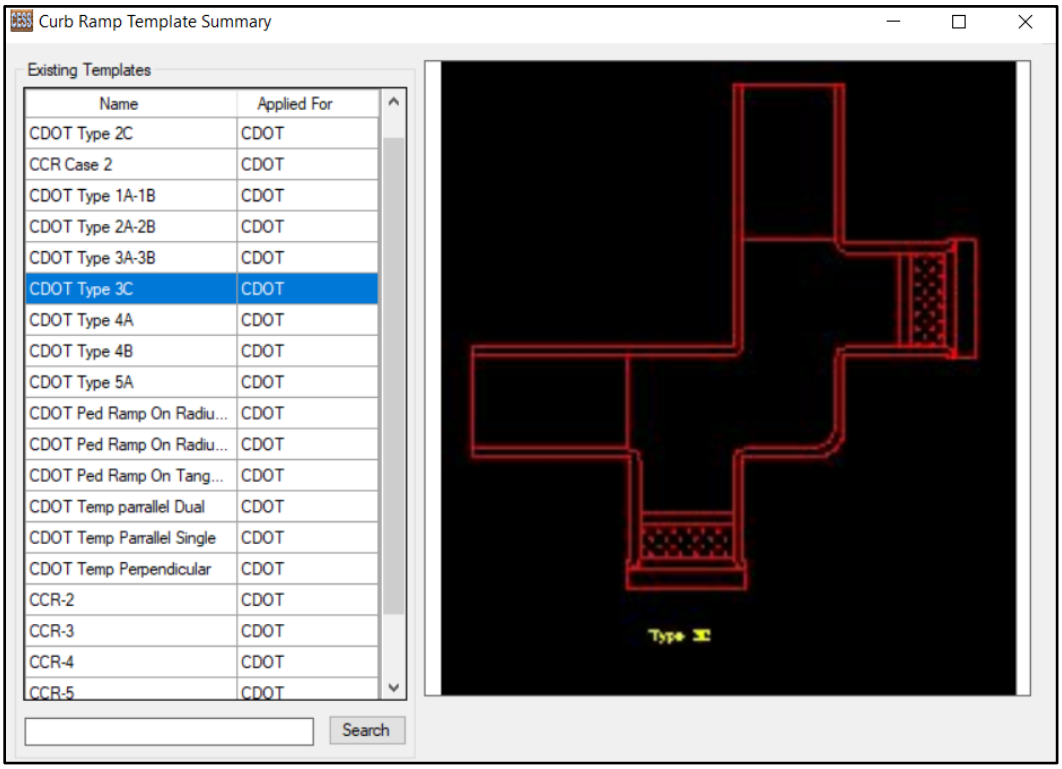
Figure below is the interface for new Setting:



Input Shape Type, Level, Color, Line Weight, Fill Color, and Note, check Fill or not, then click ***Save*** button. Level, Color, Line Weight, and Fill Color can be obtained by clicking pink button (right of Level Combo box) if a sample element is selected in Microstation.

3.2 Curb Ramp Template Summary

Figure below is the interface of template summary interface, and all curb ramp templates of the company are listed in the data grid.



Input text in search textbox and click ***Search*** button, all templates containing the text are filtered and listed in data grid. Right click on data grid, a menu with five sub menus displays:

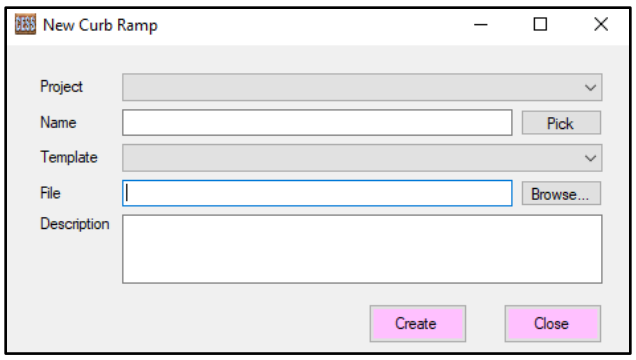
- ***New:*** Create a new template, which is introduced in chapter 3.1.
- ***Edit:*** Update an existing template, similar as New function***.***
- ***Remove:*** Delete an existing template.
- ***Refresh:*** Reload all templates.
- ***Auto Review:*** Review templates automatically, and click data grid, or photo, auto review stops.

3.3 New Curb Ramp

The figure below is the interface to create a new curb ramp.

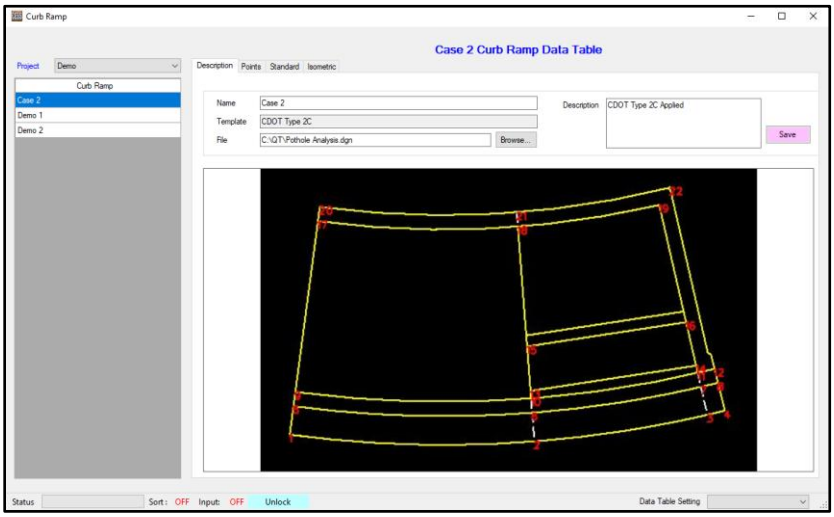
Select a project and a template, input name (can retrieve by clicking ***Pick*** button if a Text element is selected in Microstation), design file, and description; Then click ***Create*** button, and a new curb ramp is created.

All points, standards, isometric information are imported from the template to the new curb ramp if a template is selected.



3.4 Curb Ramp Design

The following figure is the interface for curb ramp design.



Select a project, and all curb ramps in the project are listed in the left side data grid.

Click a curb ramp in data grid, and all information of the curb ramp are loaded. Right click on the data grid, and a menu with eight sub-menus displays.

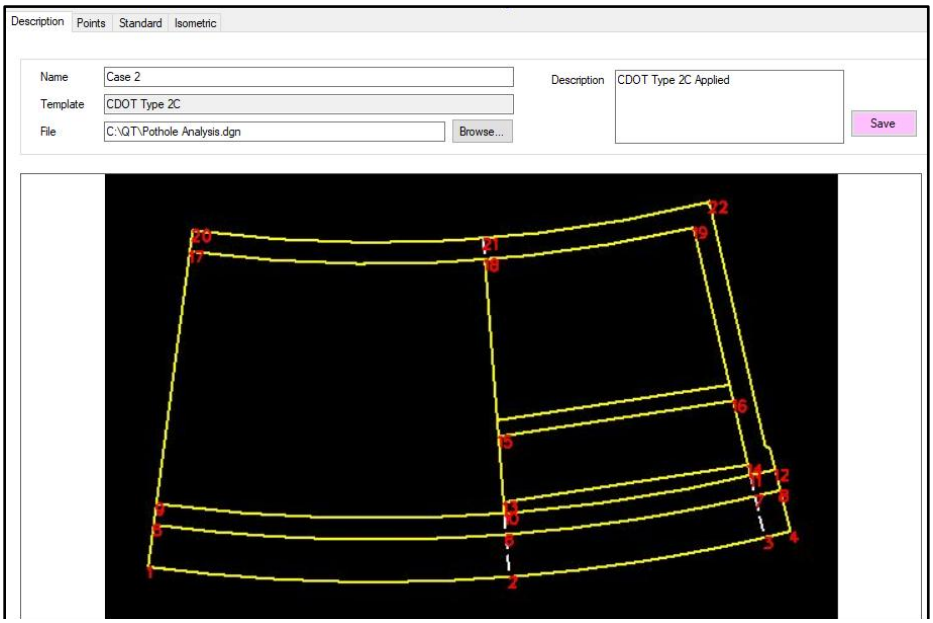
- ***New Curb Ramp***: Create a curb ramp, see Chapter 3.3.
- ***Remove Curb Ramp***: Removes curb ramp from the project.
- ***Open Design file***: Open working design file of the curb ramp.
- ***Draw Template Cell***: Draws the template cell in the design file.
- ***Export to Cogo Point***: Exports all points to text file as Cogo point format and applied in Inroads.
- ***Export to Surface***: Exports all points to text file as surface format and applied in Inroads.
- ***Copy to…***: Saves curb ramp to another curb ramp.
- ***Save as New Template***: Saves the curb ramp as template.

Note: functions without introduction in curb ramp design are same as the function in Template

Similar as the curb ramp template, there are four tabs for curb ramp design.

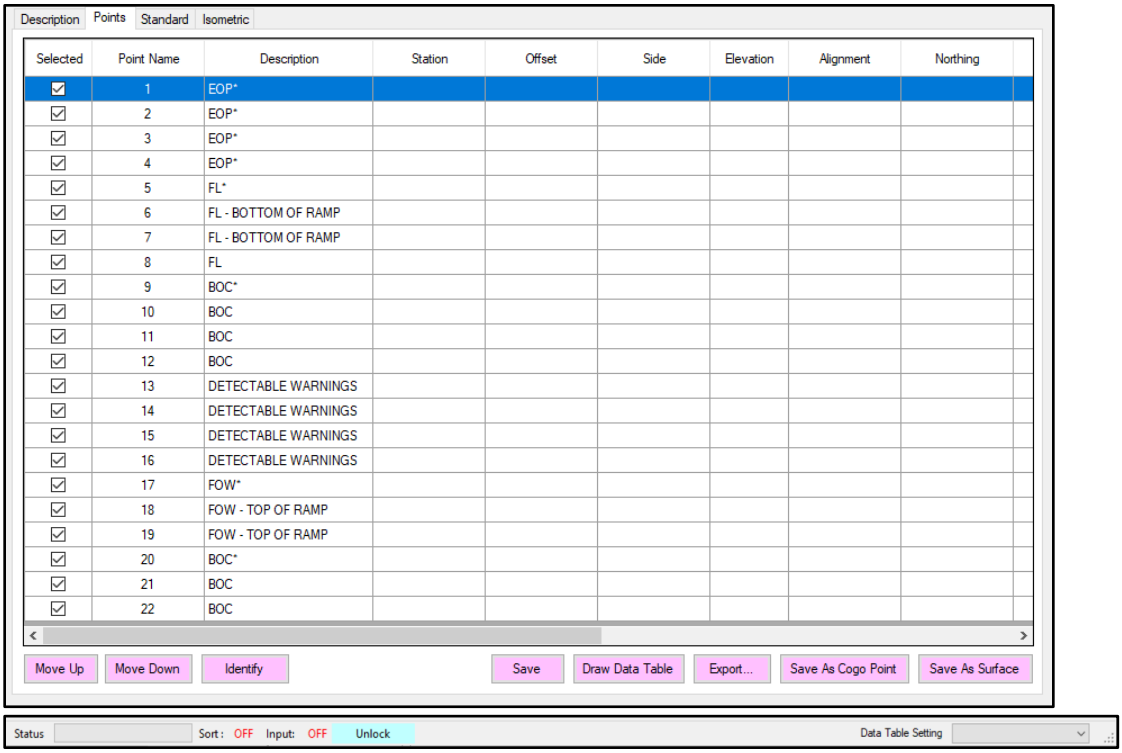
Tab 1: Description

In this tab, basic information of curb ramp are included, user can edit the information and click ***Save*** button to save the change directly.



Tab 2: Points

Figure below is the interface of Point Tab, and all points of the curb ramp are listed in data grid.



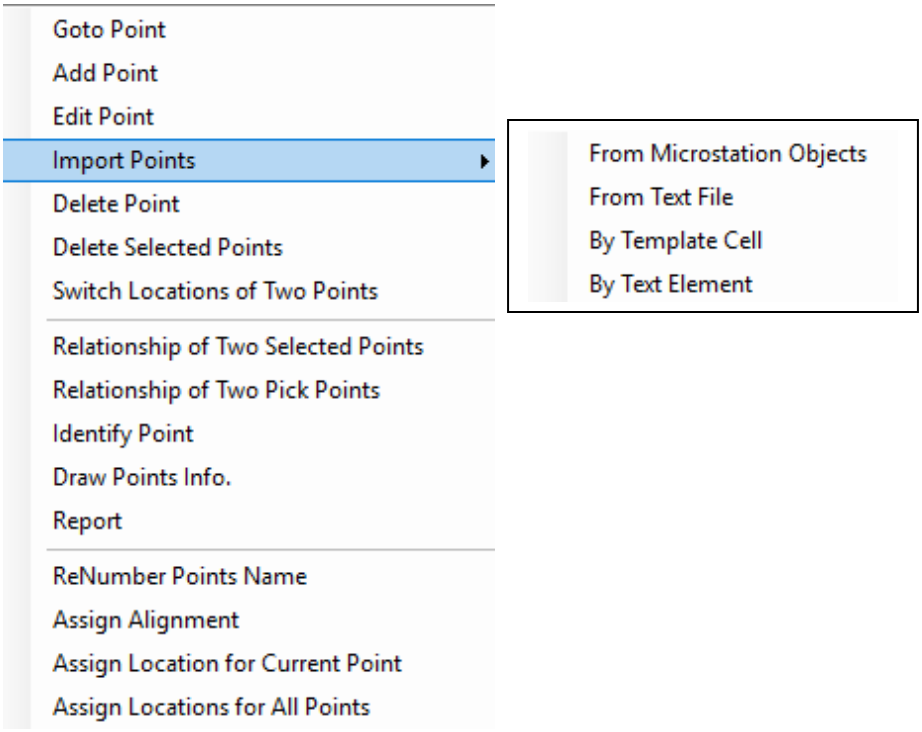
The following is an introduction to the buttons found at the bottom of the screen.

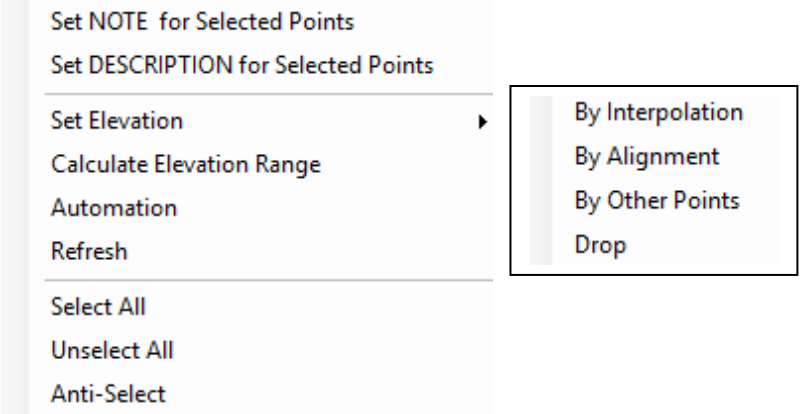
1. ***Move Up***: Moves current point up in data grid.
2. ***Move Down***: Moves current point down in data grid.
3. ***Identify***: Identify a point in Microstation. Clicking ***Identify*** button and clicking a point in MicroStation, then point in data grid is selected and highlighted.
4. ***Save***: Save all change of points to database.
5. ***Draw Data Table***: All selected points' information are drawn in MicroStation.
6. ***Export***…: All selected points are exported to spreadsheet.
7. ***Save As Cogo Point***: All selected points are saved as Cogo point format and be imported in Inroads.
8. **Save As Surface**: All selected points are saved as surface formation and be imported to Inroads directly.

There are some other items listed in status bar:

1. ***Status***: Display status of the application.
2. ***Sort***: If ***Sort*** status is on, point can be sorted in data grid. Otherwise Sort function is locked. On/Off can be switched by clicking on the red text.
3. ***Input On/Off***: when ***Input*** status is on, Text can be read from selected Text element in Microstation. (step 1: keep ***Input*** On, step 2: select a Text element in Microstation, step 3: Click a cell in data grid)
4. ***Lock/Unlock***: When locked, curb ramp is frozen and no change can be made until it is unfrozen, and a password is required to unfreeze the curb ramp.
5. ***Data Table Setting***: The setting for the data table drawing, a setting should be selected before data table is drawn.

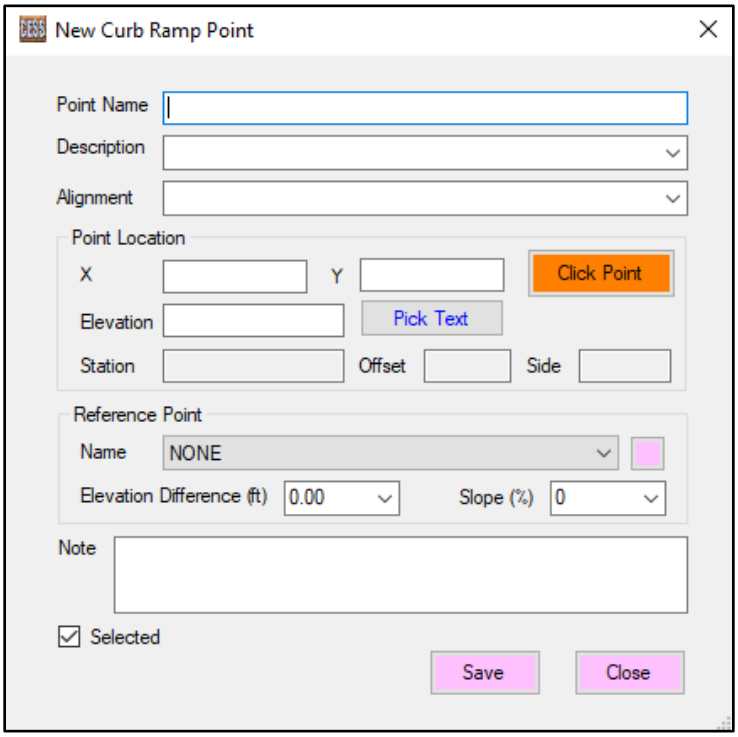
Right click on point data grid, there are multiple menus, see figure below:





1. ***Goto Point***: Go to the selected point location in MicroStation.
2. ***Add Point***: add a new point for curb ramp.

   The figure below is the interface for a new point; Specify Point Name, Description, Alignment (if available), and point location and elevation, select reference point, elevation difference and slope (for some independent point, such as existing ground point, set reference point to NONE), then click ***Save*** button to save new point.



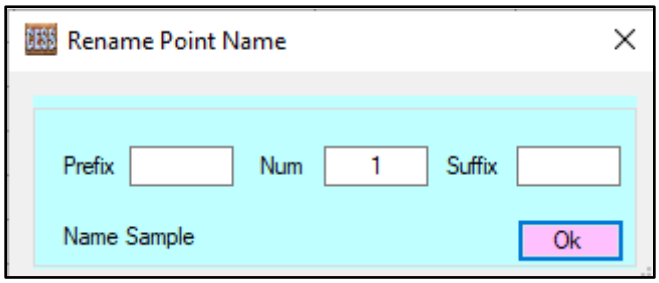
3. ***Edit Point***: Similar to Add Point function.
4. ***Import Points***

   There are four methods to import points to curb ramp:

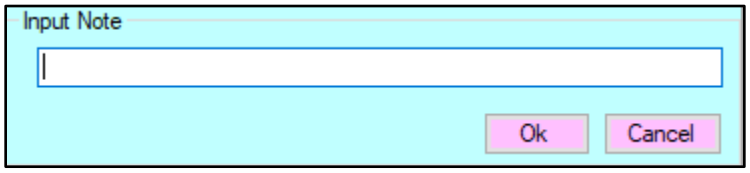
   - ***From MicroStation Objects***: All points in selected elements in MicroStation are imported.
   - ***From Text File***: Points are imported from Text file which exports from Inroads and includes point information.

- ***By Template Cell***: Points are imported from curb ramp template cell which includes points names.
- ***By Text Element***: Import points from selected Text elements in MicroStation.

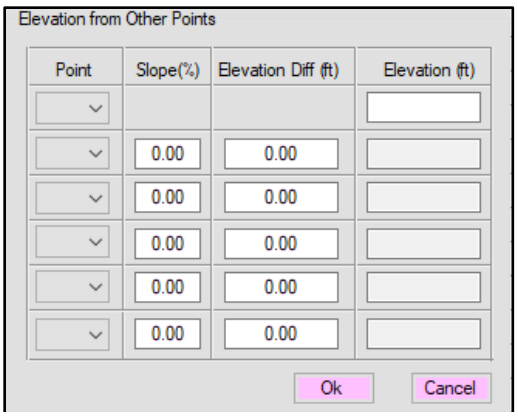
5. ***Delete Point***: Remove current point in data grid from curb ramp.
6. ***Delete Selected points***: Remove all selected points.
7. ***Switch locations of two points***: Switch locations of two selected points.
8. ***Relationship of Two Selected Points***: Display the relationship of two selected points, including slope, elevations, and elevation difference.
9. ***Identify Point***: Identify a point in Microstation. Clicking ***identify*** button and clicking a point in MicroStation, then point in data grid is selected and highlighted. ***Draw Point Info.***: Draw point information in MicroStation.
10. ***Report*:** Generate report for the relationship of all points of curb ramp.
11. ***Rename Point Names***: The figure below is the interface to rename point names. Input Prefix, start number, and Suffix, click ***Ok*** button, and all points are renamed.



12. ***Assign Alignment***: Specify alignment for all points, and station, offside, and side of selected points are calculated automatically.
13. ***Assign Location for Current Point***: Allocate location for the point by clicking a point in MicroStation.
14. ***Assign locations for all Points***: Allocate locations for all points by picking points in MicroStation continually.
15. ***Set NOTE for Selected Points***: The figure below is the interface to specify Notes for all selected points. Input notes and then click ***Ok*** button

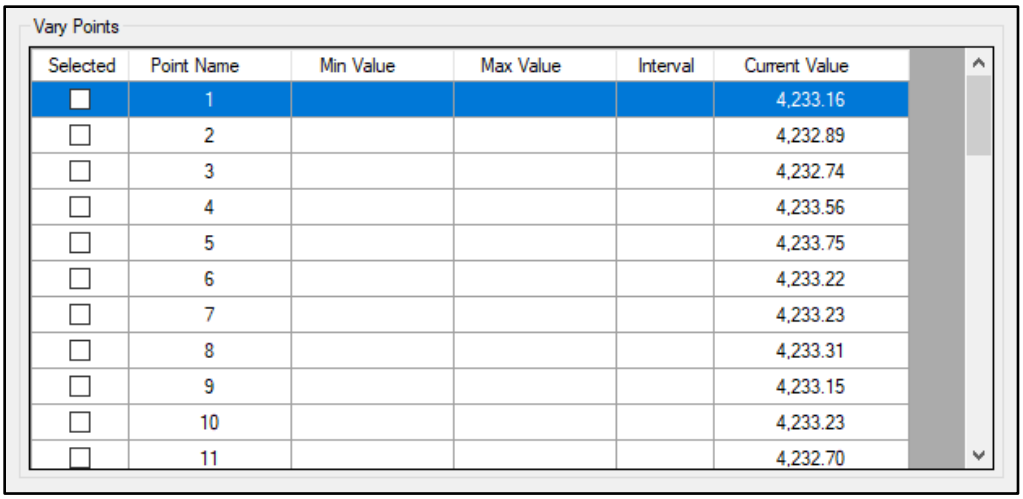


16. ***Set DESCRIPTION for Selected Points***: Specify description for all selected points, similar as NOTE introduced above.
17. ***Elevation by Interpolation***: Calculate point elevation based on other two given points with Interpolation method.
18. ***Elevation from Other Points***: The figure below is the interface to calculate elevation of multiple points at same time. Input base elevation and each slope and elevation difference with previous points, then click ***OK*** button, and the elevation of all points are calculated and updated in point data grid.



19. ***Calculate Elevation Range***: Obtain elevation range of current point based on the selected standards.
20. ***Automation***: Procedures are introduced step by step below.

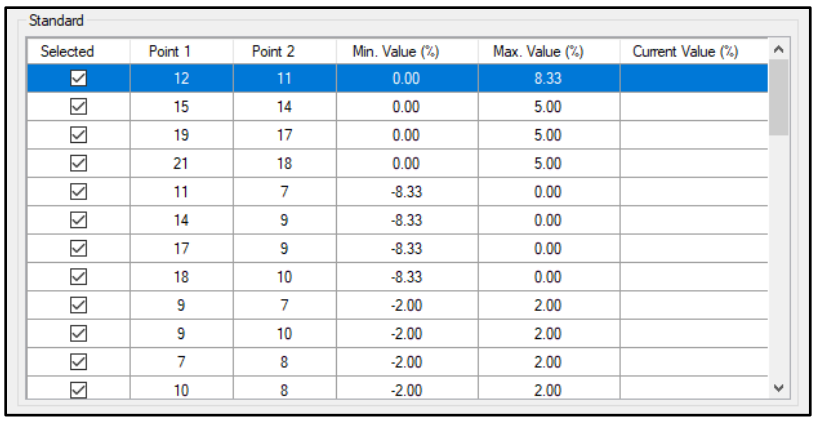
Step 1: Select varying points; the user can select a maximum of 20 points at one time. The default value of interval is 0.05 feet, and minimum value and maximum value of each point are calculated automatically.



Application also provides some functions to set these values. Right click on data grid, and a menu with five sub menus displays:

- **Select Point with Zero Ele.**: Select all points with zero elevation.
- **Set Interval for Selected Points**: Assign interval for all selected points.
- **Set Max Ele for Selected Points**: Assign maximum elevation for all selected points.
- **Set Min Ele for Selected Points**: Assign minimum elevation for all selected points.
- **Set Min. Max Ele. for Current Points**: Assign minimum and maximum elevation for current points.

Step 2: Select Standards. The selected standards are applied to calculate elevations of the varying points.



Right click on data grid, a menu with four sub-menus displays:

- ***Optimize Standards:*** All necessary standards are selected automatically based on selected varying points.
- ***Select All:*** All standards are selected.
- ***UnSelect All:*** all standard are unselected.
- ***Anti-Select:*** All unselected standard are selected, and others are unselected.

Step 3: Click ***Run*** button, a solution is found automatically if a solution exists, otherwise a warning message displays.

Step 4: Click ***Continue*** button to find next solution if necessary.

Step 5: Click ***Save*** button, and all elevations of varying points are saved and updated in data grid

21. ***Refresh***: Recalculate elevations of all points based on their reference points.

Tab 3: Standards

All standards applied in curb ramp are listed in the data grid. The rows with a yellow background indicate that current values do not meet criteria and need to be adjusted.

Right click on the data grid, and a menu with twenty-one sub menus displays.

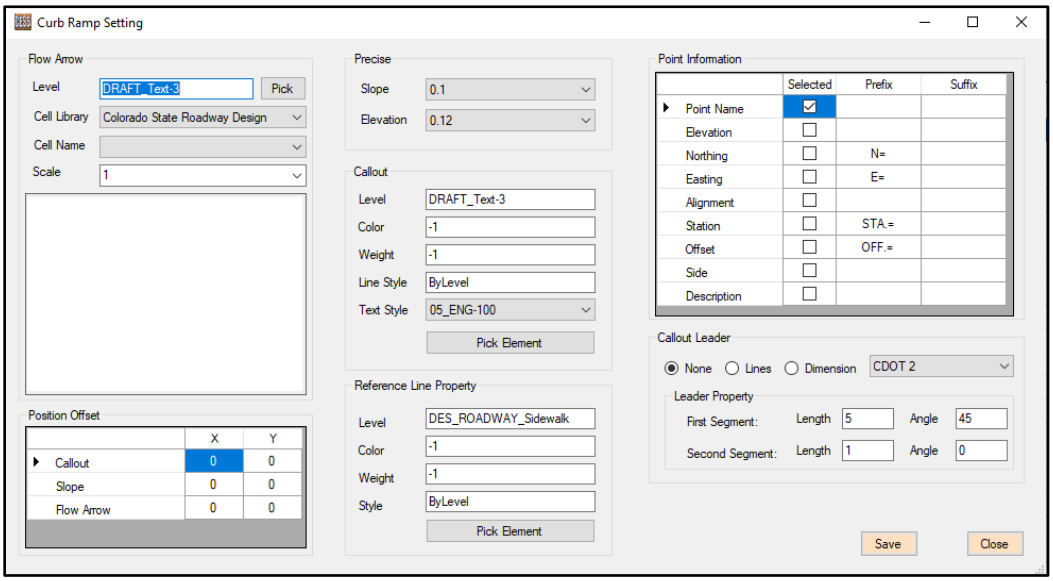
- ***Most functions are similar to functions introduced in curb ramp template introduced.***
- ***Switch Points***: Change order of points in the standard.
- ***Check Current Standard***: Calculate the value and check whether the value meets the standard.
- ***Check All Standards***: Check all values whether they meet the criteria.
- ***Min./Max. Ele. of First Point:*** Calculate the minimum and maximum elevation of first point based on selected standards.
- ***Min./Max. Ele. of Second Point:*** See above.
- ***Draw All Standards:*** Draw all standards in MicroStation including the value and slope direction.
- ***Draw Current Standard:*** Draw current standard in MicroStation.
- ***Save Standards:*** Save values to database.
- ***Draw All Lines:*** Draw all lines from points in standards in MicroStation.
- ***Draw Current Line:*** Draw line by current standard in MicroStation.

Tab 4: Isometric

All functions are same as curb ramp template.

3.5 CURB RAMP SETTING

The figure below is the interface for curb ramp setting.



I. Flow Arrow

- ***Level***: Flow arrow level
- ***Cell Library:*** *Cell library which includes flow arrow.*
- ***Cell Name:*** *Name of flow arrow cell.*
- ***Scale:*** *Scale when drawing flow arrow in MicroStation.*

II. Position Offset

- ***Callout:*** Offset of Callout of a point based on its location.
- ***Slope:*** Offset of Slope of two points based on their middle points.
- ***Flow Arrow:*** Offset of flow arrow based on their middle points.

III. Precise: Set slope and elevation format.

IV. Callout: Set properties of callout in MicroStation.

V. Reference Line: Set Reference line properties in MicroStation

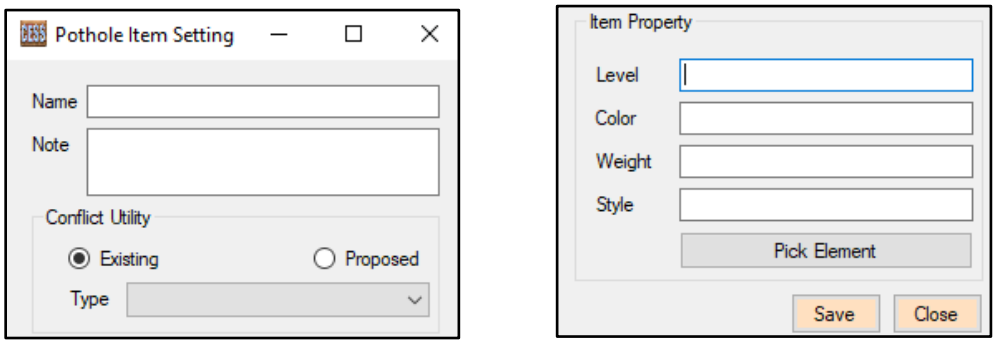
VI. Point Information: Set point information including prefix, suffix, and the items to draw when drawing point information into MicroStation.

VII. Callout Leader: Set Leader type, length, angle etc.

4. POTHOLE TABLE DESIGN

4.1 New Pothole Item

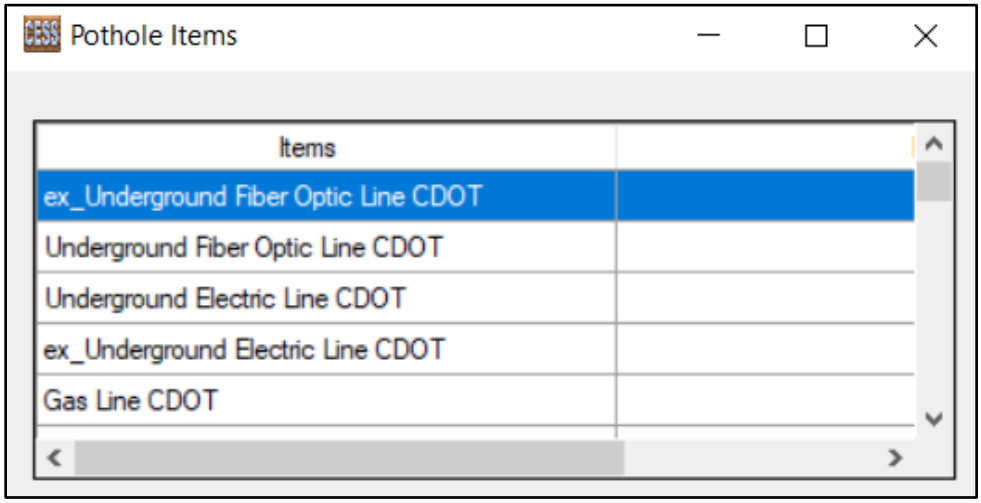
Figure below is the new pothole item interface, and all pothole items need to be preset before pothole table auto-generation.



- ***Name***: Setting name,
- ***Note***: Take note for setting.
- ***Conflict Unitilty***: Including existing and proposed utility.
- ***Type***: Including Electric, gas, water, etc.
- ***Item Property***: item properties in Microstation. Click ***Pick Element*** to get properties from selected element in Microstation

4.2 Pothole Items Summary

Figure below is item summary interface and all existing items of the company are listed.



Right click on data grid and a menu with three sub-menus displays:

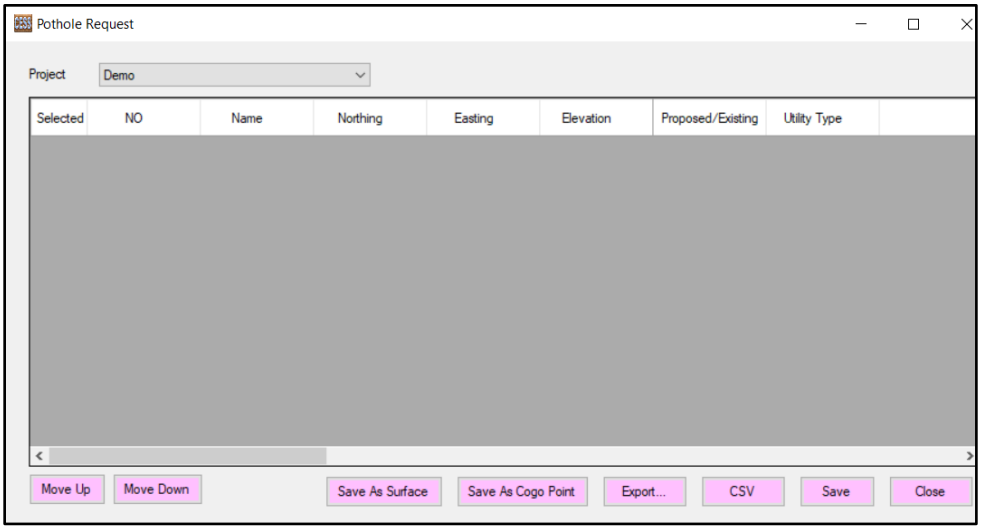
New: Add a new pothole item.

Edit: Edit an existing pothole item.

Delete: Remove existing pothole from database.

4.3 Pothole Table Design

Figure below is the main interface for pothole table design. Select a project, all conflict points as pothole point of the project are listed in the data grid.



Followings are introduction of the buttons in the interface:

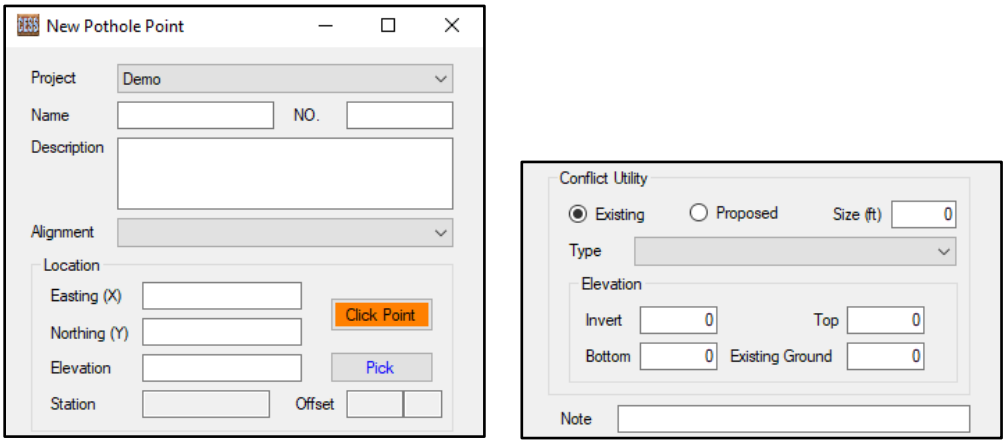
- ***Move Up***: Move current pothole up.
- ***Move Down***: Move current pothole down.
- ***Save As Surface***: Save selected potholes points to a text file with surface format, which can be imported to Inroads.
- ***Save Ad Cogo Point***: Save selected potholes point to a text file as Cogo point format, which can be imported to Inroads.
- ***Export…***: Export potholes data to spreadsheet.
- ***CSV***: Export pothole to text file with CSV format.
- ***Save***: Save any change to database.
- ***Close***: Close the application.

Right click on the data grid, a menu with 18 sub-menus displays:

- ***New Pothole:*** Add a new pothole to the project, see details below.
- ***Edit Pothole:*** Update current pothole, and similar with ***New Pothole*** function.
- ***Auto Finder:*** Automation for pothole design, see details below.
- ***Remove Pothole:*** Delete pothole from the project.
- ***Remove Selected Pothole:*** Delete all selected potholes.
- ***Goto Pothole:*** Go to the pothole location in Microstation.
- ***Import Points:*** Import points in selected objects in Microstation.
- ***Draw Circle for Pothole:*** Draw a circle for current pothole in Microstation.
- ***Draw Pothole Name: Draw*** Pothole name at pothole location in Microstation
- ***Draw Name with Arrow:*** Draw a pothole's arrow and name in Microstation.
- ***Rename:*** Rename the all selected pothole.
- ***Renumber No.:*** Re-index numbers for all potholes.
- ***Open Dgn File:*** Open working Microstation file of the potholes.
- ***Select Alignment:*** Specify an alignment for the potholes, and the station, offset is calculated for all potholes automatically when the alignment is selected.

Create a New Pothole

Figure below is the interface for new pothole:



Steps below are how to create a new pothole:

Step 1: Select a project.

Step 2: Specify Name of pothole, NO, and Description.

Step 3: Select an Alignment.

Step 4: Pick a point of pothole and specify the elevation.

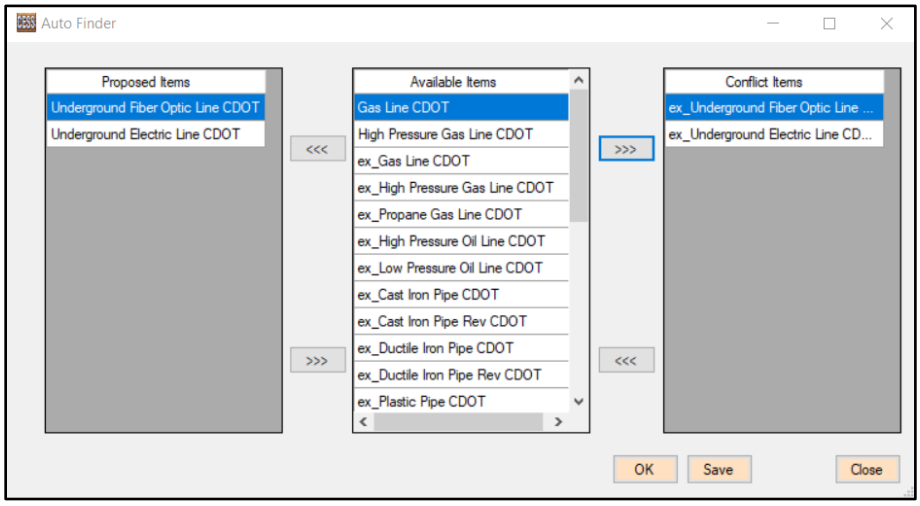
Step 5: Set Conflict Utility and its information: size, type, and its different elevations.

Step 6: click ***Save*** button to save the pothole.

Step 7: click ***New*** button and repeat step 1 to 6 to create new potholes.

4.4 Auto Finder

Figure below is auto finder interface, and all pothole locations can be identified automatically.



Step 1: Select all possible proposed items and conflict items form available items.

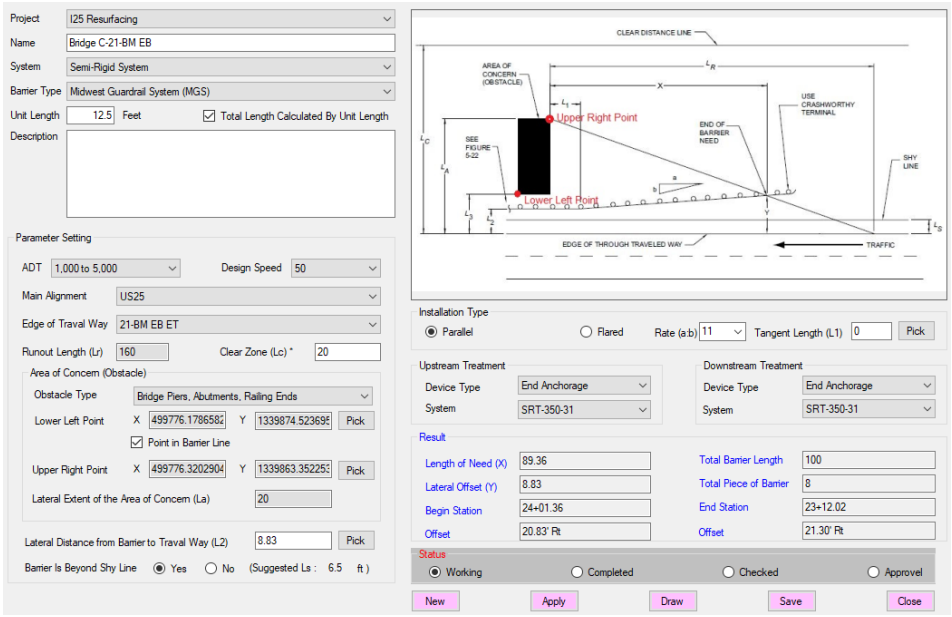
Step 2: Click ***OK*** button and all possible potholes are identified.

Step 3: Click ***Save*** button to save all potholes to database.

5. GUARDRAIL DESIGN

5.1 New Guardrail Design

The figure below is the interface for new guardrail.



Followings are the descriptions of all parameters. More details can be found in reference book -- “Roadside Design Guide”.

- **Project:** Select a project and all alignments of the project are loaded.
- **Name:** Name of guardrail.
- **System**: Guardrail system, including Flexible System, Semi-Rigid System, and Rigid System.
- **Barrier Type**: Type of barriers.
- **Unit Length**: Unit length of barrier.
- **Total Length Calculated by Unit Length**: Total length round to total piece of barrier times unit length, instead of Length of Need.
- **Description**: Description of the guardrail.
- **ADT**: Average daily traffic Volume.
- **Design Speed**: Design speed at guardrail location.
- **Main Alignment**: Main alignment of project, which is applied for begin station and end station.
- **Edge of Travel Way**: Alignment of edge of travel way.
- **Runout Length**: The distance from the object being shielded to the location where the vehicle departs from the traveled way. Runout length can be calculated automatically once ADT and design speed are determined.
- **Clear Zone**: Unobstructed, traversable roadside area that allow a driver to stop safely, or regain control of a vehicle that has left the roadway.
- **Area of Concern**: Distance from the edge of the traveled way to the far side of the fixed object or to the outside edge of the clear zone of an embankment or a fixed object that extends beyond the clear zone.
- **Obstacle Type**: Type of obstacle.

- **Lower Left Point**: Key point for guardrail design and the lower left point of obstacle.
- **Upper Right Point**: Key point for guardrail design and the upper right point of the obstacle.
- **Lateral Extent of the Area of Concern**: Distance from the edge of the traveled way to the far side of the fixed object or to the outside edge of the clear zone of an embankment or a fixed object that extends beyond the clear zone. Which can be calculated automatically once Edge of Travel Way and Upper Right Point are set.
- **Lateral Distance from Barrier to Travel Way**: Distance from barrier to travel way.
- **Barrier is Beyond Shy Line**: Determine whether barrier is beyond shy line or not.
- **Installation Type**: Type of installation of barrier
- **Upstream Treatment**: Upstream treatment of barrier
- **Downstream Treatment**: Downstream treatment of barrier

Result including following items:

- **Length of Need (LON)**: Minimum length of barrier.
- **Total Barrier Length**: Total length of real length of barrier.
- **Lateral offset(X)**: From the edge of the traveled way to the beginning of length-of-need.
- **Total Piece of Barrier**: piece of the barrier required.
- **Begin Station**: Station of the beginning of barrier.
- **Offset**: Offset of the beginning of barrier.
- **End Station**: Station of the end of barrier.
- **Offset**: Offset of the end of barrier.

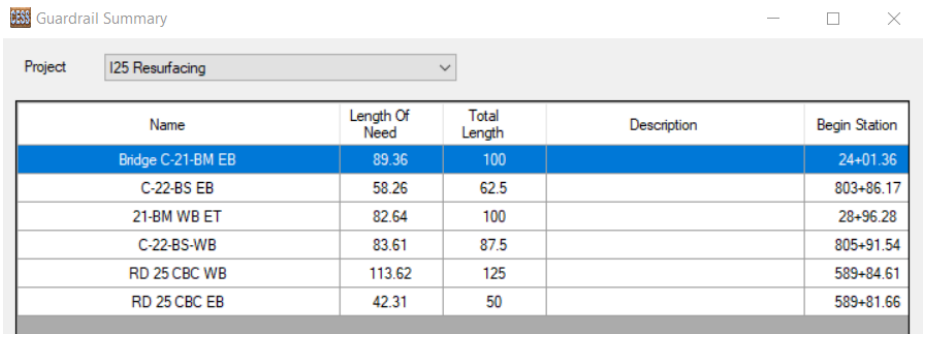
Status: Status of guardrail design, including Working, Completed, Checked, and Approval.

Click ***Apply*** button, the results are generated. Click ***Draw*** button and the guardrail and treatments are drawn in the MicroStation. Click ***Save*** button, all guardrail information is saved to database. Click ***New*** button, a new guardrail is created. IT IS IMPORT TO NOTE:

1. **UNROTATED VIEW WHILE DRAWING**
2. **ALIGNMENT OF EDGE OF TRAVEL WAY SHOULD FOLLOW THE TRAFFIC FLOW, AND MAKE SURE LOWER LEFT POINT AND UPPER RIGHT POINT ARE AT RIGHT SIDE OF THE ALIGNMENT.**

5.2 Guardrail Summary

Figure below is guardrail summary of projects. When a project is selected, all guardrails in project are listed.



Right click on the data grid, a menu with six sub-menu displays:

New: Create a new guardrail.

Edit: Edit an existing guardrail, Similar as New function.

Goto Begin Point: Move to beginning point of guardrail.

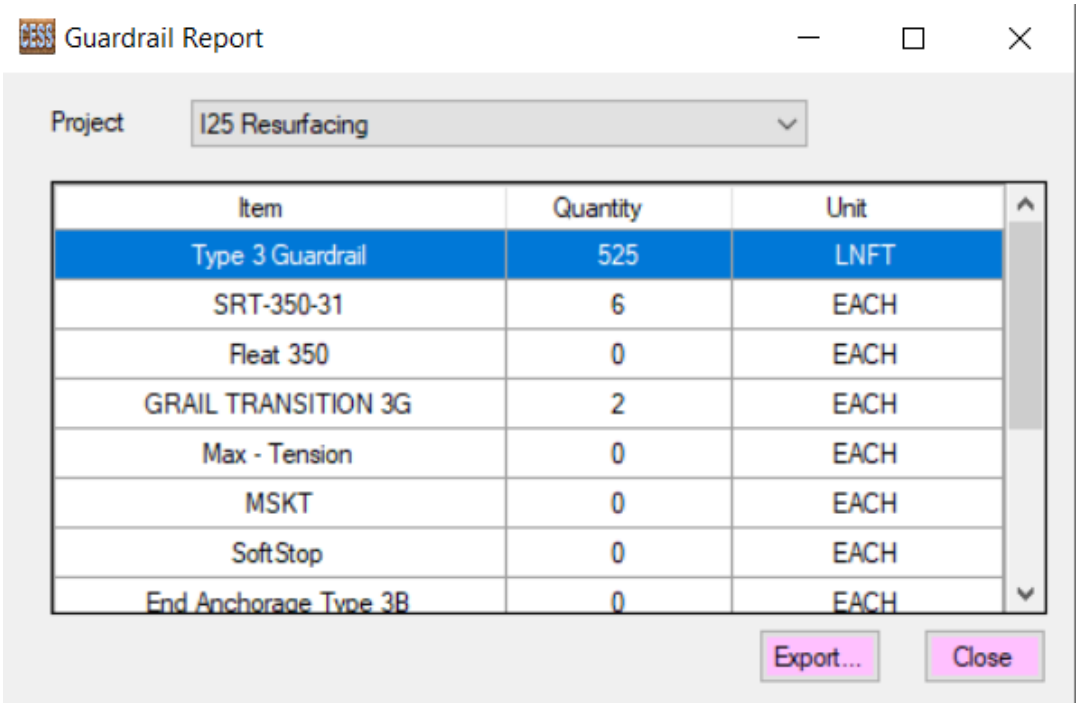
Goto Key Point: Move to lower left point of obstacle.

Report: Quantity report displays.

Draw Callout: Callout of key points is drawn in MicroStation.

5.3 Report

The figure below is guardrail quantity report.



Select a project and amount of all items are summarized. Click ***Export*** button, and quantities are exported to a spreadsheet.

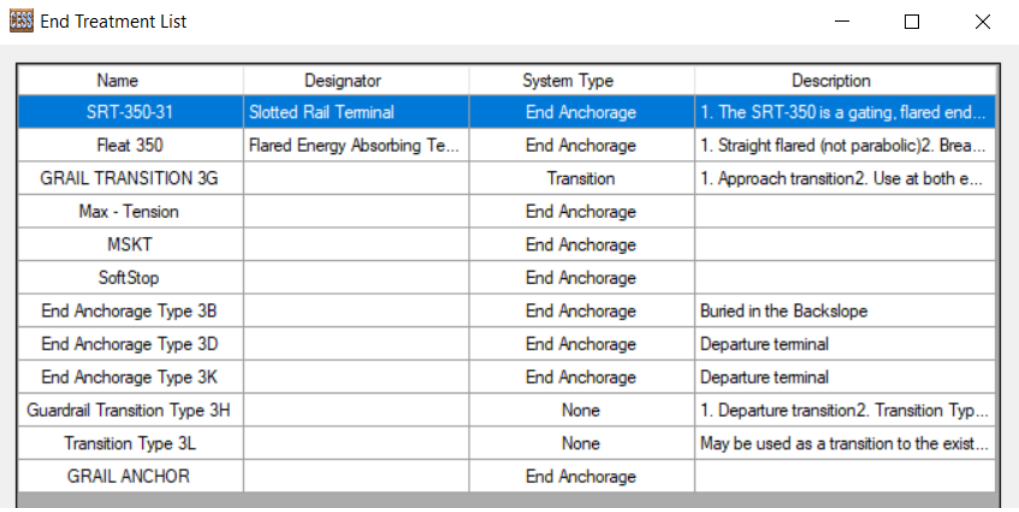
5.4 End Treatment Summary

Figure below is interface of End Treatments and all end treatment of the company are listed int he data grid. Right click on the data grid, a menu with three sub menus displays:

New…: Create new end treatment or terminal, see detail below.

Edit: Update an existing treatment or terminal.

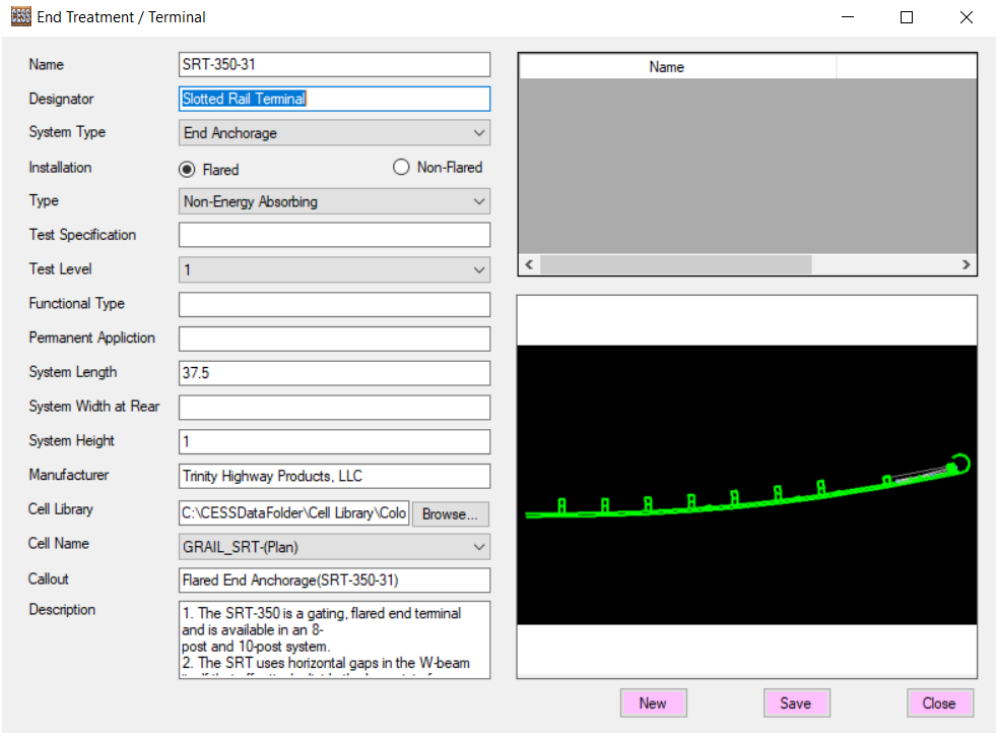
Delete: Remove existing treatment or terminal from database.



Name	Designator	System Type	Description
SRT-350-31	Slotted Rail Terminal	End Anchorage	1. The SRT-350 is a gating, flared end...
Fleat 350	Flared Energy Absorbing Te...	End Anchorage	1. Straight flared (not parabolic)2. Brea...
GRAIL TRANSITION 3G		Transition	1. Approach transition2. Use at both e...
Max - Tension		End Anchorage	
MSKT		End Anchorage	
SoftStop		End Anchorage	
End Anchorage Type 3B		End Anchorage	Buried in the Backslope
End Anchorage Type 3D		End Anchorage	Departure terminal
End Anchorage Type 3K		End Anchorage	Departure terminal
Guardrail Transition Type 3H		None	1. Departure transition2. Transition Typ...
Transition Type 3L		None	May be used as a transition to the exist...
GRAIL ANCHOR		End Anchorage	

Create or Edit Treatment /Terminal

Following is the interface for adding or editing treatment/Terminal.

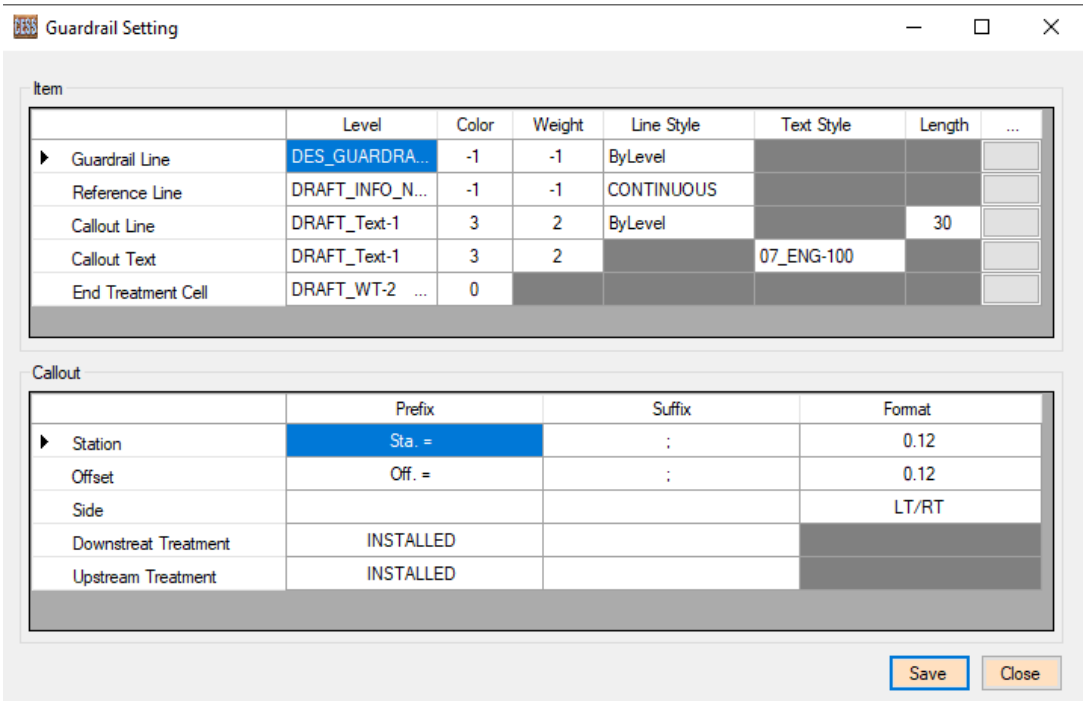


Name: Specify Treatment/Terminal name.
Designator: Designator of Treatment or Terminal.
Cell Library: Cell Library for End Treatment or Terminal.
Cell Name: Cell name of end treatment or terminal.
Description: Description of end treatment or terminal.

Definition of other items can be found in reference book “Roadside Design Guide”.
Click ***Save*** button to save end treatment or terminal.

5.5 Guardrail Setting

Figure below is the guardrail setting interface.



Guardrail, Reference Line, Callout Line, Callout Text, and End treatment cell can be set in the data grid directly, or select an element in Microstation as sample, then click the button at most right cell of each row, the properties are retrieved automatically.

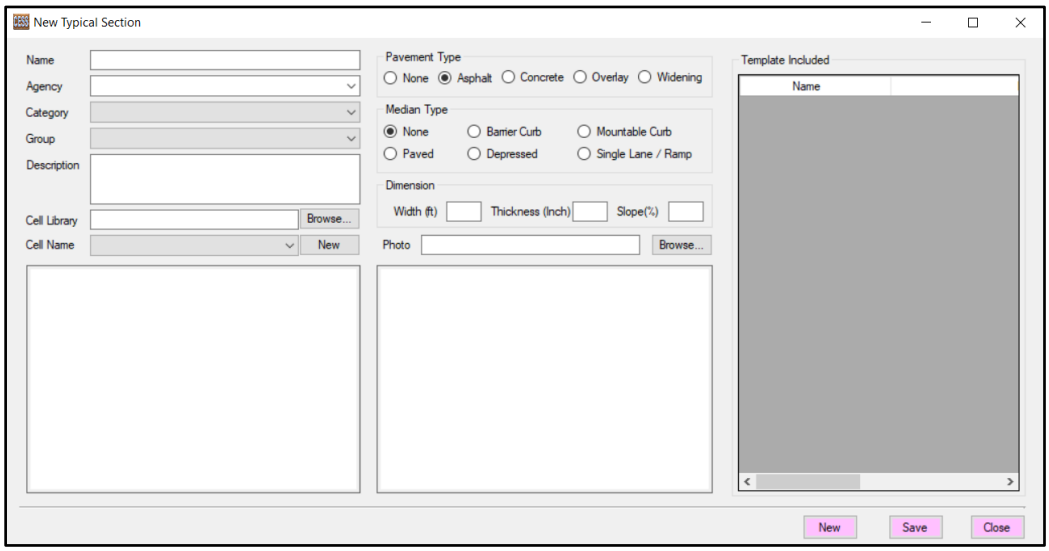
Specify Callout properties of Station, Offset, Side, Downstream Treatment, and Upstream Treatment in data grid directly.

Click ***Save*** button and guardrail setting is saved.

6. TYPICAL SECTION DESIGN

6.1 New Typical Section

The figure below is the interface for a new typical section.



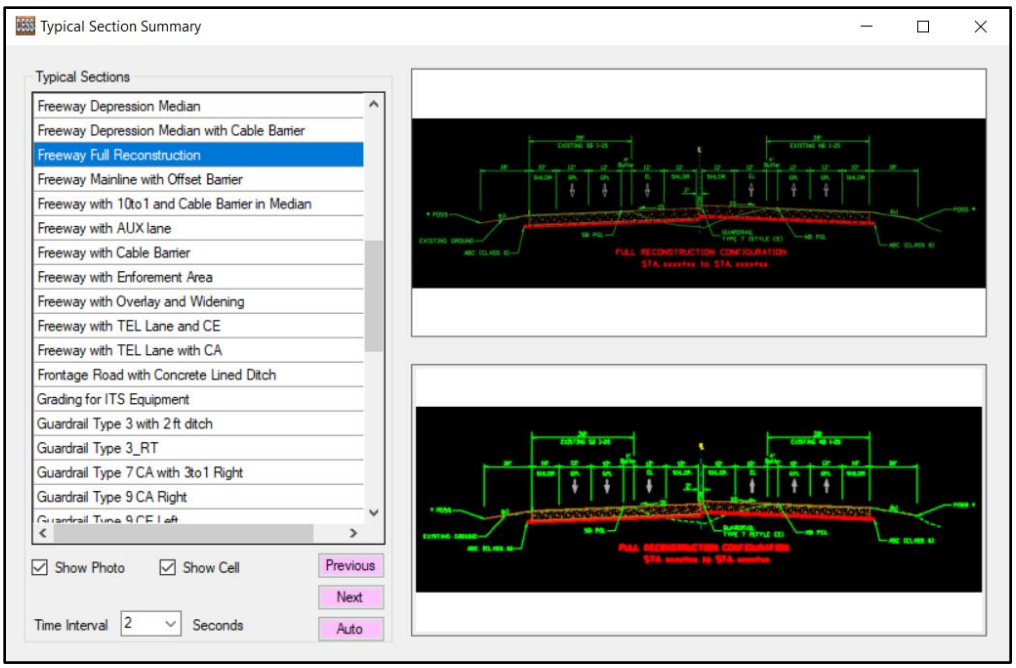
- ***Name***: Specify name for new typical section.
- ***Agency***: Agency that typical section applied for.
- ***Category***: Classification of typical section.
- ***Group***: Group of typical section belong to.
- ***Description***: Explanation or note for typical section.
- ***Cell Library***: File that typical section is placed.
- ***Cell Name***: Name of cell in cell library.
- ***Pavement Type***: Type of pavement if available.
- ***Median Type***: Type of Median if available.
- ***Dimension***: Dimension of typical section, no necessary in most case.
- ***Photo***: Legend of typical section.

Template Included: Templates in Inroads are related to typical section.
Normally, multiple templates or components are applied in Inroad for one typical section, and all available templates are listed in here. By right clicking on the data grid, a menu displays, and the user can add or remove templates for typical section.

6.2 Typical Section Summary

All available typical sections are listed in the data grid, Click a typical section, and photo and cell displays.

Check box of “Show Photo” determine whether typical section legend will display, check box of “Show Cell” determine whether Cell displays or not. Time Interval is for auto review and meant to determine the gap between two typical sections.

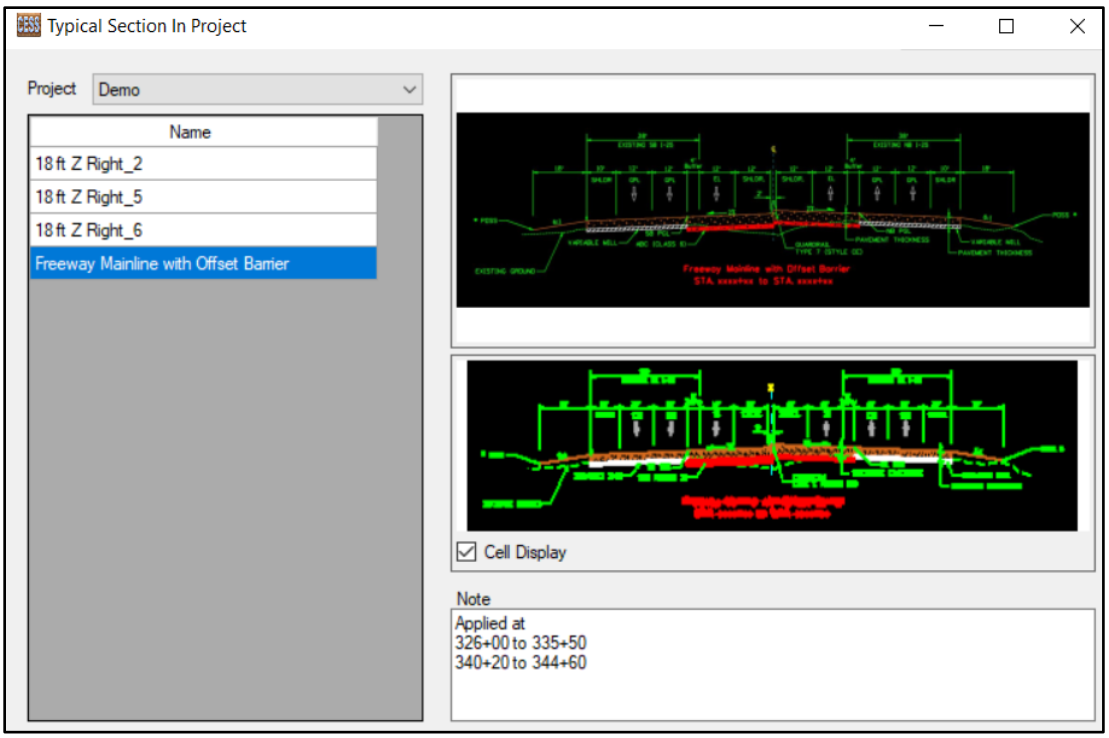


Right click on data grid, and a menu with nine sub menus will display:

- ***New***: Add a new typical section.
- ***Edit***: Similar to New.
- ***Details***: Details of typical section.
- ***Remove***: Delete typical section from database.
- ***Refresh***: Reload all typical sections.
- ***Draw***: Draw typical section cell in MicroStation.
- ***Add To Project***: Add current typical section to the current project.
- ***Search…***: Search specific typical section.
- ***Auto Review***: Review typical section one by one listed in data grid.

6.3 Typical Section In Project

The figure below is the interface for typical section in project. Select a project and all typical sections in the project are listed. Click a typical section, and legend, cell, and note will display.



Right click on data grid, and a menu with five sub menus will display.

New: Add new typical section to the project.

Edit: Similar as New.

Details: Show details of typical section

Remove: Remove typical section from project.

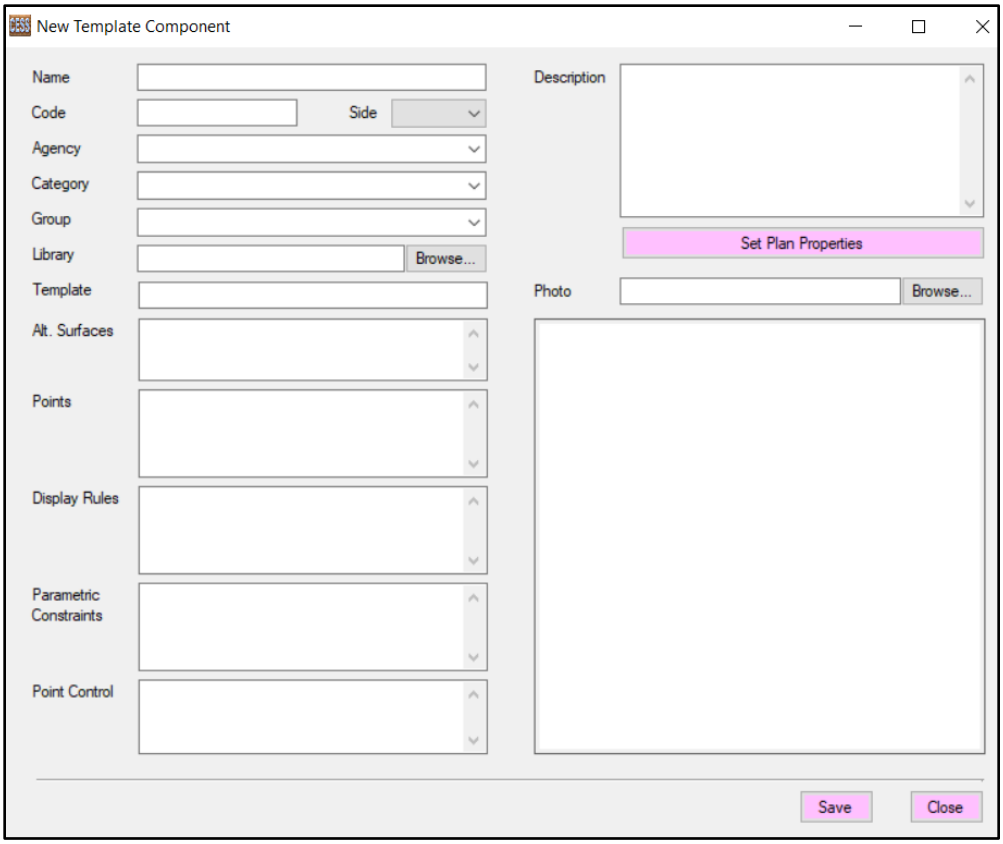
Draw: Draw typical section in MicroStation

Input all information of template, and then click ***Save***.

6.4 New Template and Component

The figure below is the interface for a new template component.

- ***Name***: Template / Component name.
- ***Code***: number to identify the component, and it also to t determine whether the component display in the template.
- ***Side***: Left or right side applied in road.
- ***Agency***: Agency that template/component applied.
- ***Category***: Classification of template/component.
- ***Group***: Group of template/component.
- ***Library***: Template library in Inroads (.itl)



- ***Template***: Template name in library.
- ***Alt. Surface***: Alternative surface in template.
- ***Points***: Ponts included in template/component.
- ***Display Rules***: Display Rules in template/component.
- ***Parametric Contraints***: Parametric Contraints in template/component.
- ***Point Control***: Point Control in template/component.
- ***Descripiton***: Description of template/component.
- ***Photo***: Photo of template/component.

.

6.5 Template and Component Summary

The figure below is the interface of template summary, there are two tabs, Auto Review and List Review, which include all existing template Components.

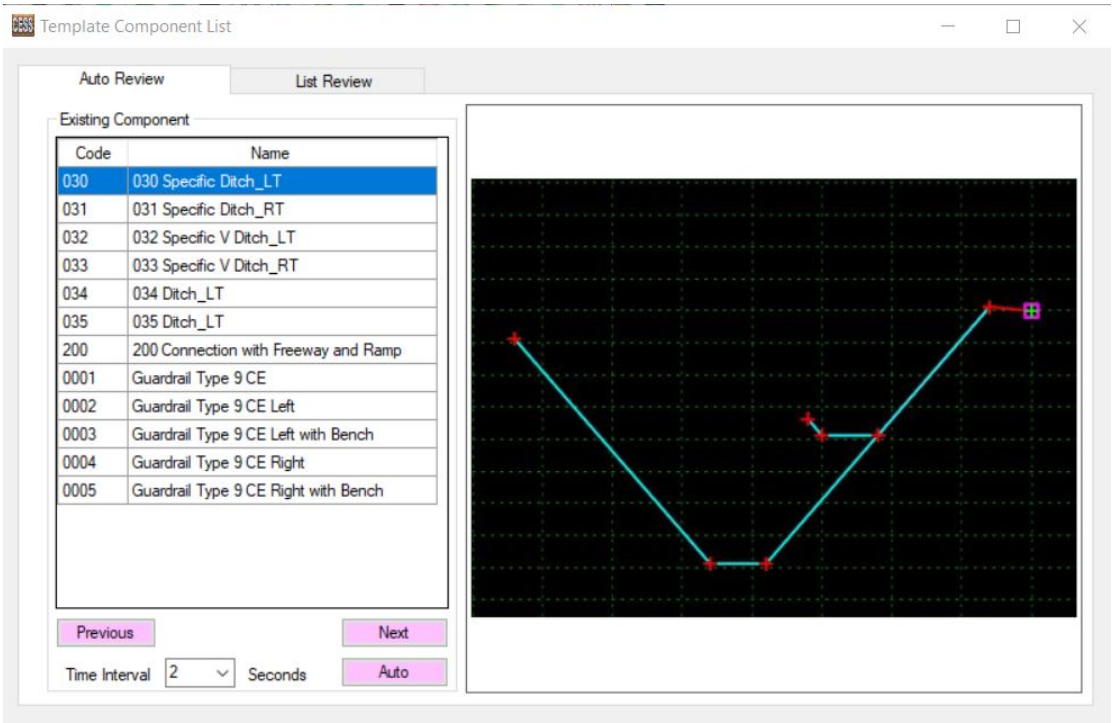
In Auto Review tab, template component can be reviewed atomatically. Functions are introduced below:

Previous: display previous .

Next: display next component

Auto: Review templates one by one automatically.

Time Interval: The interval between the two templates when reviewing (similar to a slideshow).



Right click on data grid, and a menu with five sub-menu displays.

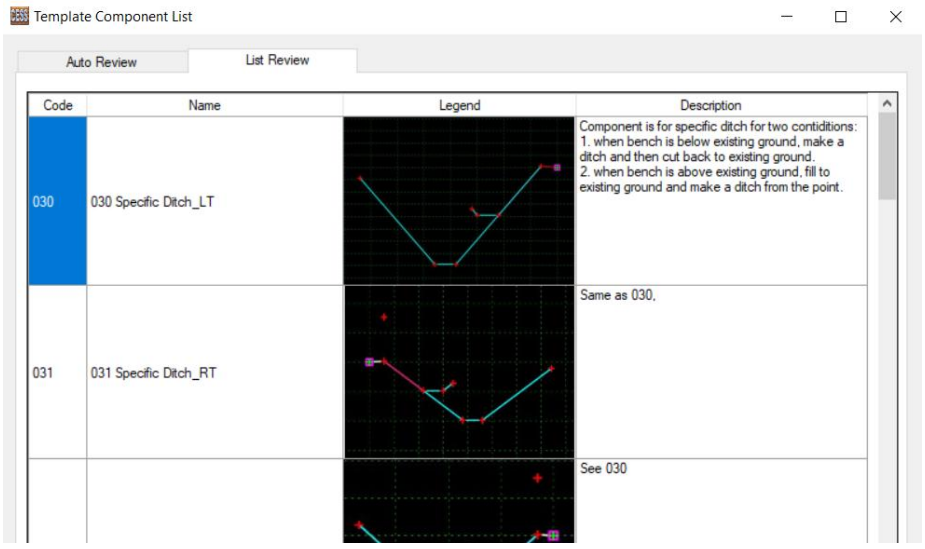
New: Add new template, see New Template module for details.

Edit: Similar with New function.

Details: Details of template component

Remove: Remove the template from database.

Search: Search specific template, and template meet the filter are selected and diplayed.

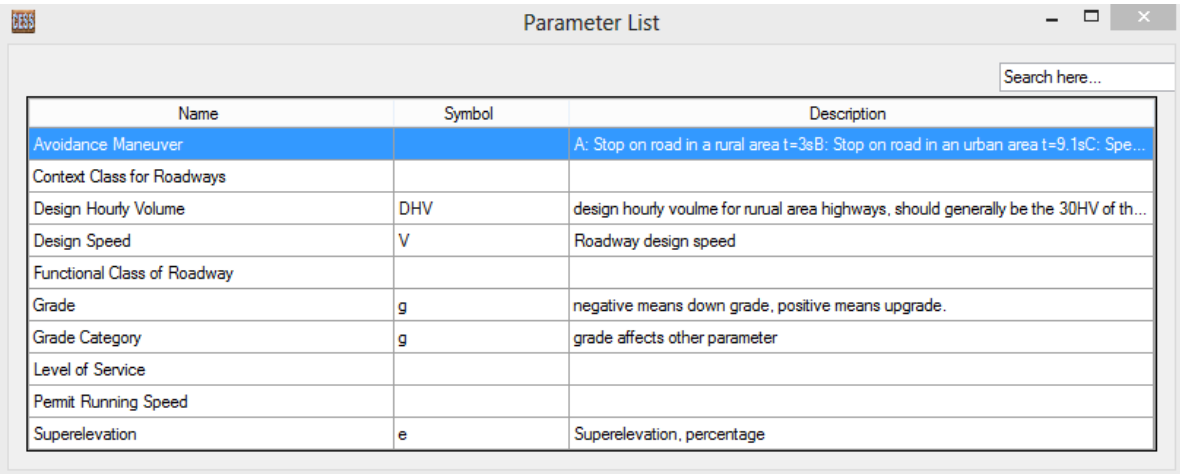


7. Criteria Management

There are three aspects of criteria management: Parameter, Criteria, and criteria applied in Project.

7.1 Parameter

Figure below is the interface of parameters.



All existing parameters of the company (or agency) are listed in the data grid. To search specific parameters, input letters in search box and press ***Enter*** key. Right click on data grid, a menu with three sub menus displays:

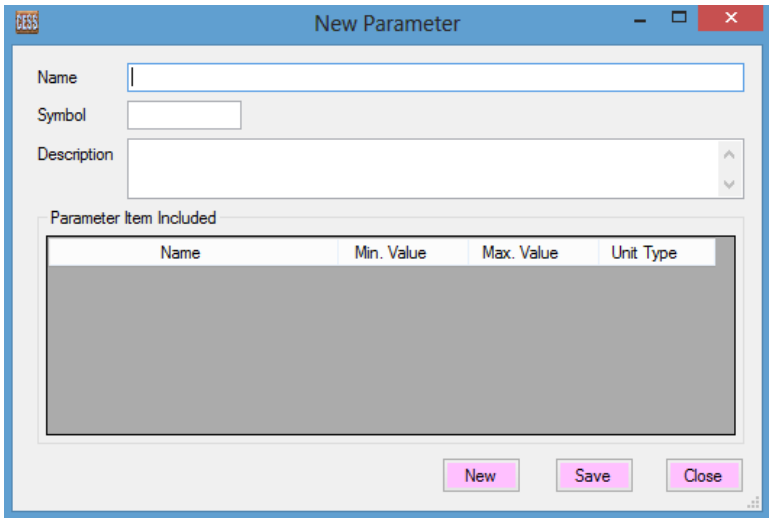
New...: Creates a new parameter.

Edit...: Updates an existing parameter, similar to ***New*** function.

Remove: Deletes an existing parameter.

Create a New Parameter

Figure below is the interface to create a new parameter.

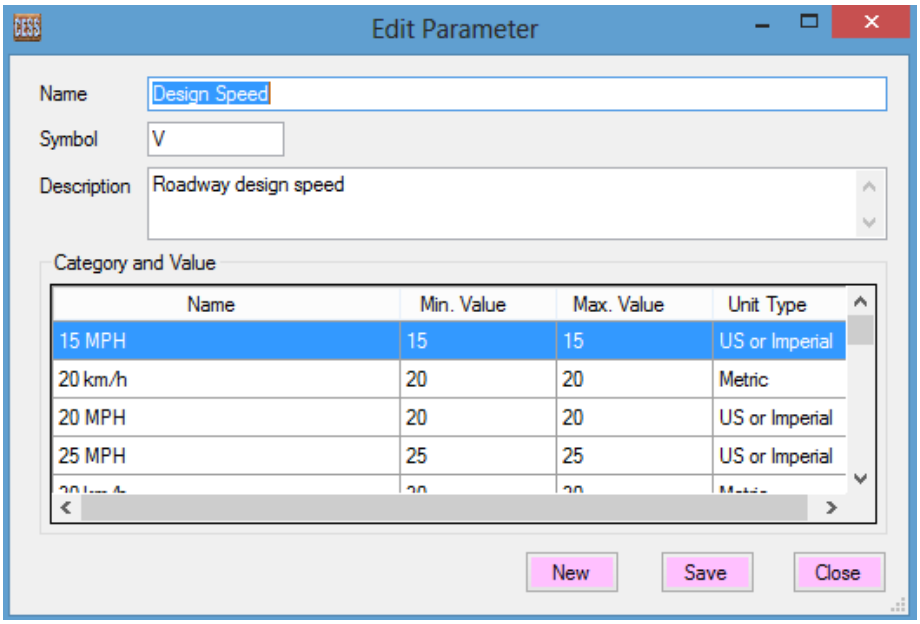


Name: Specify parameter name.

Symbol: Symbol of parameter, can be multiple letters.

Description: Parameter description.

Category and Value: Category of parameter and its value (see figure below for an example).



Right click on the data grid, a menu with three sub menus displays:

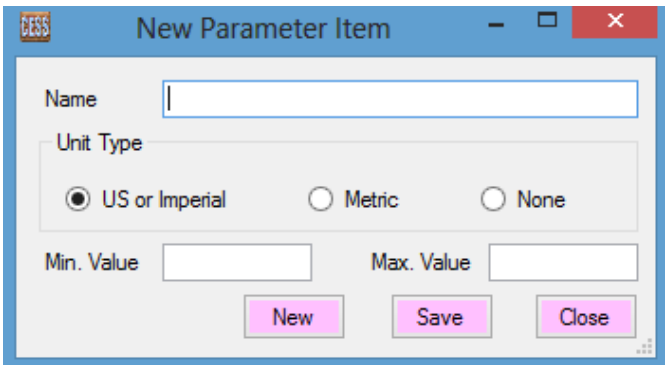
New...: Creates a new category and set its values (more details introduced later).

Edit: Updates an existing category of parameter, similar to ***New*** function.

Delete: Removes an existing category and its values.

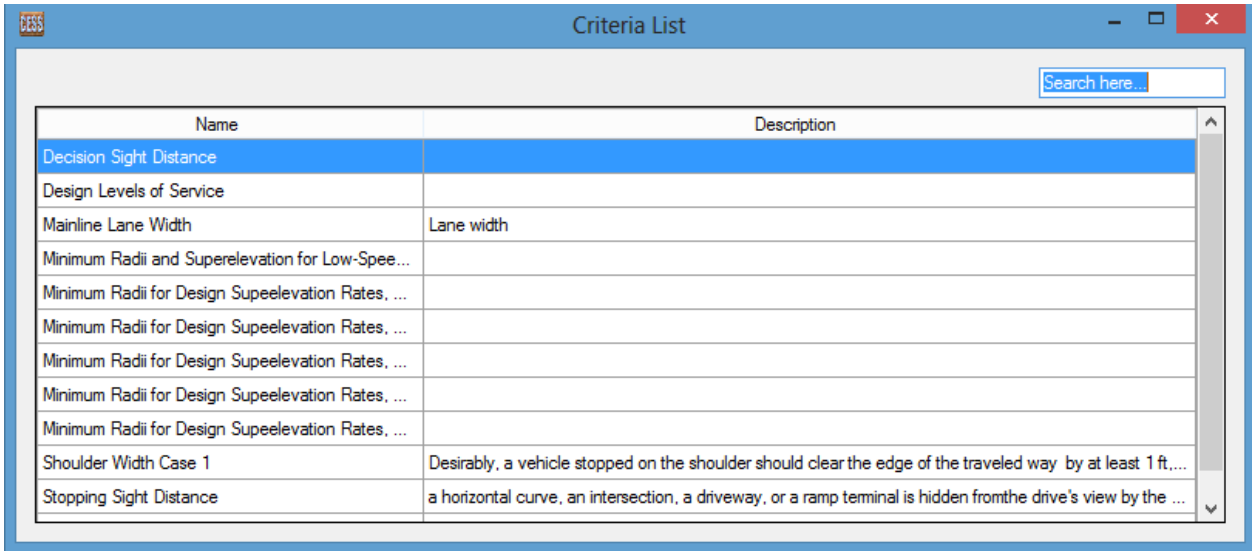
Create A New Parameter Item

Figure below is the interface for a new category item. Specify the name of the parameter item, select Unit Type, and input the minimum and maximum value of the parameter item, and then click ***Save*** button to save parameter. Click ***New*** button for another new parameter item.



7.2 Criteria

Figure below is criteria in the company.



Right click on the data grid, a menu with five sub menus displays:

New...: Creates a new criterion (more details introduced later).

Edit...: Updates an existing criteria, similar to ***New*** function.

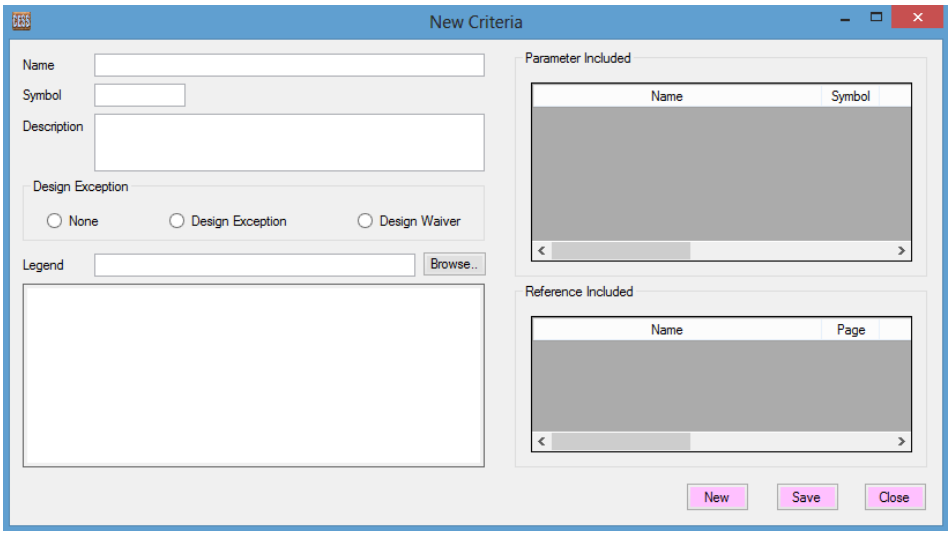
Remove: Deletes an existing criterion.

Set Value: Sets value for criteria.

Open Reference: Open reference of the criteria.

Create a New Criterion

Figure below is the interface for New Criterion:



Name: Specify name of the criterion

Symbol: Symbol of criterion.

Description: Description of criterion.

Design Exception: Whether the criteria is design exception, design waiver, or regular criteria.

Legend: Criterion's legend.

Parameter Included: All parameters of the criteria are listed in data grid. Right click on the parameter data grid and a menu with two sub menus displays:

Add: Adds parameters for the criterion. When a new window included all existing parameters are shown, double click a parameter and the parameter is added to the criterion.

Delete: Removes the selected parameter from the criterion.

Reference Included: All references of the criterion are listed in the data grid. Right click on data grid, a menu with three sub menus displays:

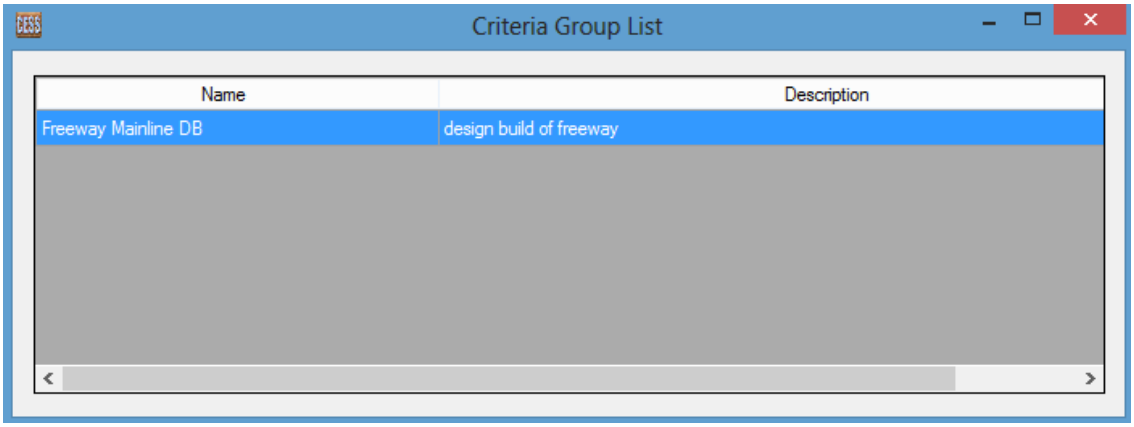
Add: Add a reference for the criterion.

Edit: Edits a reference of the criterion.

Delete: Removes the selected reference from the criterion.

7.3 Criteria Group List

Figure below is the interface of criteria group, and all groups are listed in the data grid.



Right click on data grid and a menu with three sub menus displays:

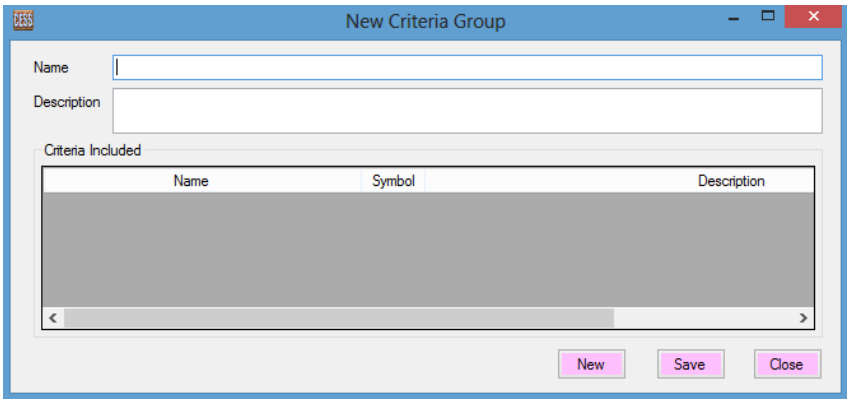
New...: Creates a new criteria group (more details introduced later).

Edit...: Updates an existing criteria group.

Remove: Deletes an existing criteria group.

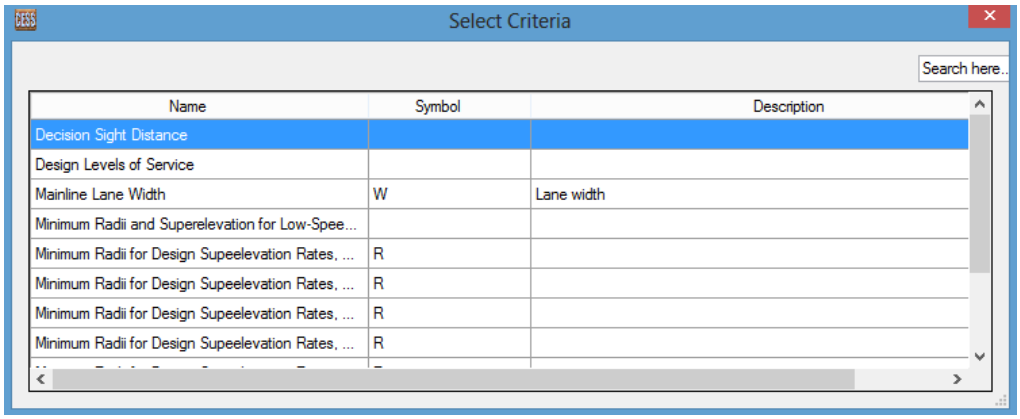
Create New Criteria Group

Figure below is the interface for new criteria group. Input specific name and description, and then save;



After saving the group, right click on the criteria data grid, and a menu with two sub menu displays:

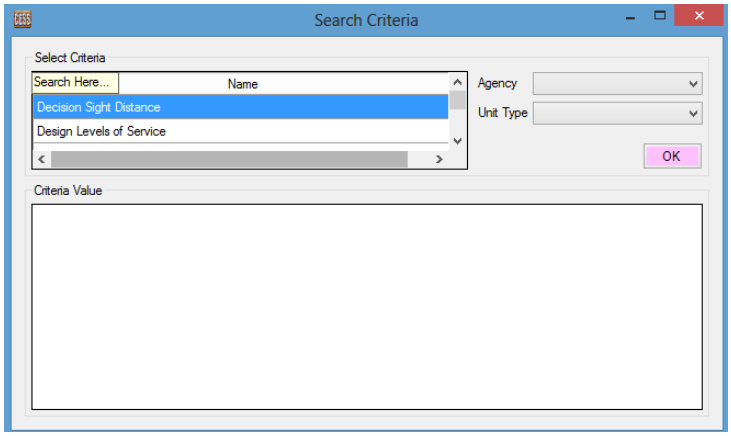
Add... : Interface below displays. Double click a criterion and the criterion adds to the group. Using search box, some specific criteria are filtered and displayed.



Remove: the selected criterion removes from the criteria group.

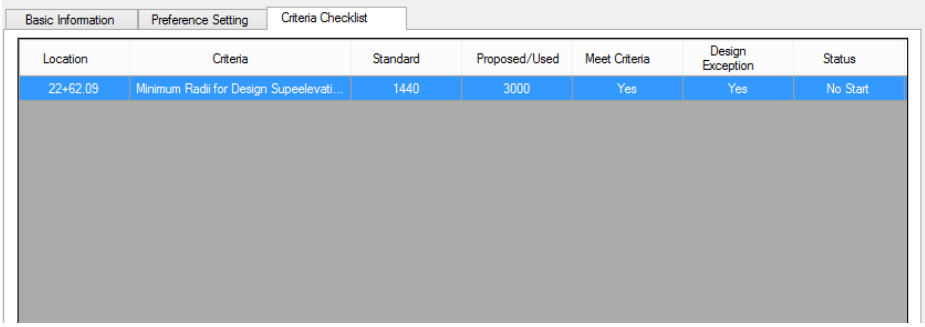
7.4 Search Criteria

Figure below is the interface to search criteria. Using search box, specific criteria can be filtered and displayed in data grid. Select a criterion, select Agency and Unit Type, then click ***OK*** button. All criteria values display.



7.5 Criteria Applied in Roadway

This module is one of modules of ***Roadway In Project***. Figure below is the interface.



Select a project and all roadways are listed. Select a roadway, all criteria applied in the roadway are listed in the data grid. Right click on the data grid, a menu with eight sub menus displays:

New...: Creates a new criteria checklist for the roadway (more details introduced later).

Edit...: Updates existing criteria checklist, similar to ***New*** function.

Delete: Removes existing criteria checklist.

Goto Location: Moves to the criterion checklist location in Microstation.

Open Exception Form: Opens Exception Form if criterion is design exception.

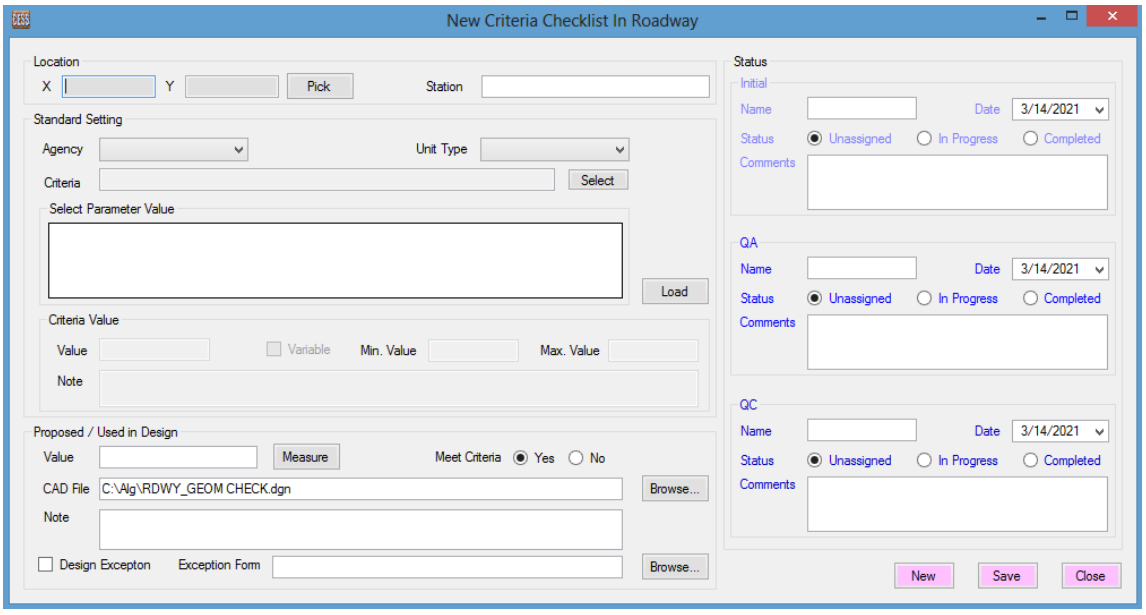
Print Criteria of Current Roadway: Prints all criteria checklist of selected roadway.

Print All UnMeet Criteria of Entire Project: Prints all criteria that do not meet standards as checklist.

Print All Criteria checklist of Entire Project: Prints all criteria in the entire project as checklist.

New Criteria Checklist

Figure below is the interface for adding criteria checklist.



Step 1: Pick location of checklist in Microstation and Station of location is retrieved.

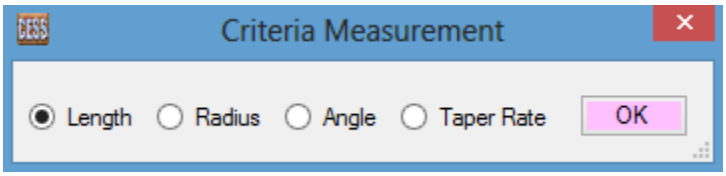
Step 2: Select an agency from Agency combo box.

Step 3: Select unit type from Unit Type combo box.

Step 4: Click ***Select*** button, a new window with all existing criteria displays. Double click a criteria, the criterion is selected and all parameters of the criterion are loaded in the data grid.

Step 5: Select values of all parameters, then click ***Load*** button. The criterion value is retrieved.

Step 6: Input current design value or click ***Measure*** button to measure the value.



There are four measurements:

Length: Click ***Ok*** button, then pick two points in the Microstation, and length is calculated.

Radius: Select a curve in Microsation first, then click ***OK*** button, and radius of curve is retrieved.

Angle: Select two lines in Microsation first, then click ***OK*** button, and angle is calculated.

Taper Rate: Select two lines in Microstation first, then click ***OK*** button, and taper rate is calculated.

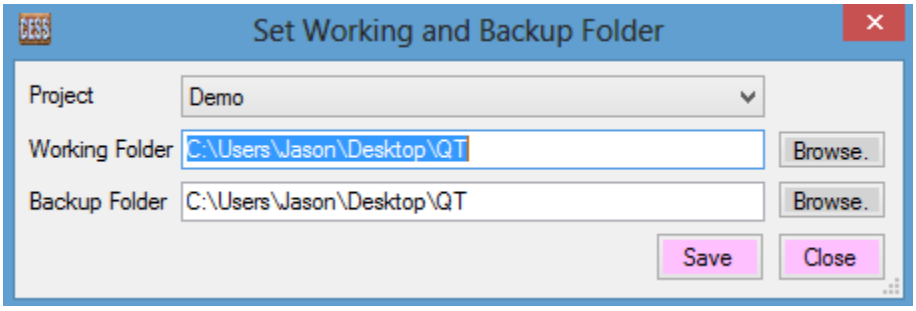
If criterion is design exception, attach exception form if needed.

8. Roadway Calculation

Roadway calculation includes nine aspects: 1) Vertical Clearance, 2) Horizontal Sight Distance, 3) Intersection Sight Distance, 4) Profile Grade Break and Cross Slope Break, 5) Tie-in to Existing, 6) Sight Distance at Undercrossings, 7) Superelevation (Introduces at Generate Superelevation module), 8) Length of Need of Guardrail (Introduces at Guardrail Design module), and 9) Vertical Headlight Sight Distance (Introduces at Alignment and Profile Validation module).

Since all calculations are related to roadways, alignment, and profile, roadways should be set up before calculations, as well as a working setup and backup folder.

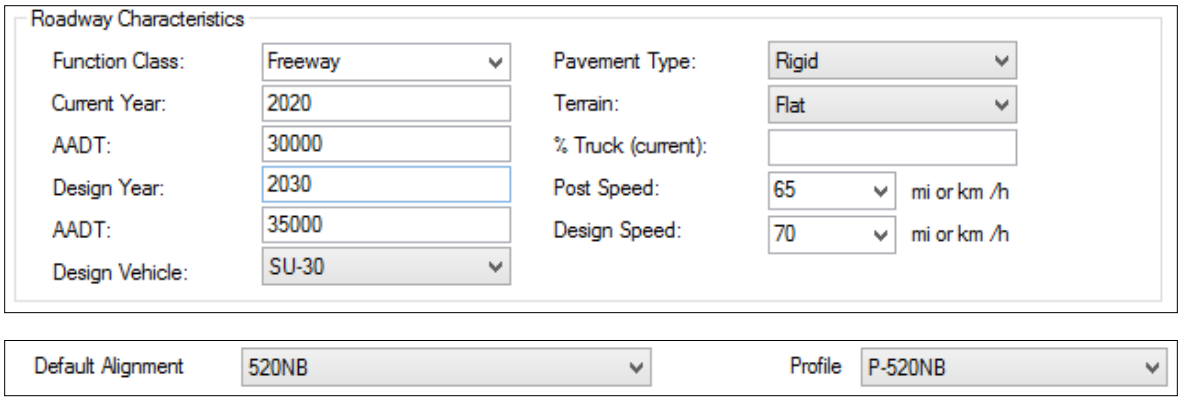
8.1 Set Working and Backup Folder



Select a project and click ***Browse*** button. Select folders for working folder and backup folder of the project separately, and then click ***Save*** button. In Project Setting module, user can set working and backup folder as well.

8.2 Set Roadway Information for Calculation

If design speed, design vehicle, default alignment, default profile of a roadway are not set before calculation, open this module, and set those parameters.

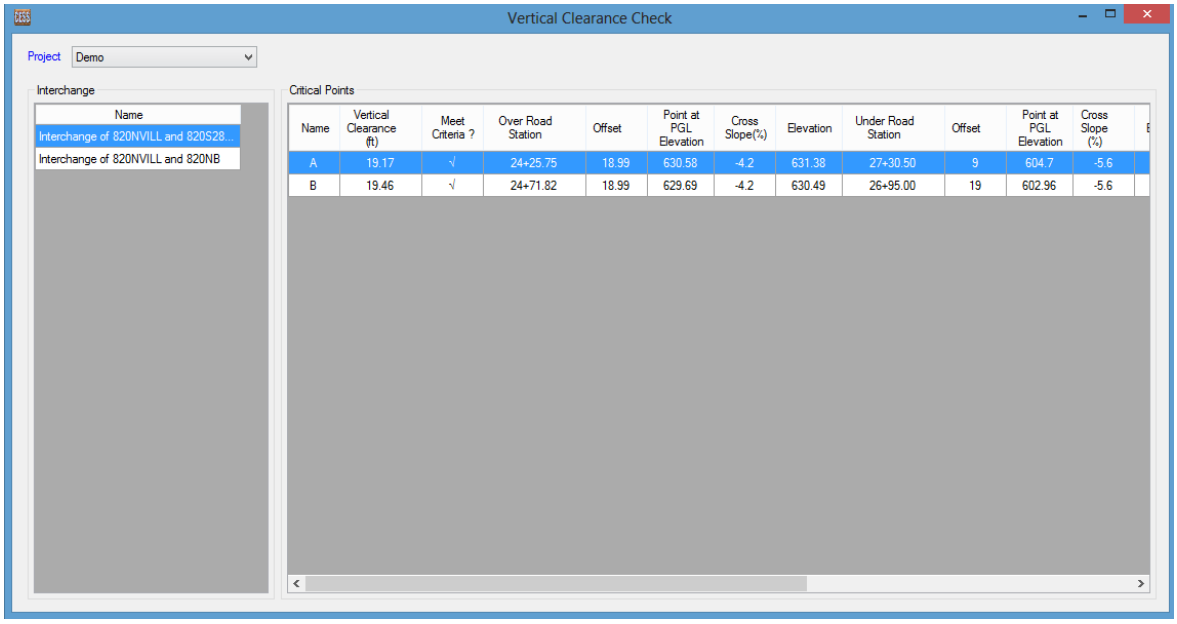


All images can zoom in, zoom out, or move using mouse. To reset the image, double click on the image. Image can be loaded by selecting an existing image file, or be screenshot using Snipping Tool (right

click on the image and use *Copy image from Clipboard* menu, image will be saved in working folder automatically).

8.3 Vertical Clearance

Figure below is interface of Vertical Clearance Check.



Select a project, and all existing interchanges are loaded in the left data grid. Right click on the interchange data grid, a menu with nine sub menus displays:

New... : Creates a new interchange for vertical clearance check (more details introduced later).

Edit... : Updates existing interchange, similar to ***New*** function.

Remove: Removes an existing interchange from the database.

Goto Interchange: Moves to the interchange location in Microstation.

Open Dgn File: Opens interchange working file in Microstation.

All Critical Points: Displays all critical points of project.

All Unmeet Requirement Points: Displays all points which do not meet vertical clearance criteria.

Print Current Interchange: Prints selected interchange and its critical points in PDF format.

Print All Interchanges: Prints all interchanges and critical points in PDF format once.

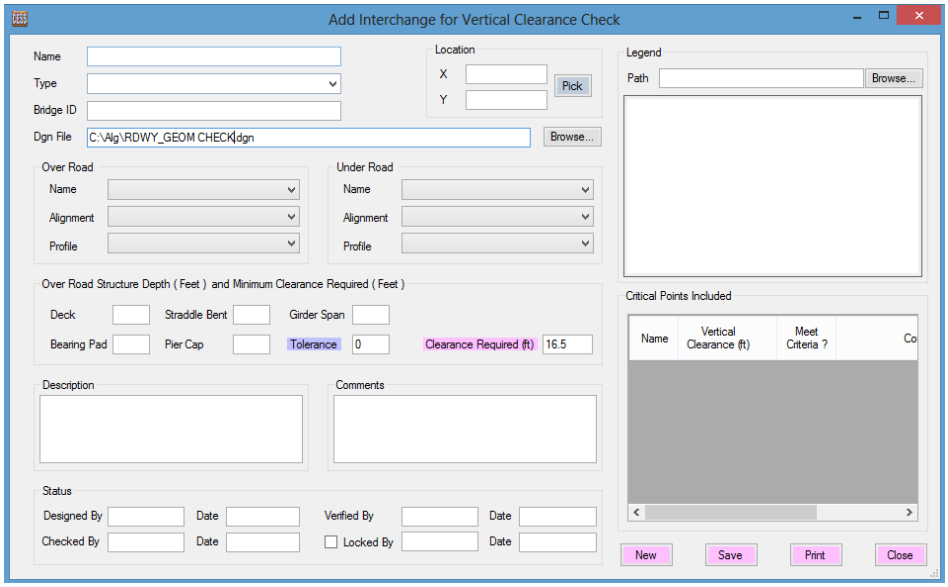
Create a New Interchange

Figure below is the interface to create a new interchange; all parameters are described separately.

Name: Specify the name of interchange.

Type: Interchange type: Highway / Highway, Highway/Railway, and Other.

Location: Interchange location.



Bridge ID: Bridge ID of the interchange.

Dgn File: Interchange working file in Microstation.

Over Road: Specify name, alignment, and profile of above road.

Under Road: Specify name, alignment, and profile of below road.

Over Road Structure Depth and Minimum Clearance Required: Over road structure includes deck, straddle bent, girder span, bearing pad, and pier cap. If there are other structures considered as structure depth, their depth can be included into tolerance. Normally, minimum clearance is set automatically when type is selected, and user can change it if needed.

Description: Describe the interchange.

Comments: Comments can be made and input here.

Status: Status of vertical clearance check.

Legend: Legend can be selected from a photo file direct or use ***Snipping*** tool to capture a screen shot (Right click, select Copy image from Clipboard, and the image will saved).

Critical Points Included: All critical points of the interchange display in the data grid. Right click on the data grid, a menu with four sub menus displays:

> ***New***: Creates a new critical point (more details below).
>
> ***Edit***: Updates an existing critical point, similar to ***New*** function.
>
> ***Remove***: Deletes an existing critical point.
>
> ***Goto Point***: Go to the location of the selected critical point.

Create New Critical Points

Figure below is the interface to create new critical points. There are five steps to create a critical point for vertical clearance check:

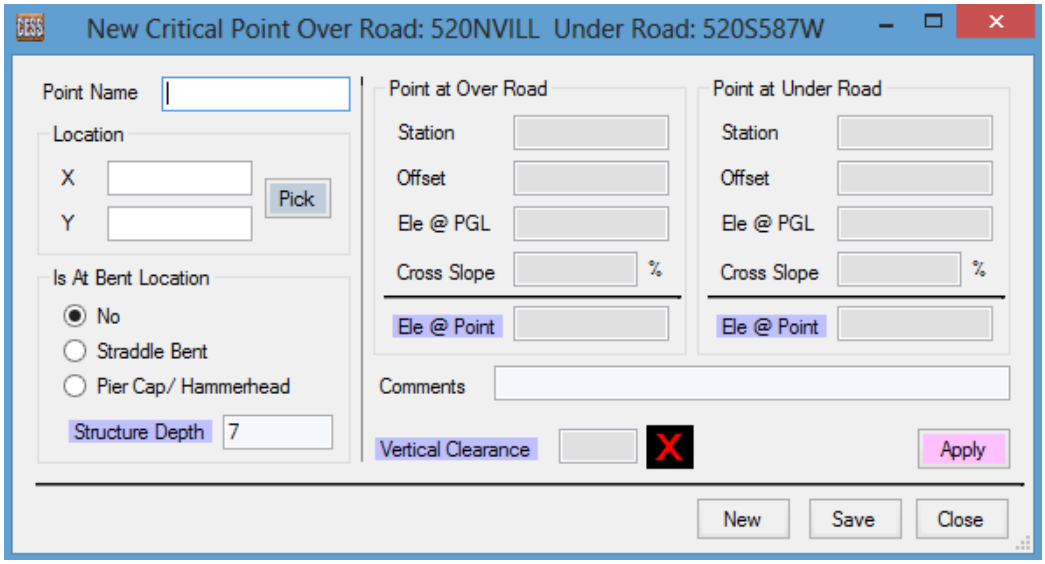
Step 1: Name critical point.

Step 2: Pick critical point in Microstation.

Step 3: Select Bent Location.

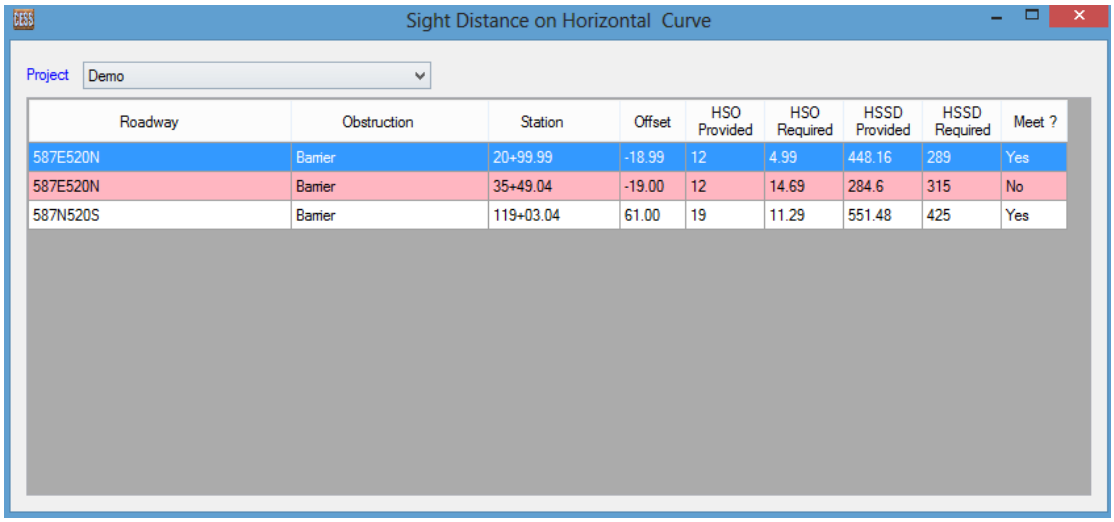
Step 4: Click ***Apply*** button.

Step 5: Click ***Save*** button to save critical point. Click ***New*** button and repeat step 1 to 5 for another new point.



8.4 Sight Distance on Horizontal Curve

Figure below is the interface of Horizontal Stop Sight Distance on Horizontal Curve (HSSD).



Select a project and all HSSD are listed in the data grid. Right click on the data grid, a menu with six sub menus displays:

New...: Creates a new HSSD (more details introduced later).

Edit: Updates an existing HSSD, similar to ***New*** function.

Remove: Removes an existing HSSD.

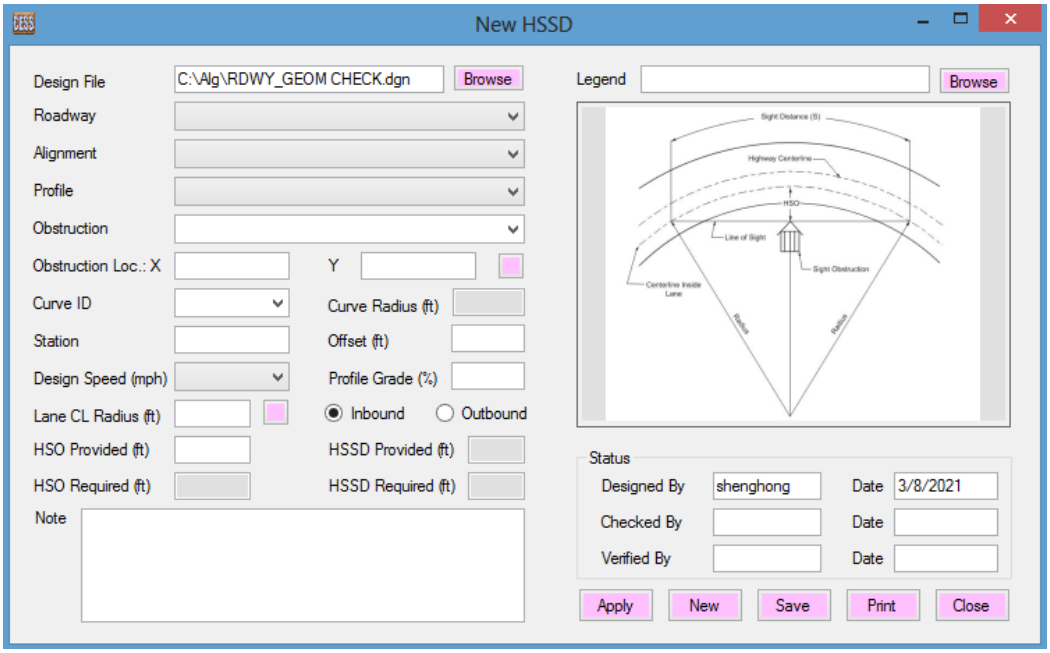
Goto Location: Moves to the HSSD location in Microstation.

Open Design File: Opens HSSD working file in Microstation.

Print All: Prints all HSSD in the project in PDF format.

Create a New HSSD

Figure below is the interface of New HSSD.



Design File: HSSD working file in Microstation file.

Roadway: Select a Roadway of HSSD, and default alignment and profile are loaded automatically.

Obstruction: Type of Obstruction.

Obstruction Location: Pick a point of obstruction in Microstation, and Curve ID, Curve Radius, Station, Offset, Design Speed, and Profile Grade are retrieved automatically.

Curve ID: ID of Curve in the alignment.

Curve Radius: Radius of the curve.

Station: Station of the obstruction.

Offset: Offset of the obstruction.

Design Speed: Design speed at the obstruction area.

Profile Grade: Profile grade at obstruction area.

Lane CL Radius: Radius of centerline inside lane. Select left and right striping of inside lane, then click ***Pick*** button. Lane CL Radius can be calculated automatically.

Inbound/Outbound: Inbound represents that traffic flow follows station of alignment, and Outbound represents that traffic flow is opposite the station direction.

HSO Provided: Horizontal Sight Distance Line Offset (HSO) can be provided for the driver in the obstruction area.

HSO Required: Minimum HSO needed for the given Design Speed.

HSSD Provided: HSSD can be provided in the obstruction area.

HSSD Required: Minimum HSSD needed for specified Design Speed.

Once parameters are set and ***Apply*** button is clicked, and Provided HSO and HSSD are calculated.

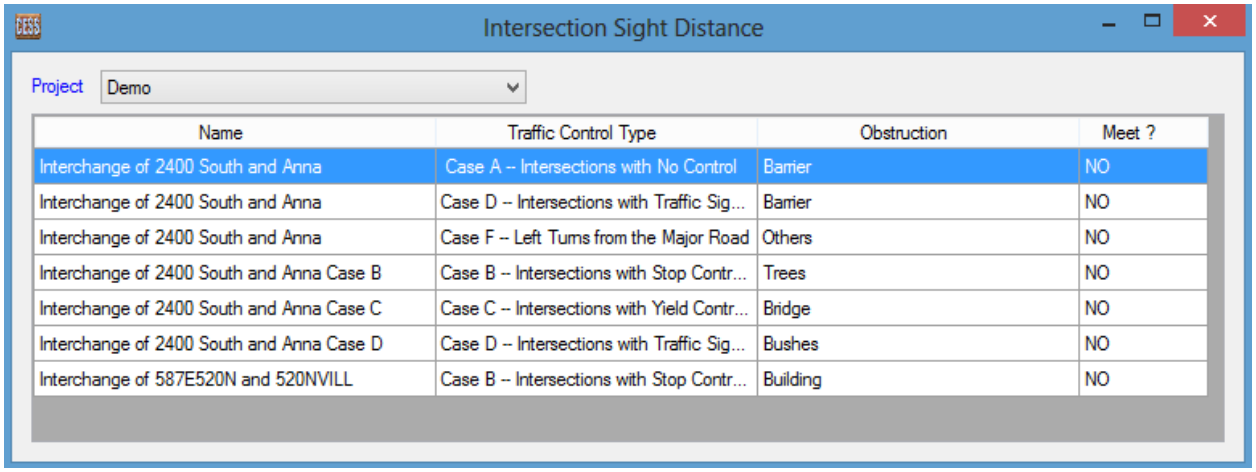
Click ***Save*** button, HSSD information is saved.

Click ***New*** button, a new HSSD is created.

Click ***Print*** button, HSSD is printed.

8.5 Intersection Sight Distance

Figure below is the interface of calculation of Intersection Sight Distance (ISD).



Select a project and all ISD calculations are loaded in data grid, right click on data grid, a menu with six sub menus displays:

New...: Creates a new calculation of ISD (more details introduced later).

Edit: Updates the selected calculation of ISD, similar to ***New*** function.

Remove: Removes a calculation of ISD.

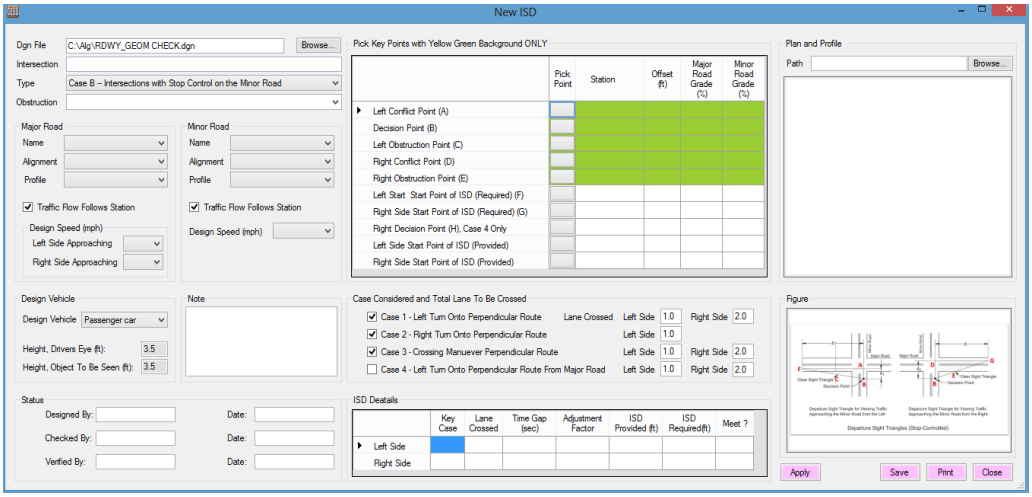
Goto Location: Goes to the location of the intersection.

Open Dgn File: Opens working file of ISD in Microstation.

Print All: Prints all calculations of ISD of the entire project in PDF format.

Create A New ISD Calculation

Figure below is the interface of new calculation of ISD.



Dgn File: Working Microstation file of ISD.

Intersection: Name of ISD intersection.

Type: Type of intersection control, including six types listed below. Details can be found in AASHTO Geometric book.

Case A-- Intersection with no control

Case B -- Stop control on the minor road

Case C -- Yield control on the minor road

Case D -- Traffic signal control

Case E -- All-way stop control

Case F -- Left turns from major road

Obstruction: Type of obstruction (barrier, bridge, cut slope, etc.)

Major Road: Major road and other properties such as alignment, profile, traffic flow direction, and design speed on both sides.

Minor Road: Minor road and other properties such as alignment, profile, traffic flow direction, and design speed.

Design Vehicle: Design vehicle applied in the intersection, and height of driver's eye and object height are retrieved once design vehicle is determined.

Key Points: Key points applied in the case. Only points with yellow green background are required and vary by different control type.

Case Considered and Total Lane to Be Crossed: Specify the lane crossed from left side and right side.

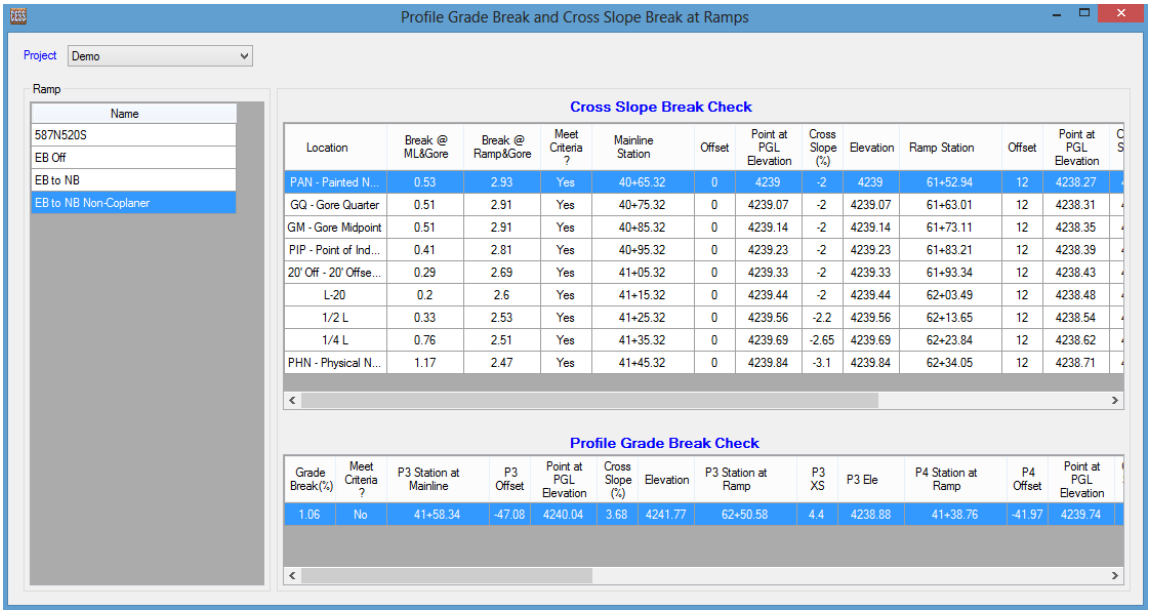
Once all parameters are set, click ***Apply*** button and the ISD results are calculated.

Click ***Save*** button, ISD calculation is saved to database.

Click ***Print*** button, ISD calculation is printed out in PDF format.

8.6 Profile Grade Break and Cross Slope Break at Gore (PGB&CSB@Gore)

Figure below is the interface of PGB&CSB@Gore.



Select a project, all PGB&CSB@Gore of entire project are listed in the ramp data grid. Right click on ramp data grid, a menu with six sub menus displays:

New...: Creates a new PGB&CSB@Gore (more details introduced below).

Edit...: Edits an existing PGB&CSB@Gore, similar to ***New*** function.

Remove: Removes an existing PGB&CSB@Gore.

Goto Ramp: Locates the ramp in Microstation.

Print Current Ramp: Prints out the calculation of current PGB&CSB@Gore in PDF format.

Print All Ramps: Prints out all PGB&CSB@Gore of entire project in PDF format.

Create a New PGB&CSB@Gore

Figure below is the interface of new PGB&CSB@Gore. There are two tabs, one is basic information of ramp, the other is for cross slope break and profile grade break check.

Name: Specify ramp name.

Type: Onramp or Offramp, Coplanar or Non-Coplanar.

Maximum Allowable Profile Grade Break: Threshold of profile grade break.

Maximum Allowable Slope Break: Threshold of cross slope break.

Location: Ramp location.

Dgn File: Working file of PGB&CSB@ Gore.

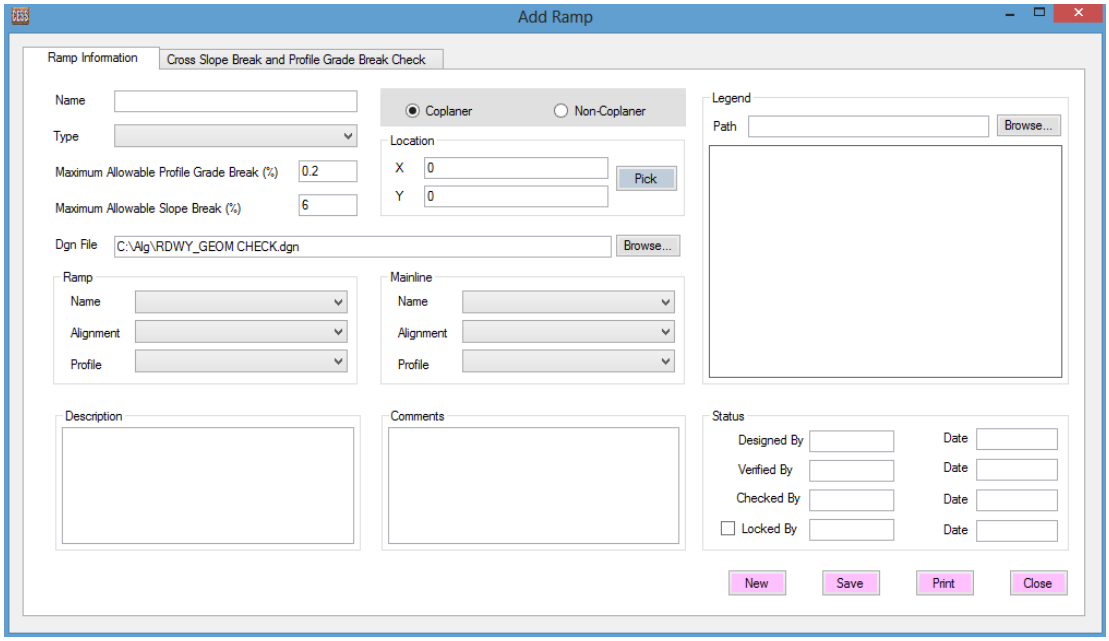
Ramp: Specify ramp and its alignment and profile.

Mainline: Specify mainline and its alignment and profile.

Description: Describe the ramp.

Comments: Comments for the PGB&CSB@Gore

Legend: Screenshot of the ramp. User can capture the ramp with Snipping Tool, right click on the image area, and use ***Copy Image from Clipboard*** menu to save screen shot directly.



After save ramp, then switch to the other tab to generate location for cross slope break and profile grade break check. Right click on above data grade, a menu with five sub menus displays:

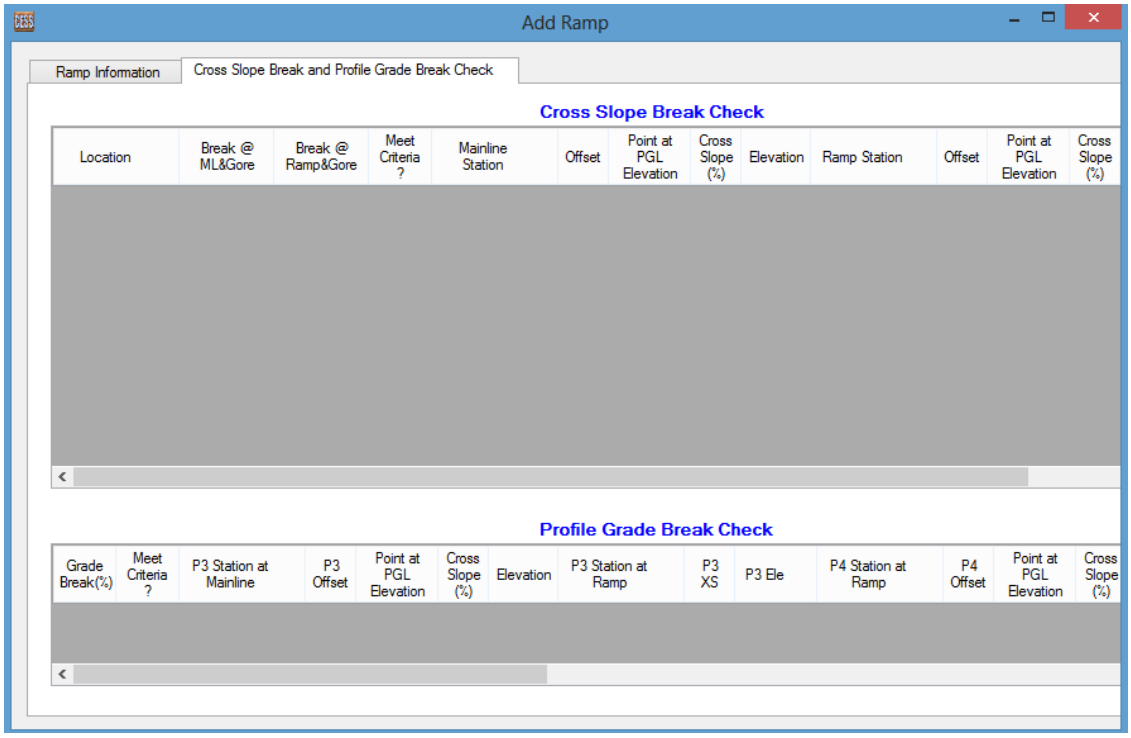
New...: Creates a new location for Cross Slope Break Check (CSBC) (more details introduced later).

Edit...: Updates an existing location of CSBC.

Remove: Deletes a location of SCBC.

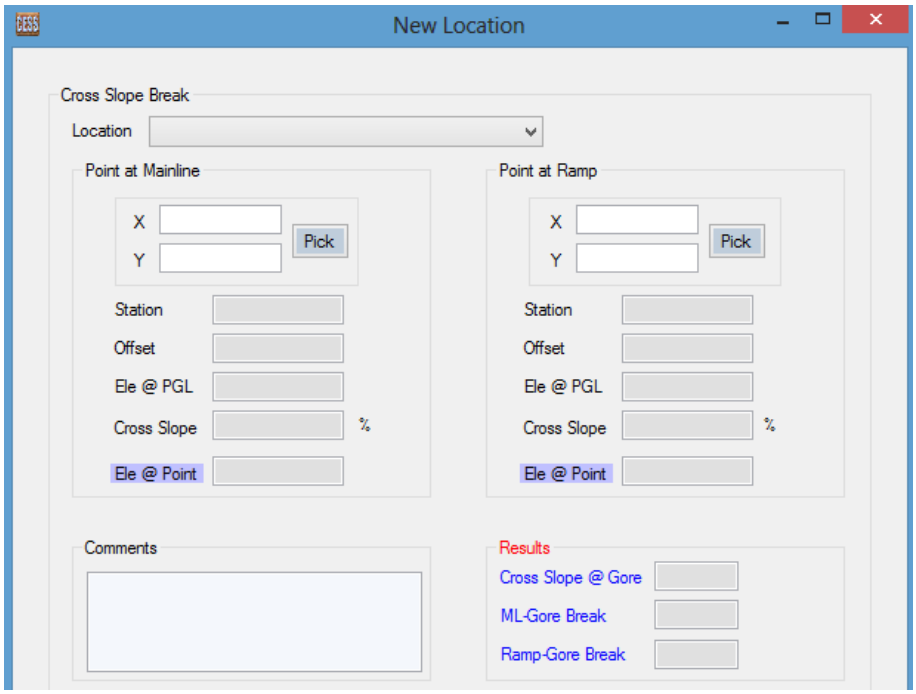
Goto Point at Mainline: Moves to the point at mainline of CSBC in Microstation.

Goto Point at Ramp: Moves to the point at ramp of CSBC in Microstation.



Create New Location of CSBC

Figure below is the interface for new location of CSBC.

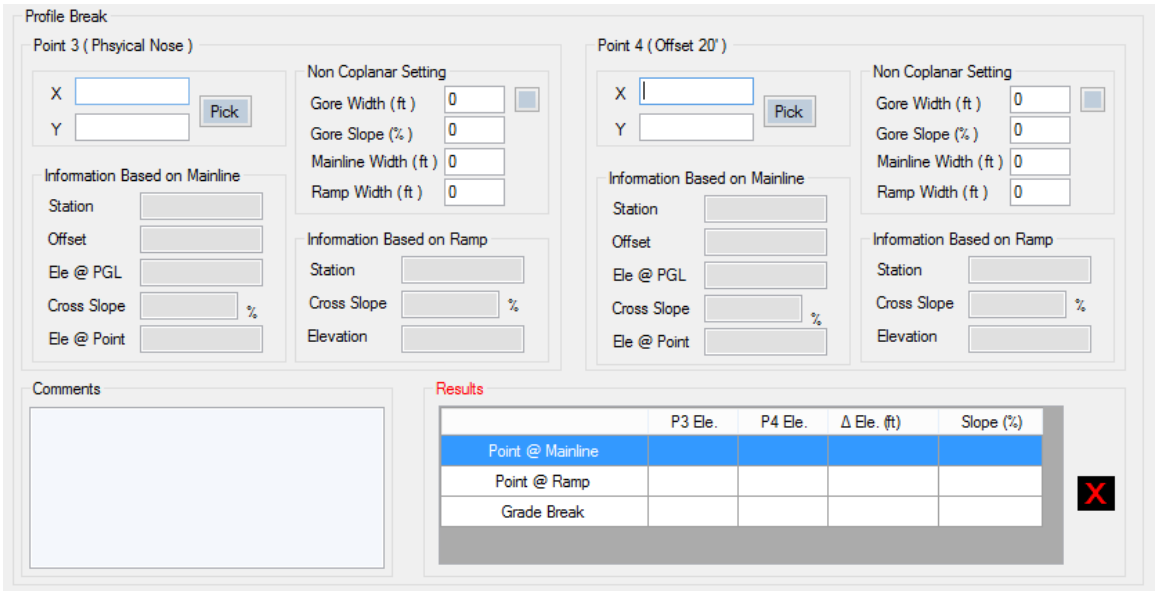


Select category of location and click one point on edge of striping of mainline and another on edge of striping of ramp, then click ***Apply*** button, a new location of CSBC is created.

Right click on below data grid, a menu with five sub menus displays. The functions are similar as the functions of cross slope except ***New*** and ***Edit*** function.

Create New Location of Profile Grade Break Check (PGBC)

Figure below is the interface for new location of PGBC.



To Non-Coplanar Gore Area:

Step 1: Pick point 3 and point 4 in gore area in Microstation.

Step 2: Set Gore Width, Gore Slope, Mainline Width, and Ramp Width of Point 3 and point 4. Gore width, mainline width, and Ramp Width can be obtained by clicking ***blue*** button, then click a point on edge of striping of mainline and a point on edge of ramp.

Step 3: Click ***Apply*** button.

To Coplanar Gore Area:

Step 1: Pick point 3 and point 4 in gore area in Microstation.

Step 2: Click ***Apply*** button.

Right click on window, a menu with seven sub menus displays:

Goto Point 3: Move to Point 3 in Microstation.

Measure Gore Width of Point 3: Same function as ***blue*** button mentioned above.

Set Gore Slope for Point 3: There are five methods to obtain the gore slope at point 3.

a. Follow Mainline Slope: Gore slope is same as cross slope of mainline.

b. Follow Ramp Slope: Gore slope is same as cross slope of ramp

c. Opposite Mainline Slope: Gore slope is opposite to mainline slope.

d. Opposite to Ramp Slope: Gore slope is opposite to ramp Slope.

e. Average of Mainline and Ramp Slope: Slope equals the average slope of mainline and ramp.

Goto Point 4: Move to Point 4 in Microstation.

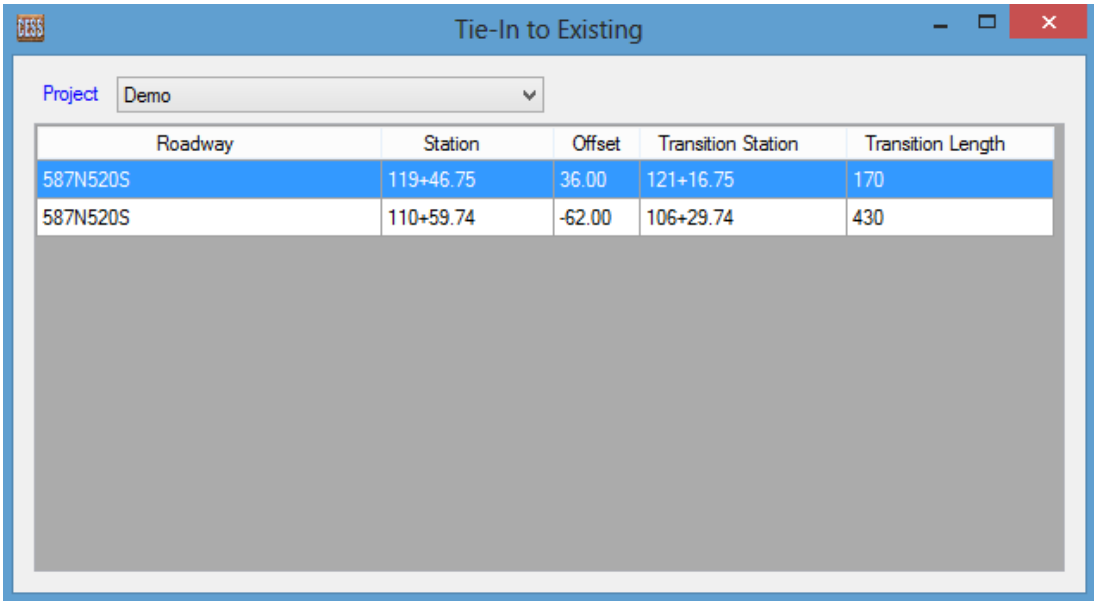
Measure Gore width of Point 4: Similar as ***Measure Gore Width of Point 3***.

Set Gore Slope for Point 4: Similar to Point 3 introduced above.

Update Point 3 and Point 4: Update Point 3 and 4 information, station, elevation, cross slope, and offset, based on new alignment and profile.

8.7 Tie-in to Existing

Figure below is the interface for Tie-in to Existing.



Select a project and all locations of Tie-in to Existing are listed in data grid. Right click on the data grid, a menu with six sub menus displays:

New... : Creates a new location of Tie-in to Existing (more details introduced later).

Edit...: Updates an existing location, similar to ***New*** function.

Remove: Deletes an existing location.

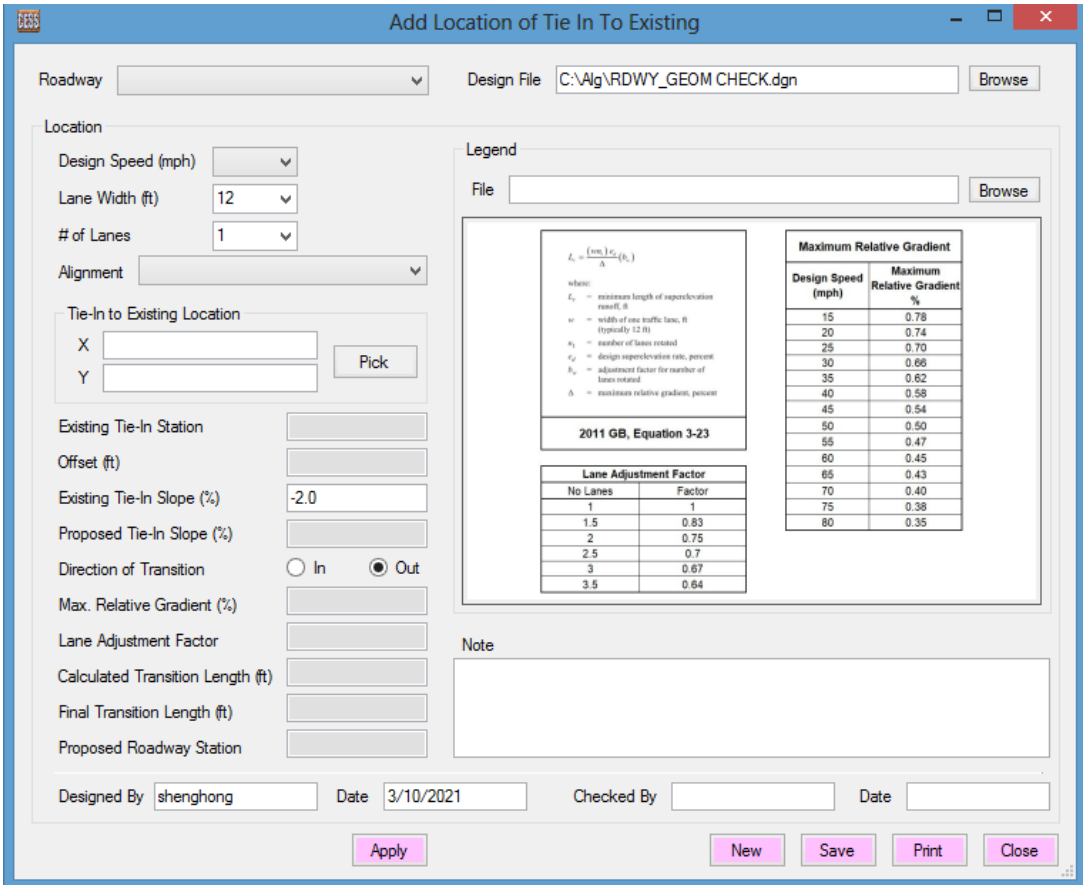
Goto to Location: Moves to the tie-in location in Microstation.

Open Design File: Opens the working file of location of Tie-in to existing.

Print All: Prints all locations.

Create a New Location of Tie-in to existing

Figure below is the interface for new location. Parameters are listed and described below:



Step 1: Select a Roadway, and Design Speed, Alignment of the Roadway, and Max. Relative Gradient is retrieved automatically.

Step 2: Specify Lane Width.

Step 3: Specify number of lanes of transition.

Step 4: Pick a point at tie-in location in Microstation, and Existing Tie-in Station, Offset, and Proposed Tie-In Slope are retrieved automatically.

Step 5: Specify existing Cross Slope of Tie-in location.

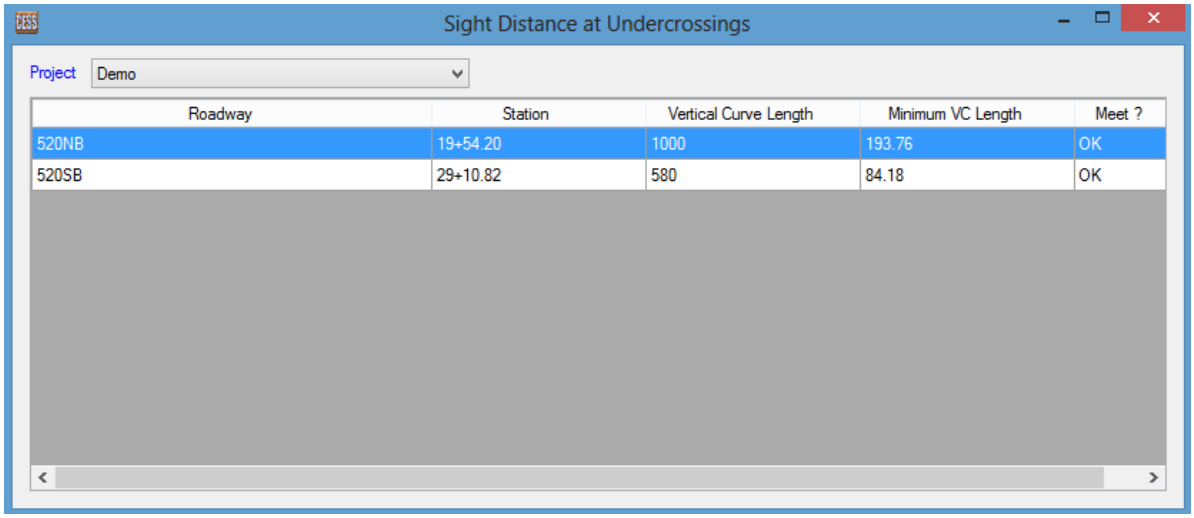
Step 6: Click ***Apply*** button, and Lane Adjustment Factor, Calculated Transition Length, Final Transition Length, and Proposed Roadway Station are calculated.

Step 7: Click ***Save*** button, all data is saved.

Step 8: Click ***Print*** button, Location information is printed out in PDF format.

8.8 Sight Distance at Undercrossings

Figure below is the interface of Sight Distance at Undercrossings(SDU).



Select a project and all SDU are listed in the data grid. Right click on data grid, a menu with six sub menus displays:

New... : Creates a new SDU (more detailed introduced later).

Edit... : Updates an existing SDU, similar to ***New*** function.

Remove: Deletes an existing SDU.

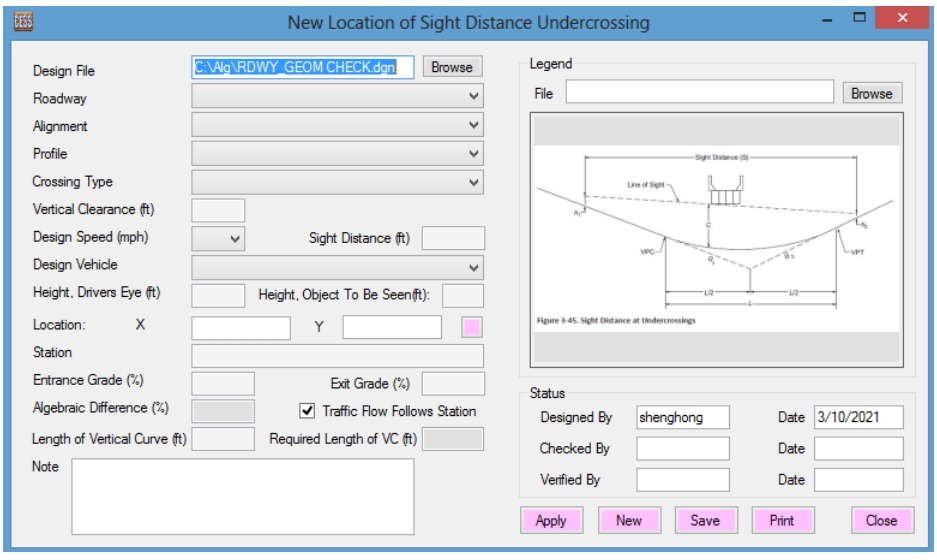
Goto Location: Moves to the location of undercrossings in Microstation.

Open Design File: Opens the working file of undercrossing.

Print All: Prints all SDU in PDF format.

Create a New Location of SDU

Figure below is the interface for new SDU.



Step 1: Select a Roadway, and Roadway Alignment, Profile, and Design Speed are loaded automatically.

Step 2: Select Crossing Type, and Vertical Clearance is retrieved.

Step 3: Select Design Vehicle, and Height of Drivers Eyes, and Object Height are loaded.

Step 4: Pick a point from undercrossing area in Microstation, and Station, Entrance Grade, Exit Grade, Algebraic Difference, and Required Length of VC are retrieved.

Step 5: Check whether traffic flow follows station.

Step 6: Click ***Apply*** button, length of vertical Curve is calculated.

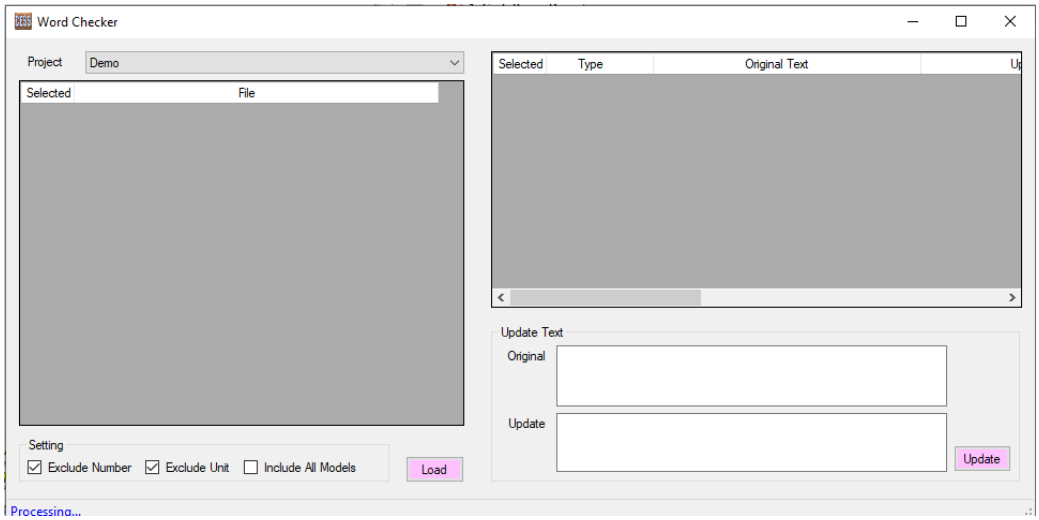
Step 7: Click ***Save*** button, SDU is saved.

Step 8: Click Print button, SDU is printed out in PDF format.

9. Tools

9.1 SPELL CHECKER

The figure below is the spell checker interface.



Select a project and all existing selected files are loaded in the data grid. Right click on the left data grid, and a menu with eleven sub menus displays.

All Select: Selects all files.

Anti-Select: Reverse selects all files.

Unselect All: Unselects all files.

Add Active Design File: Adds current Microstation file for check.

Add Files: Selects multiple Microstation files for check.

Add Files in Folder: Selects all files in specified folder for check.

Remove Current File: Removes the selected file from checklist.

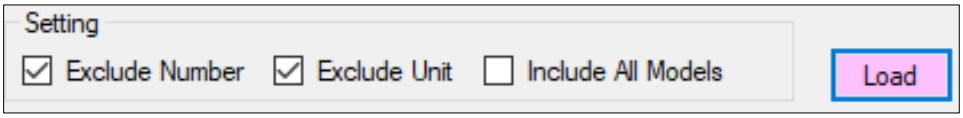
Remove All Files: Remove all files from checklist.

Remove All Selected Files: Removes all selected files from checklist.

Remove All Unselect Files: Removes all unselected files from checklist.

Save: Saves checklist and settings.

Figure below is setting screenshot.



Exclude Number: Numbers are excluded from spell check.

Exclude Unit: Unit is excluded from spell check.

Include All Models: All models in Microstation files are included for spell check.

Click ***Load*** button and all texts in the selected files are imported to right data grid.

Right click on Text data grid and a menu with thirteen sub menus displays:

All Select: Selects all Text in the data grid.

Anti-Select: Selects all unselected Text in the data grid, and unselected all selected Text.

Unselect All: All Texts in the data grid are unselected.

Remove Current Text: Current Text is removed from the data grid.

Remove All Texts: All Texts in data grid are removed.

Remove All Selected Texts: All selected Texts are removed from data grid.

Remove All Unselected Texts: All unselected Texts are removed from data grid.

Auto Check: All selected Texts are spell-checked automatically.

Synchronize Current Row: Current Text in data grid is updated in Microstation.

Synchronize Selected Rows: All selected Texts are updated in Microstation.

Synchronize All: All Text in data grid is updated in Microstation.

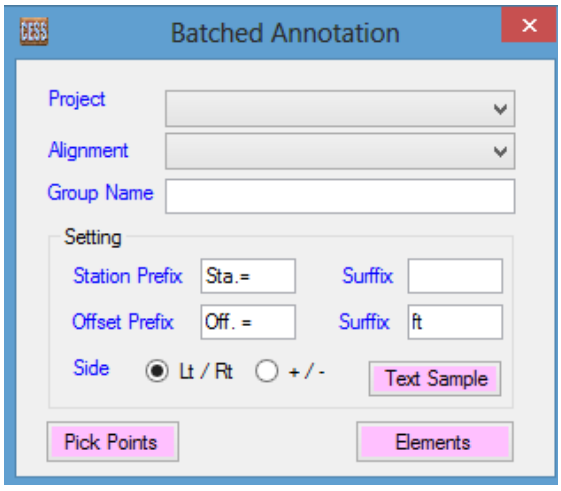
Goto Text Element: Moves mouse to the element of current Text in Microstation.

Export: Exports all Texts to Excel file for edit.

Import: Imports all Text from revised Excel file, and all updated Texts can be updated in Microstation automatically.

9.2 Batched Station and Offset Annotation

The figure below is the Station and Offset. Using this module, point station and offset can be calculated and drawn in the Microstation automatically.



Step 1: Select a project; all alignments of the project are loaded.

Step 2: Select an alignment from Alignment combox.

Step 3: Specify Group Name, and all annotation of points are grouped in Microstation.

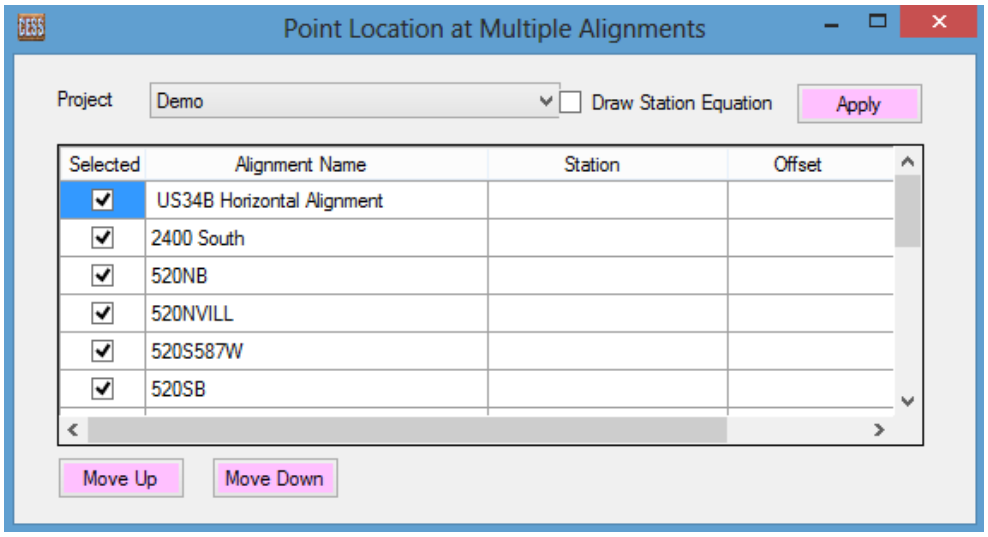
Step 4: Specify Prefix and Suffix of Station, and Prefix and Suffix of Offset, and Side format.

Step 5: Click ***Pick Points*** button and pick points in Microstation, Station and Offset of the points are drawn in the Microstation.

Step 6: Click ***Elements*** button, and all points annotations of selected elements in Microstation are drawn automatically.

9.3 Point Location at Multiple Alignments

Figure below is the interface for point location at multiple alignments.



Step 1: Select a project and all alignments of the project are loaded in data grid.

Step 2: Select alignments.

Step 3: Click ***Apply*** button, click point in Microstation, and station and offset of multiple alignments are calculated and shown in the data grid.

Move Up: Moves the selected alignment up.

Move Down: Moves the selected alignment down.

Right click data grid, a menu with four sub menus displays:

Select All: All alignments are selected.

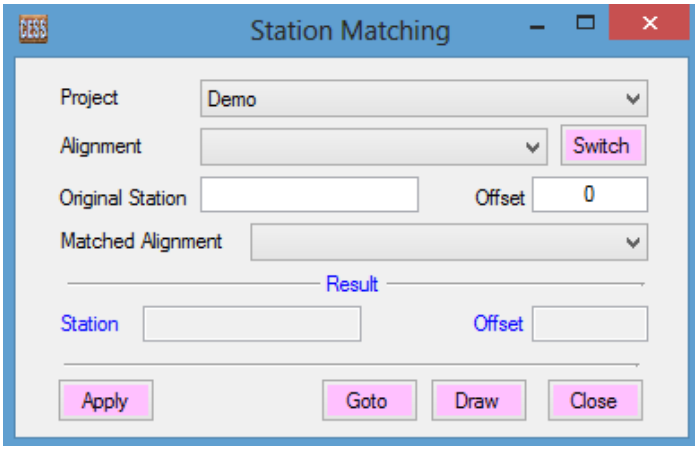
Unselect All: All alignments are deselected.

Unti-Select: Selects all unselected alignments and unselects all selected alignments.

Move To Top: Moves selected alignment to the top of the data grid.

9.4 Station Matching

Figure below is the interface of Station Matching.



Step 1: Select a project and all alignments are loaded in Alignment combox and Matched Alignment combox.

Step 2: Select alignments and Matched Alignment.

Step 3: Input Original Station and Offset.

Step 4: Click ***Apply*** button and station and offset of matched alignment are calculated.

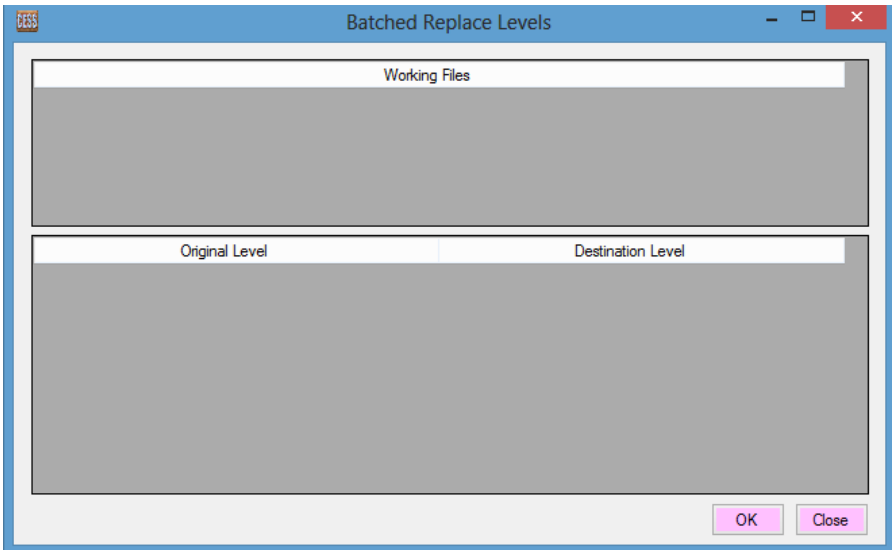
Switch : Switch Alignemnt and Match Alignment.

Goto: Goto the point based on station and offset of the alignment.

Draw: Draw station and offset in Microstation.

9.5 Batched Replace Levels

Figure below is the interface of Batched Replace Levels.



Step 1: Select working file: right click on top data grid, a menu with four sub menus displays:

Select A Dgn File: Select a Microstation file for level replacement.

Add Current Dgn File: Current working file is added to data grid.

Select All Dgn Files In Folder: All dgn files in a specified folder are added to data grid.

Remove Current File: Selected file is removed from data grid.

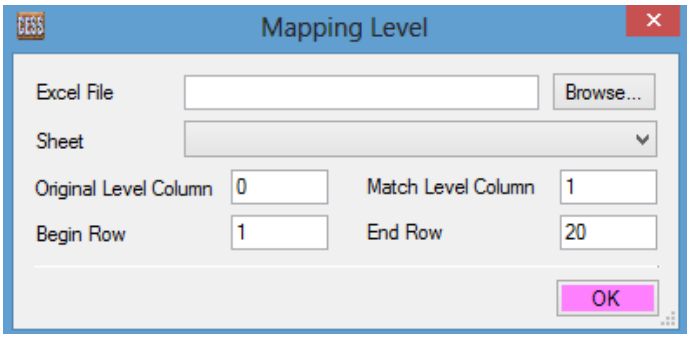
Step 2: Set up Original Level and Desination Level.

Right click on the bottom data grid, and a menu with three sub menus displays:

Add...: Adds a pair of original and destination levels. When Match Level frame displays, all levels in the current dgn file are loaded in the comboxes. Select Original Level and Match Level, then click OK button.

Remove: Removes the select pair Level from data grid.

Import from Excel: Imports mapping levels from spreadsheet. See figure below for the interface.



A: Click ***Browse*** button and select an Excel file. The sheets in the file are loaded in sheet combox.

B: Select a sheet from Sheet combox.

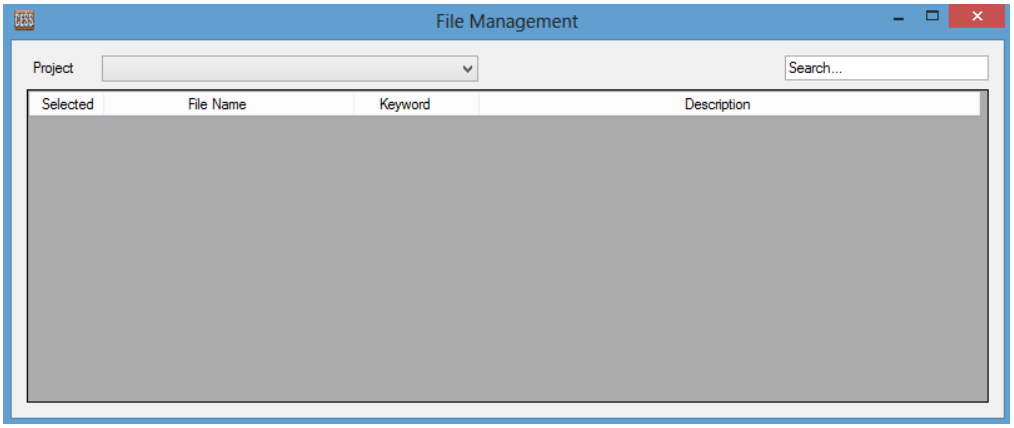
C: Specify Original Level Column, Match Level Column (Destination Level), Begin Row, and End Row.

D: Click ***OK*** button, and all mapping level are loaded in the data grid.

Step 3: Click ***OK*** button; all original levels are converted to the destination levels in the selected files.

9.6 File Management

Figure below is the interface of File Management. Select a project and all files of the project are loaded in the data grid. Using search text box, some files are filtered and listed in the data grid.



Right click data grid, a menu with eleven sub menus displays:

Add... : Adds a new file to the project

Edit...: Updates an existing file.

Remove: Removes a file from the project.

Open File: Opens the selected file.

Open Folder: Opens folder of the selected file.

Copy File Path: Copies the path of the selected file.

Attach File: Attaches the selected file if the file is dgn file.

File Properties: Displays the selected file properties.

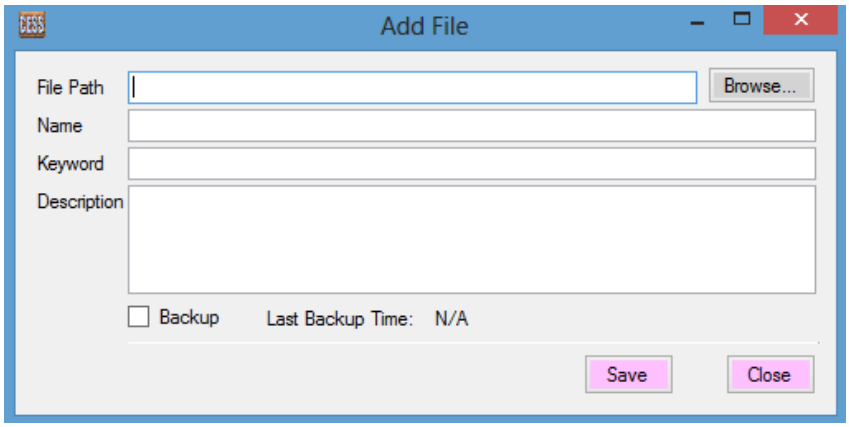
Set Backup/Working Folder: Sets backup and working folder of the project.

Backup Selected Files: Backs up the selected files.

Backup Default Files: Backs up all default files.

Add A New File

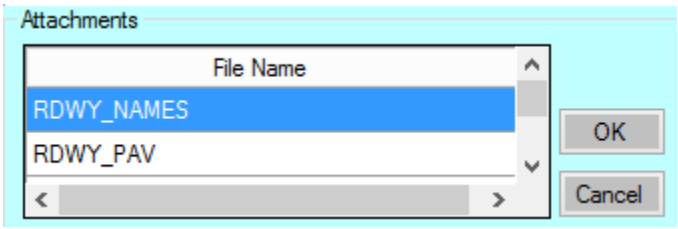
Figure below is the interface to add a new file to the project.



Select a file, and specify the name, keyword, description. Check Backup to see if the file is backed up automatically, then click ***Save*** button. Right click on window, a menu with two sub menus displays:

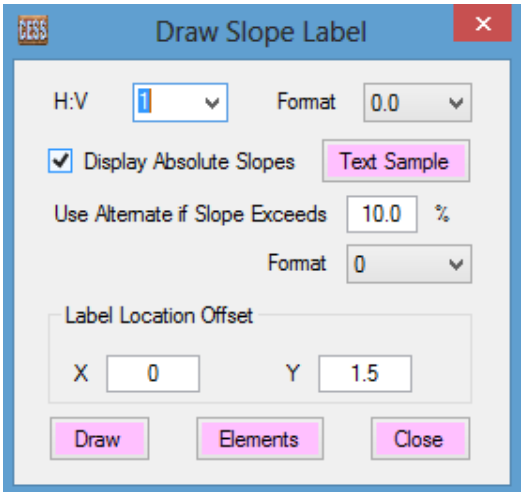
Current Microstation File: Adds thecurrent working Microstation file to the project.

Current Attachments: All attachements are loaded in data grid. Select a file then click ***OK*** button, or double click the file to add file to project.



9.7 Slope Labeling

Figure below is the interface of Slope Labeling.



Step 1: Set H:V (ratio of horizontal and vertical).

Step 2: Select Format (number of digits).

Step 3: Determine whether to just display absolute slope.

Step 4: Pick a Text element in Microstation as slope TEXT format.

Step 5: Determine the threshold of applying alternative slope format.

Step 6: Select alternative format.

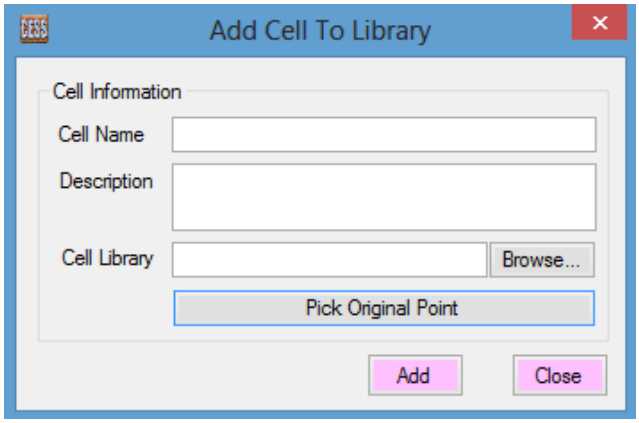
Step 7: Set label location offset from the point.

Step 8: Click ***Draw*** button, and pick two points in Microstation, slope of two points are drawn automatically.

Step 9: Click ***Elements*** button,Slope of all segments in selected elements in Microstation are labeled.

9.8 Create Cell

Figure below is the interface to add cell to a library.



Step 1: Select elements in Microstation.

Step 2: Specify cell name.

Step 3: Specify description.

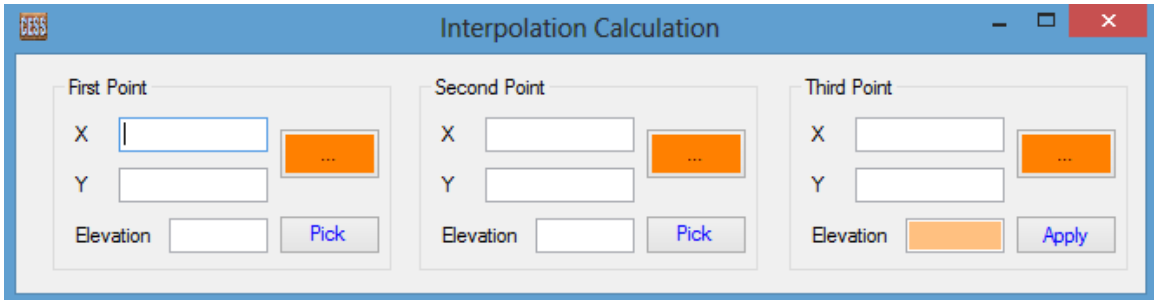
Step 4: Select a cell library.

Step 5: Pick a point in Microstation as cell original.

Step 6: Click ***Add*** button and cell is created and added to the library.

9.9 Interpolation Calculation

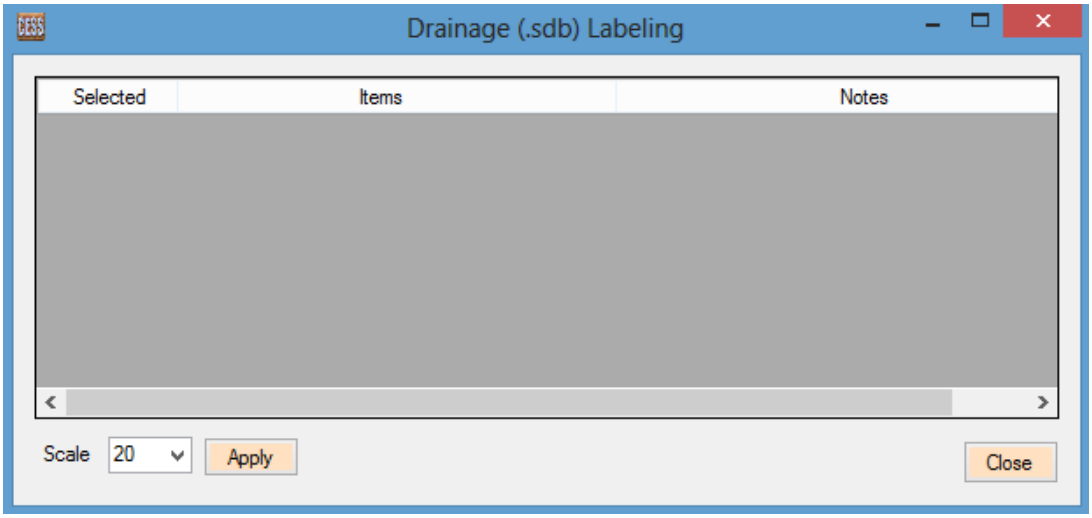
Figure below is the interface of Interpolation Calculation.



Pick the first point, second point, and third point in Microstation, and specify elevation of first point and second point, then click ***Apply*** button, elevation of third point is calcuated.

9.10 Drainage Labeling

Figure below is the interface of Drainage Labeling. In the case that when importing drainage utility (.sdb) into cross sections, only circles display in cross sections and there is no labeling included, using this tool, labeling can be added to cross section automatically.



All existing drainage items are listed in the data grid. Select items and set scale, then click Apply button; drainage items are displayed in the cross sections automatically.

Right click on the data grid, a menu with three sub menus displays:

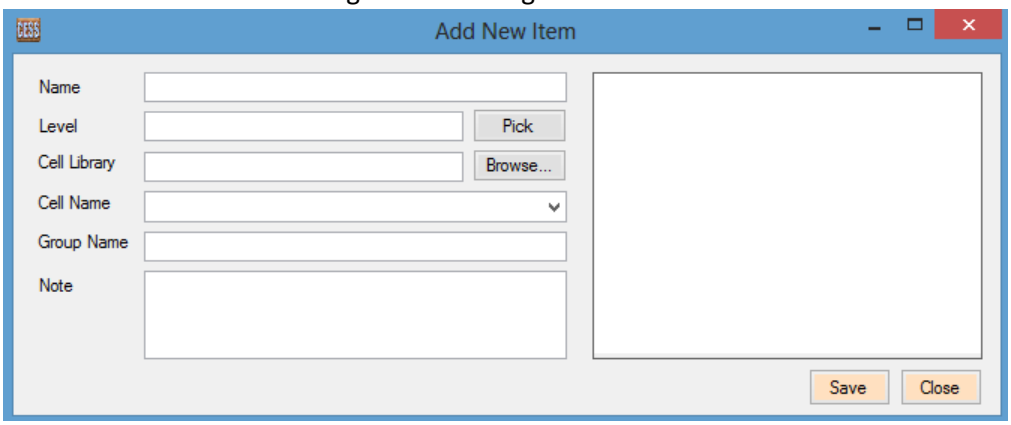
Add...: Adds a new drainage item (details introduced below).

Edit: Updates an existing drainage item, similar to ***Add*** function.

Remove: Deletes an existing drainage item.

Add New Drainage Item

Figure below is the interface of adding a new drainage item.



Step 1: Specify drainage item name.

Step 2: Specify level, or select an element of the item, then click ***Pick*** button to obtain the level.

Step 3: Select a cell library file and select a cell for label of the item.

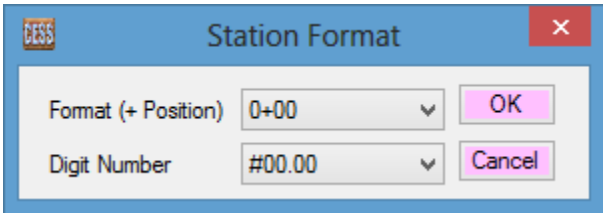
Step 4: Specify group name of the item.

Step 5: Specify note of the item.

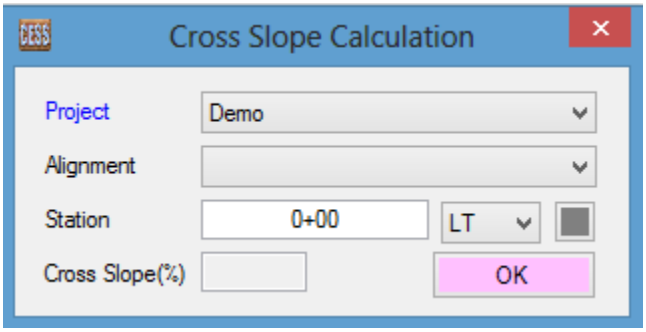
Step 6: Click ***Save*** button to save the item.

9.11 Station Format

Using this module, user can set station format temporarily.



9.12 Cross Slope Calculation



Using this module, cross slope is calculated for specified station.

Step 1: Select a project and all alignments of the project are loaded in combo box.

Step 2: Select an alignment.

Step 3: Input station and select side, or click point in Microstation.

Step 4: Click ***Ok*** button, and cross slope of the point is calculated.