



Enhanced Engineering Model Attribution

Robert Nice – Senior Application Engineer, Bentley Systems, Inc.



Learning Objectives

- Item Types - Defined
- Creating Item Types
- Attaching Item Types
 - To existing elements
 - Through feature definitions
 - Using item types plus
- Property Driven Annotations
- Item Types reporting
 - Creating a report definition
 - Add columns to a report
 - Sort report on columns
 - Formatting of columns
 - Place table from report
- How to change the display of elements based on Item Types



Enhanced Engineering Model Attribution

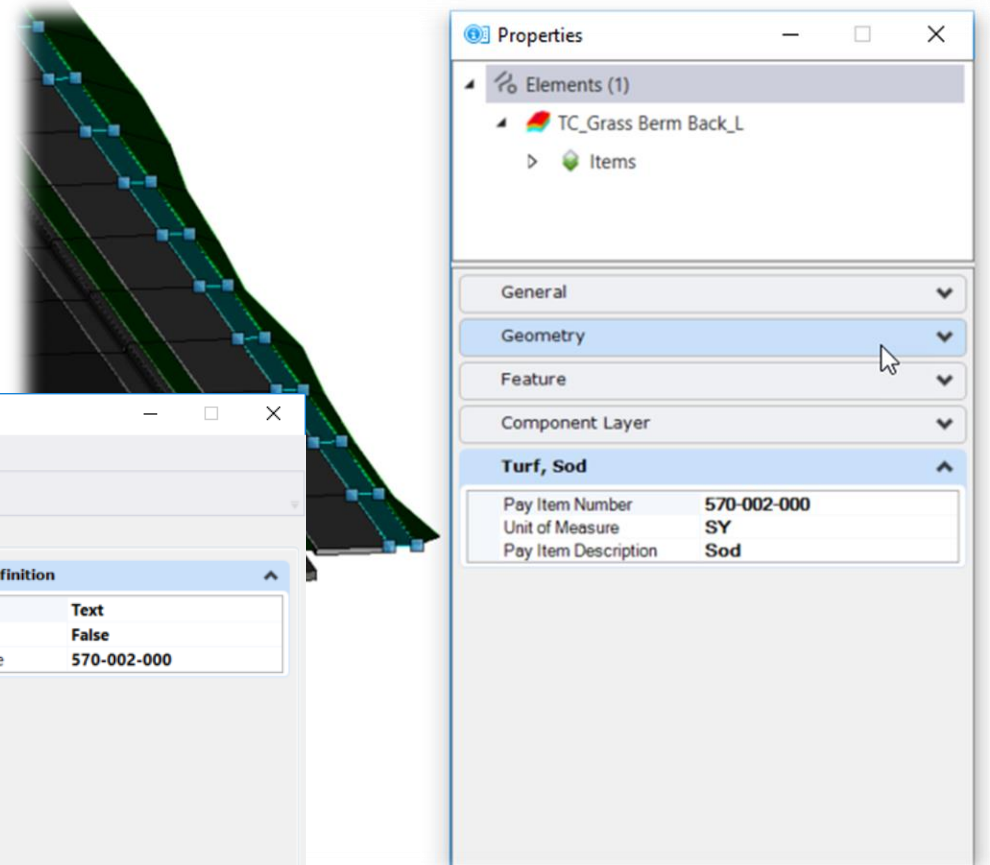
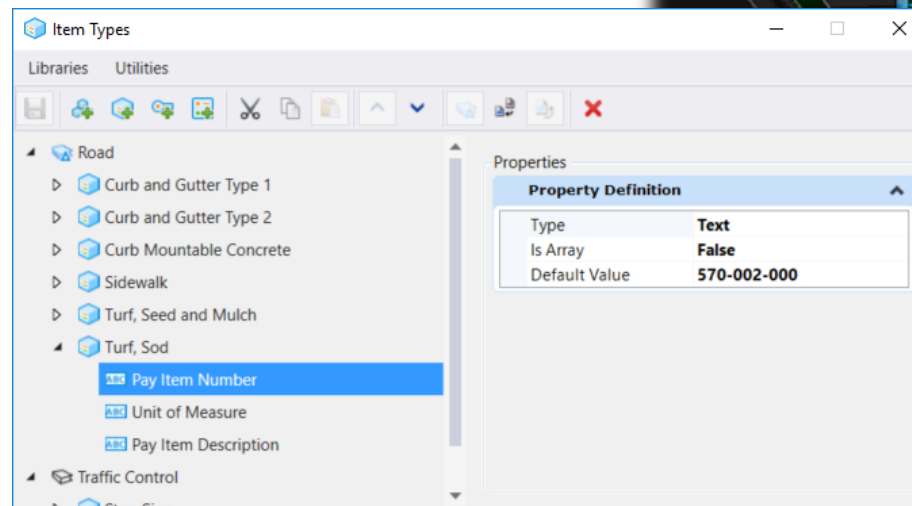
Item Types – Defined



What are Item Types?

An “Item Type” is a user defined set of properties used to describe an object or an element.

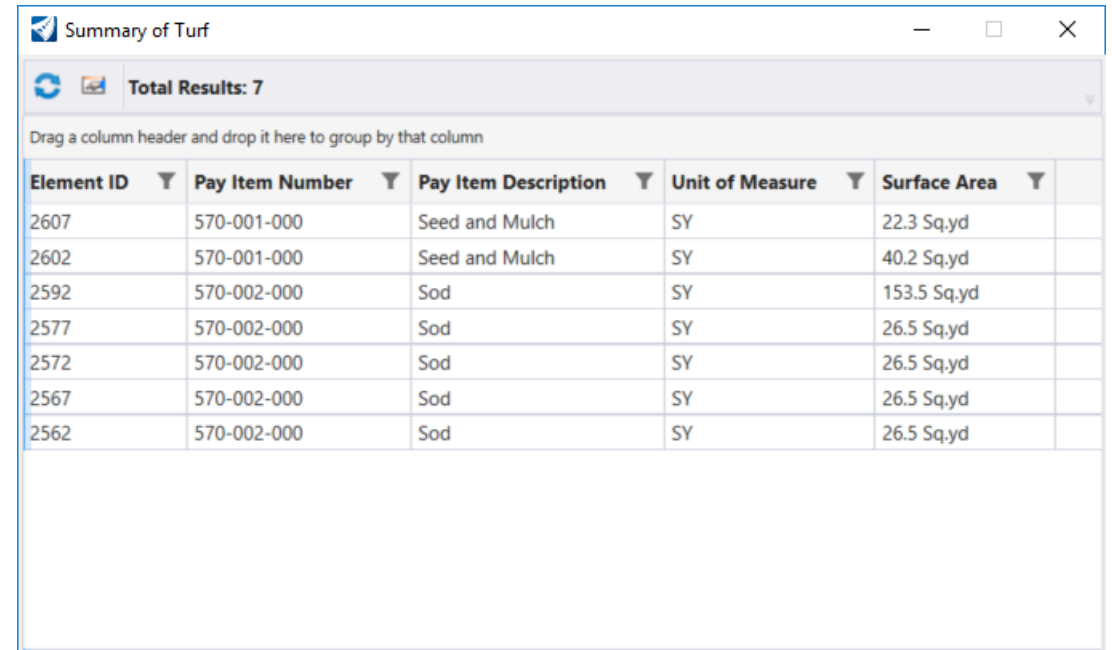
- Specification number
- Pay item data
- Element’s state
 - Existing to remain
 - To be removed
- Designer’s notes



How Can Item Types Be Used?

The properties in Item Types provide additional information about elements that can be used to:

- Generate reports
- Dynamic annotation
- Apply display styles



Summary of Turf

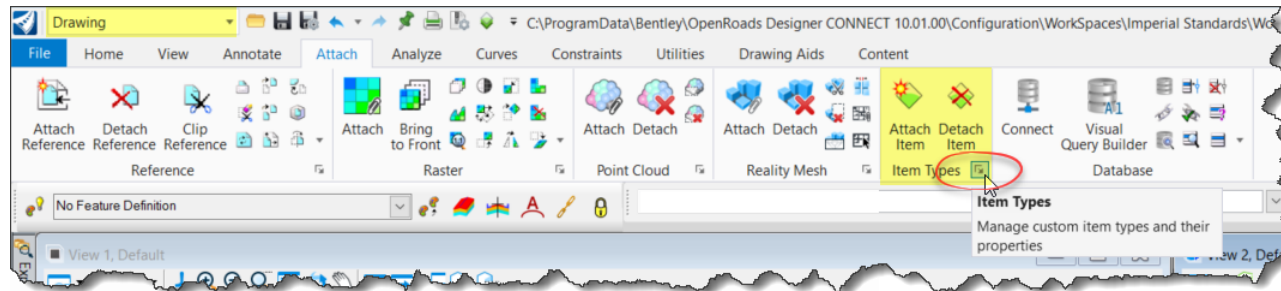
Total Results: 7

Drag a column header and drop it here to group by that column

Element ID	Pay Item Number	Pay Item Description	Unit of Measure	Surface Area
2607	570-001-000	Seed and Mulch	SY	22.3 Sq.yd
2602	570-001-000	Seed and Mulch	SY	40.2 Sq.yd
2592	570-002-000	Sod	SY	153.5 Sq.yd
2577	570-002-000	Sod	SY	26.5 Sq.yd
2572	570-002-000	Sod	SY	26.5 Sq.yd
2567	570-002-000	Sod	SY	26.5 Sq.yd
2562	570-002-000	Sod	SY	26.5 Sq.yd

Creating Item Types

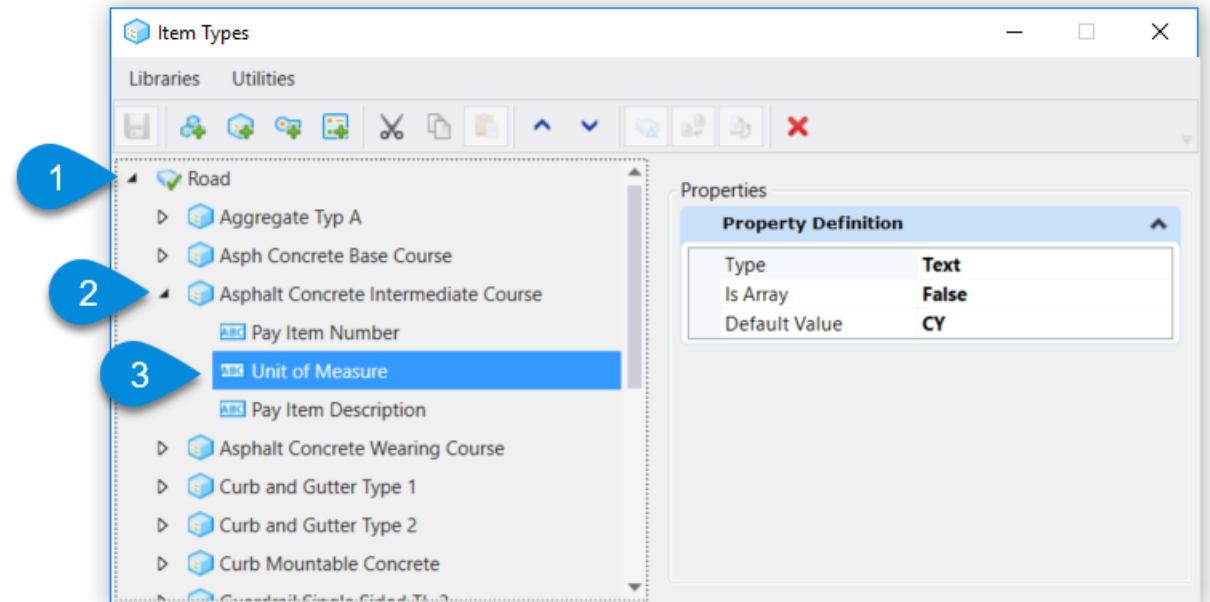
- Item Types should be stored and distributed in a DGNLib.
 - Must be included in the CFG variable MS_DGNLIBLIST
- Item Types are created and managed using the Item Types dialog.
 - Item Type dialog can be opened by clicking the “Dialog Launcher” in the lower right corner of the “Item Types” group



Creating Item Types

It's as simple as 1, 2, 3

1. Create an Item Type Library
2. Add an Item Type
3. Add Property Definitions

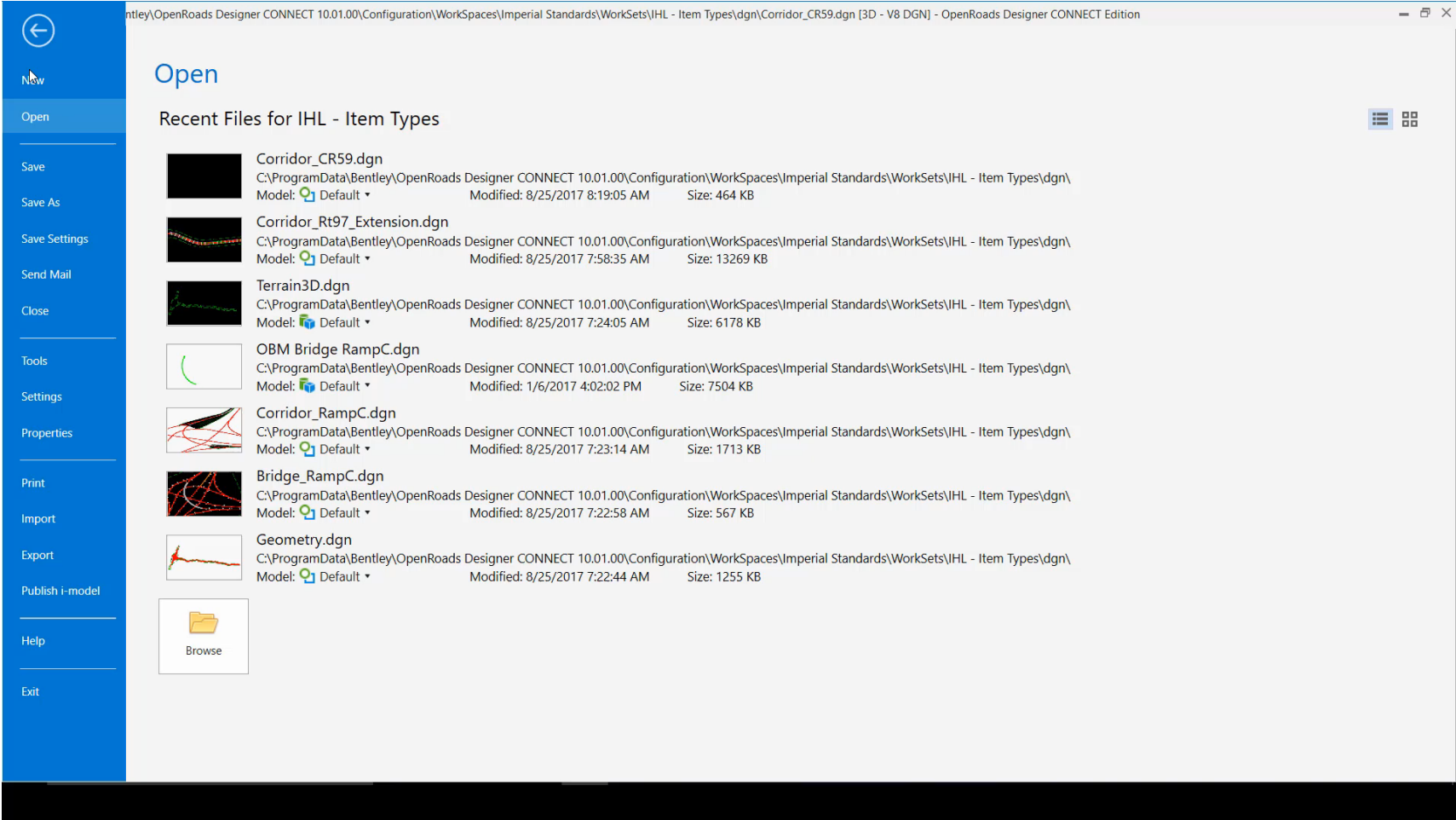


Creating Item Types

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Creating Item Types Demo



This Photo by Unknown Author is licensed under [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/)



Enhanced Engineering Model Attribution

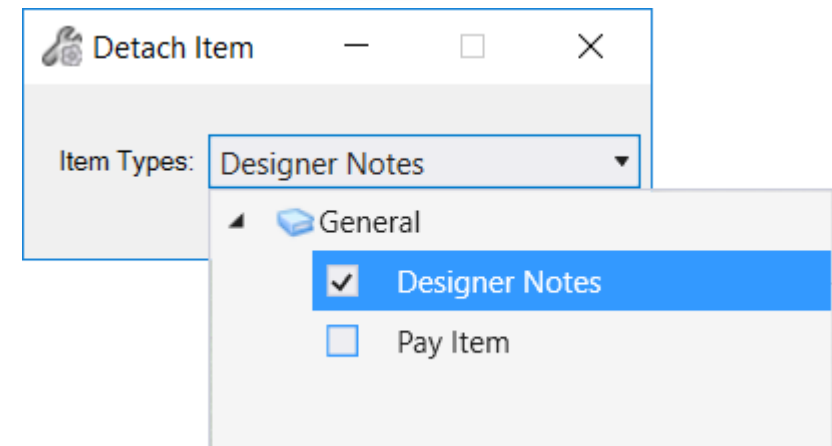
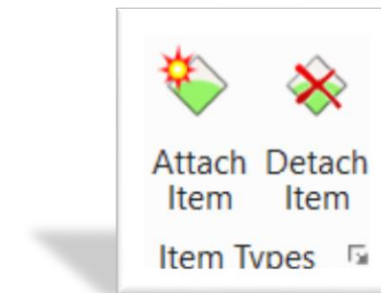
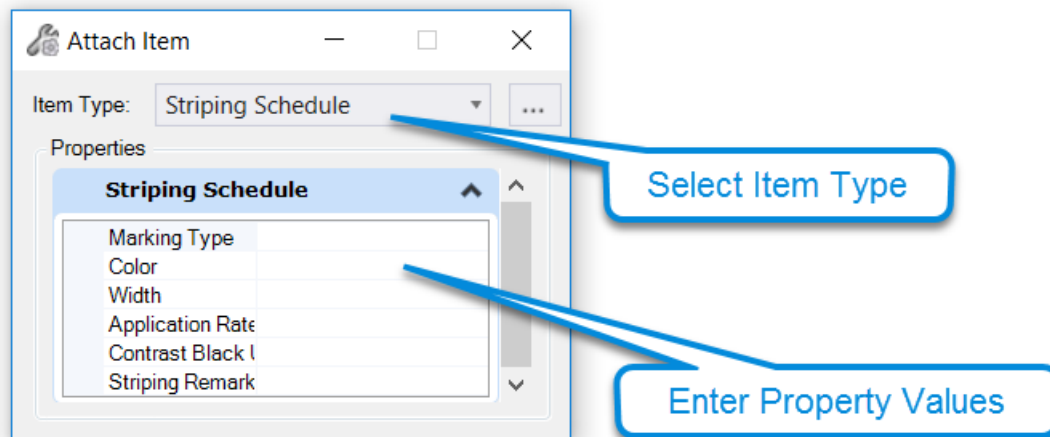
Attaching Item Types



Attaching Item Types

In its simplest form, Item Types can be added and removed from elements using the Item Types group on the ribbon

- You can access the Item Types dialog from the following:
 - Ribbon: Drawing > Content > Item Types
 - Ribbon: Drawing > Attach > Item Types
 - Ribbon: Modeling > Content > Item Types

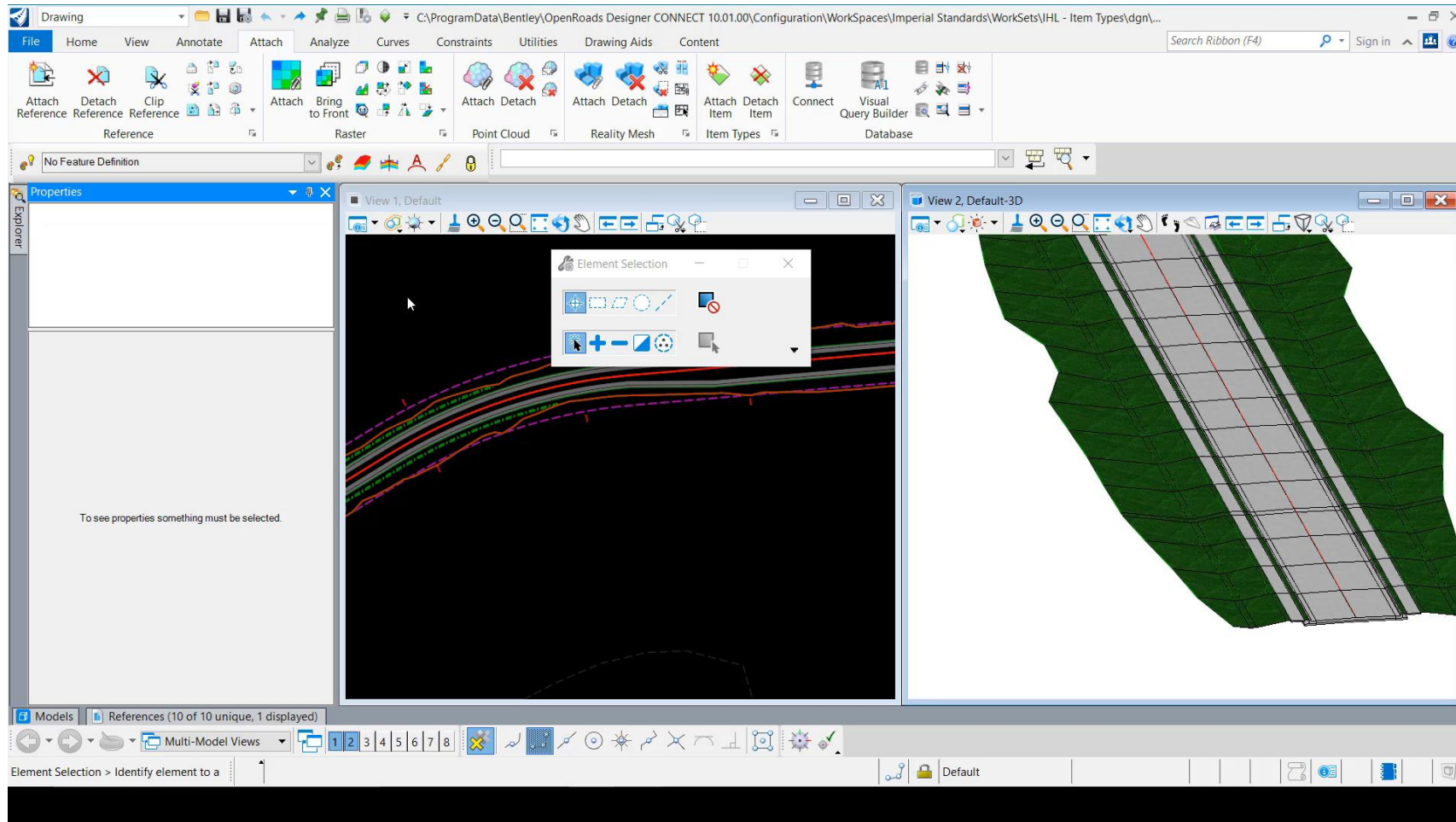


Attaching Item Types

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Attaching Item Types

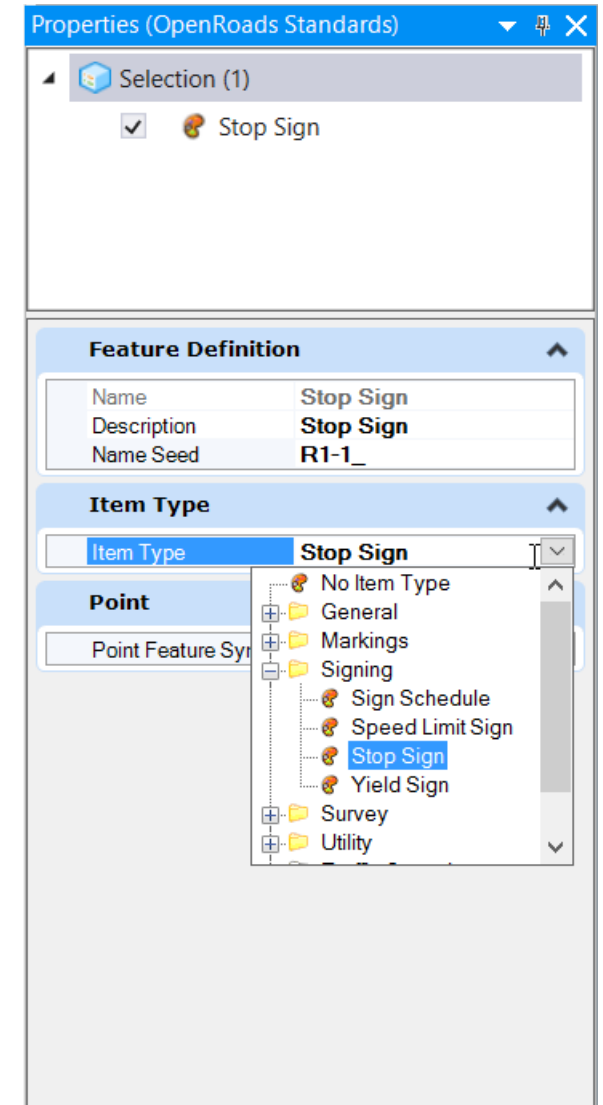


Including Item Type in Feature Definitions

Item Types can easily be included as part of a Feature Definition.

- Create Item Type first
- Edit Feature Definition
- Use Picklist to select Item Type

Note: Only 1 Item Type can be linked per Feature Definition



Include Item Type in Feature Definitions

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Include Item Type in Feature Definitions

The screenshot displays the OpenRoads Designer CONNECT Edition interface. On the left is a blue sidebar with 'Recent WorkSets' including Imperial Standards, IHL - Item Types, FDOT, KYTC_Standards, and others. The main window title is 'OpenRoads Designer CONNECT Edition' with a breadcrumb path 'Imperial Standards > IHL - Item Types'. Below this is a 'Recent Files' list with the following items:

File Name	Path	Model	Modified	Size
Feature Definitions Imperial.dgnlib	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\Organization-Civil_OpenRoads Training...	Default	8/25/2017 8:47:52 AM	432 KB
ItemTypes.dgnlib	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\Organization-Civil_OpenRoads Training...	Default	8/25/2017 8:32:52 AM	49 KB
Corridor_CR59.dgn	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\WorkSpaces\Imperial Standards\WorkSet...	Default	8/25/2017 8:19:05 AM	464 KB
Corridor_Rt97_Extension.dgn	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\WorkSpaces\Imperial Standards\WorkSet...	Default	8/25/2017 7:58:35 AM	13269 KB
Terrain3D.dgn	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\WorkSpaces\Imperial Standards\WorkSet...	Default	8/25/2017 7:24:05 AM	6178 KB
OBM Bridge RampC.dgn	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\WorkSpaces\Imperial Standards\WorkSet...	Default	1/6/2017 4:02:02 PM	7504 KB
Corridor_RampC.dgn	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\WorkSpaces\Imperial Standards\WorkSet...	Default	8/25/2017 7:23:14 AM	1713 KB
Bridge_RampC.dgn	C:\ProgramData\Bentley\OpenRoads Designer CONNECT 10.01.00\Configuration\WorkSpaces\Imperial Standards\WorkSet...	Default	8/25/2017 7:22:58 AM	567 KB
Geometry.dgn				

At the bottom of the 'Recent Files' list are 'Browse' and 'New File' buttons. On the right side, the 'Properties' panel shows details for the selected file, including Name, Description, and Workspace. Below the properties is a section for 'CONNECTED Project Properties' which indicates 'No project attached' and a 'Show All Properties' link.

Apply Item Types to Feature Definitions

Item Types can be included as part of a Feature during creation

- Item Types are attached as the elements are placed
- Integrated with Horizontal Geometry tools
- Property Values can be entered in the dialog

The 'Line' dialog box is shown with the following settings:

- Distance: 196.754
- Line Direction: N90°00'00.0"E
- Feature**
 - Feature Definition: Curb and Gutter Type 1
 - Name: RdCF
- Curb and Gutter Type 1**
 - Pay Item Number: 520-021-000
 - Unit of Measure: LF
 - Pay Item Description: Curb and Gutter Type 1

- Limited functionality :
 - Picklists and Lookup Tables are not available

The 'Properties (OpenRoads Standards)' dialog box is shown with the following settings:

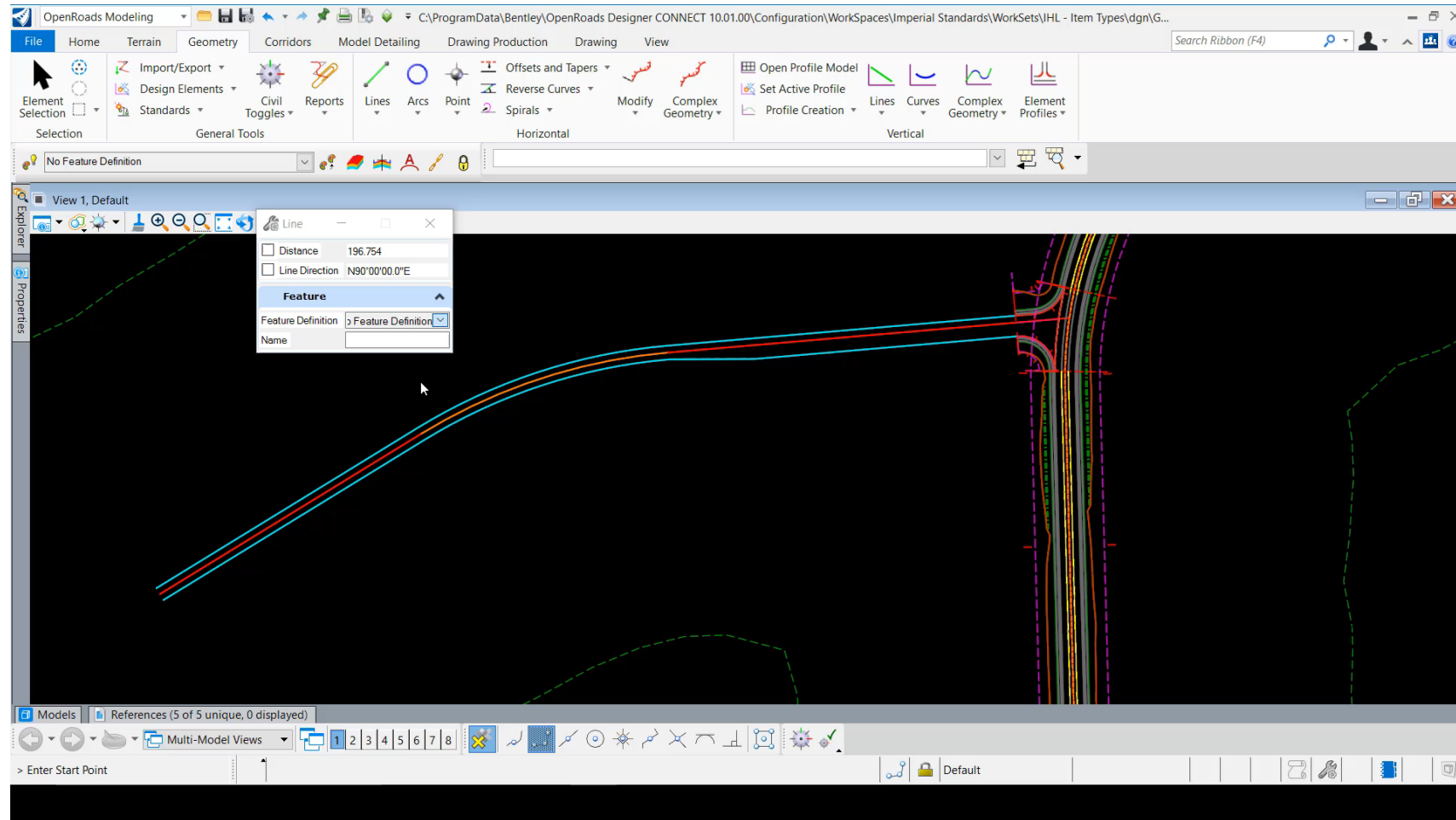
- Selection (1)**
 - Curb and Gutter Type 1
- Feature Definition**
 - Name: Curb and Gutter Type 1
 - Description: Curb Face
 - Name Seed: RdCF
- Item Type**
 - Item Type: Curb and Gutter Type 1
- Linear**
 - Create Template: True
 - Linear Feature Sy: Road_Curb_Face
 - Profile Feature Sy: Road_Curb_Face

Apply Item Types Using Feature Definitions

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

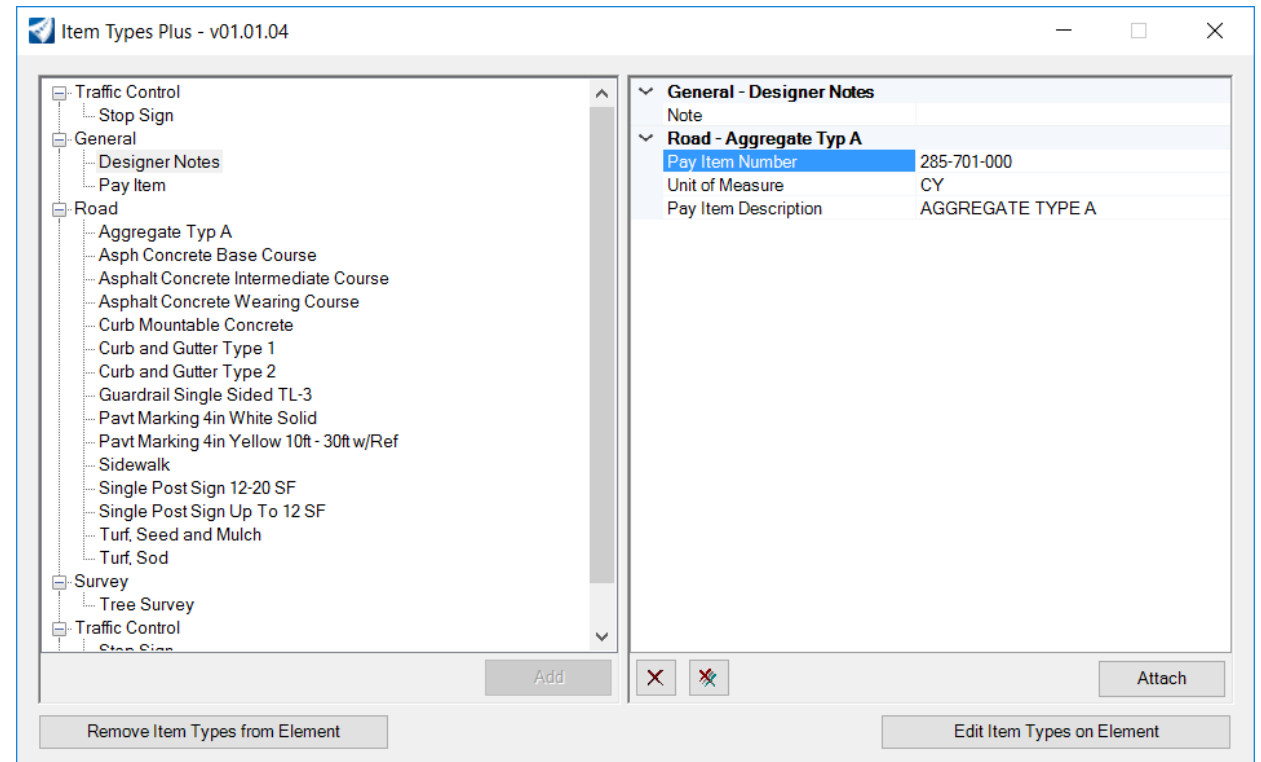
Apply Item Types Using Feature Definitions



Item Types Plus

Item Types Plus is an application to assist in the attachment of Item Types to elements.

- Attach Multiple Items at Once
- Customizable
 - Provides drop-down lists
 - Automatically populate some properties based on others

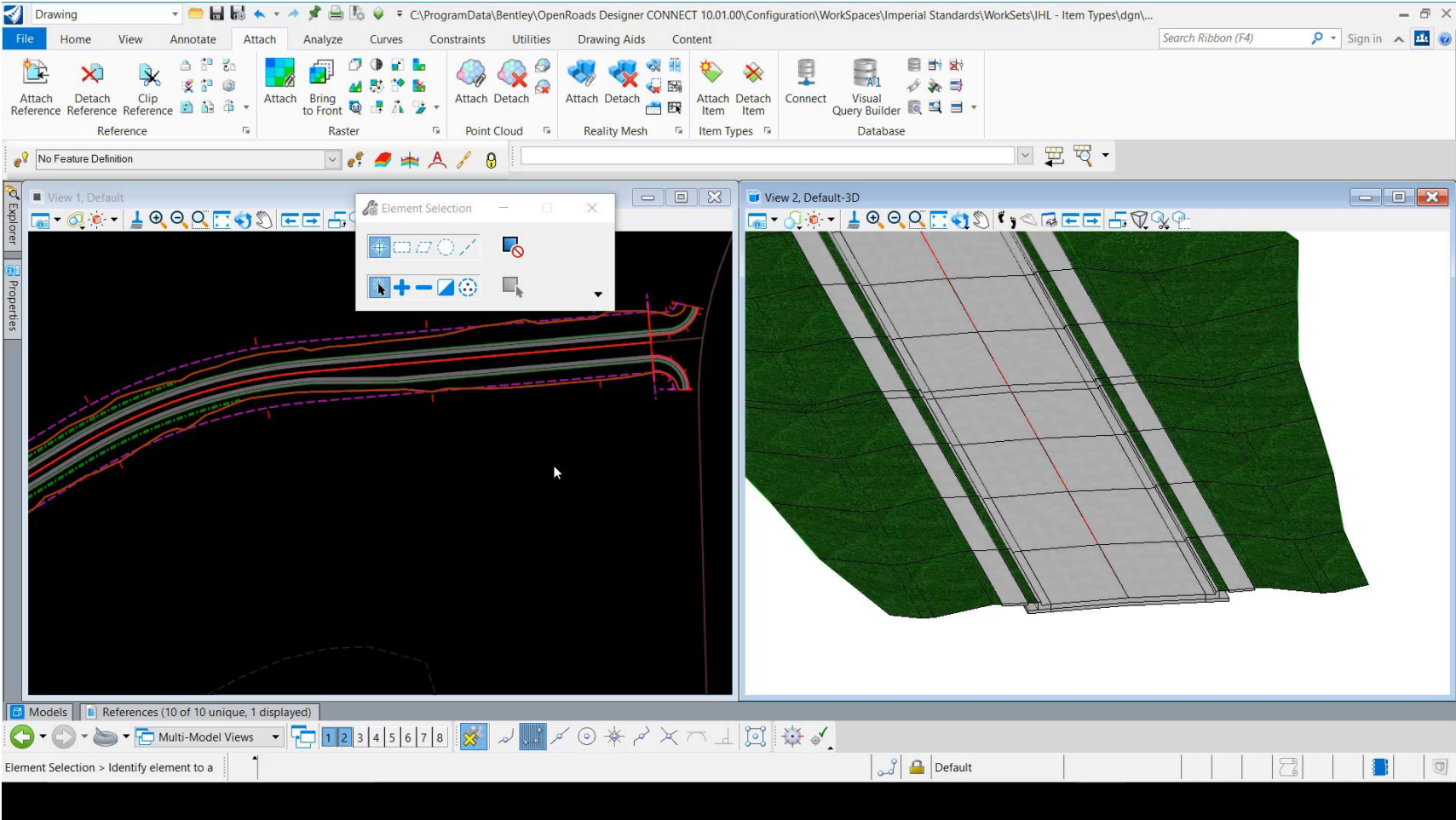


Using Item Types Plus

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Using Item Types Plus

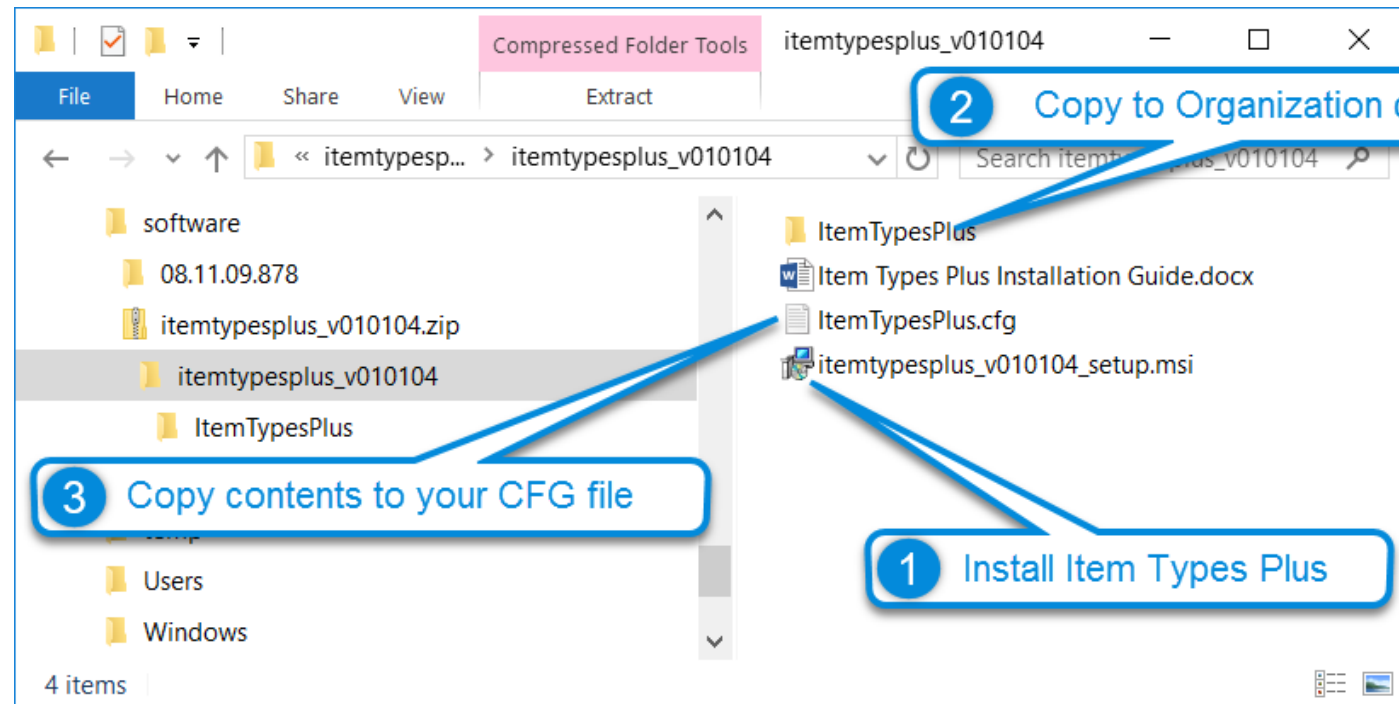


Item Types Plus Installation

After downloading Item Types Plus you will need to:

1. Install application
2. Copy example files
3. Add to CFG file

CFG variables can be added to Organization, Workspace, or WorkSet CFG file.

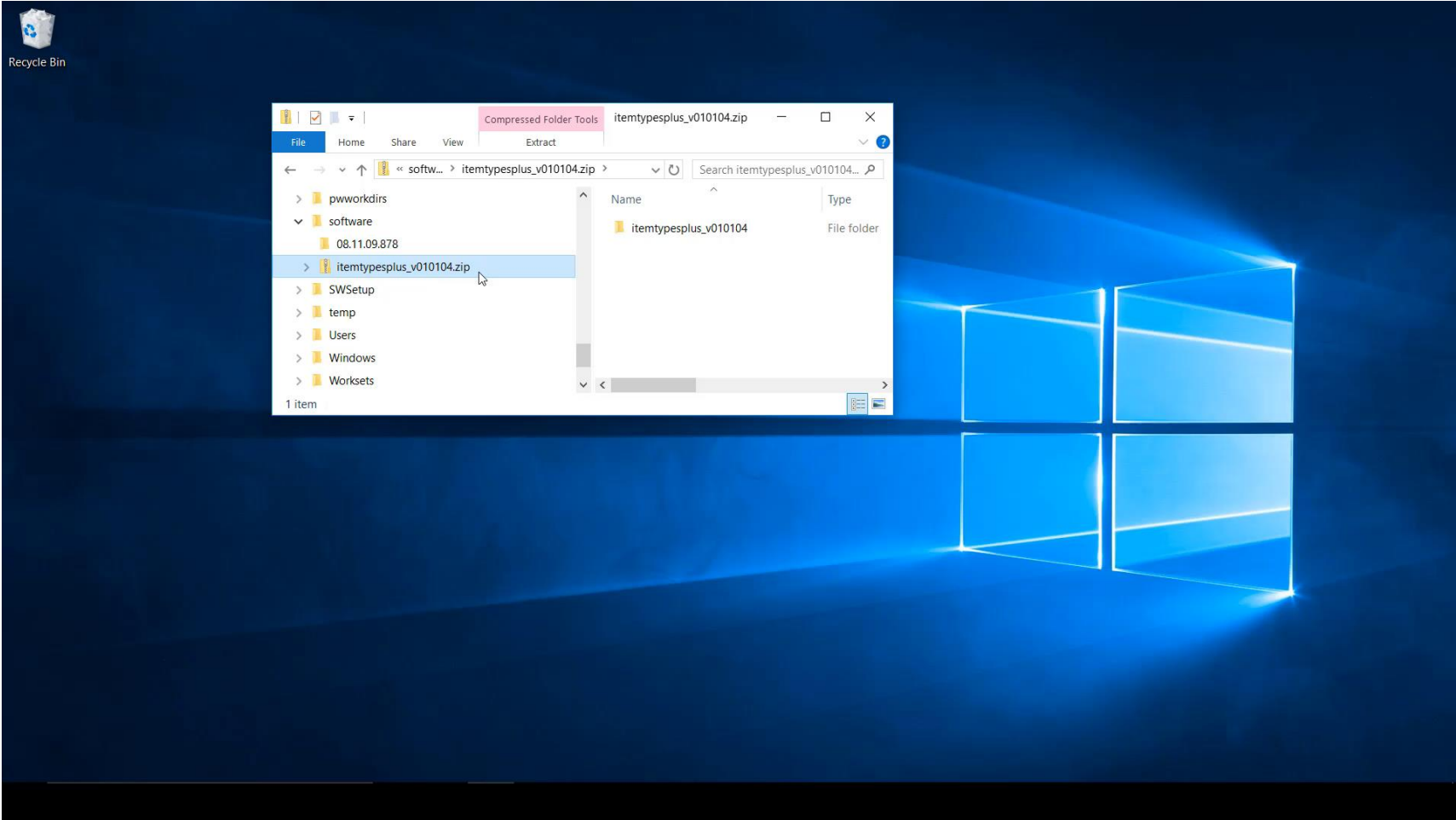


Item Types Plus Installation

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

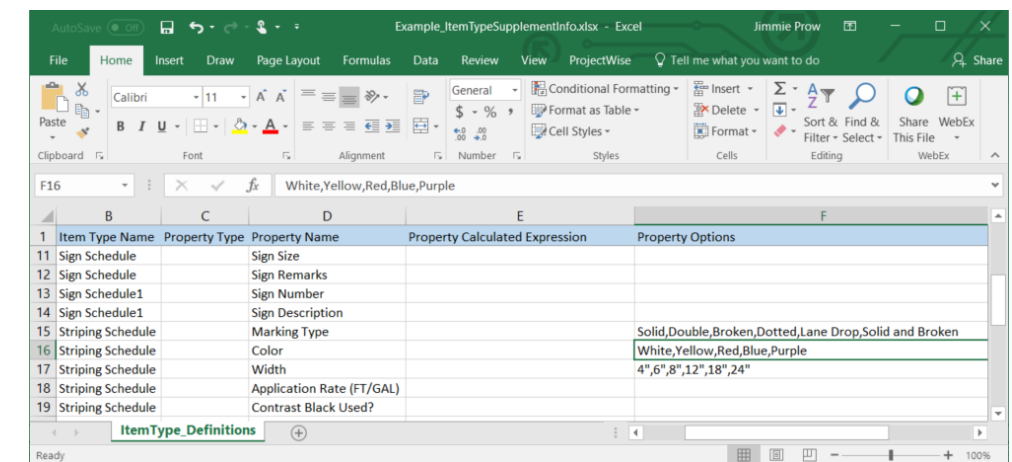
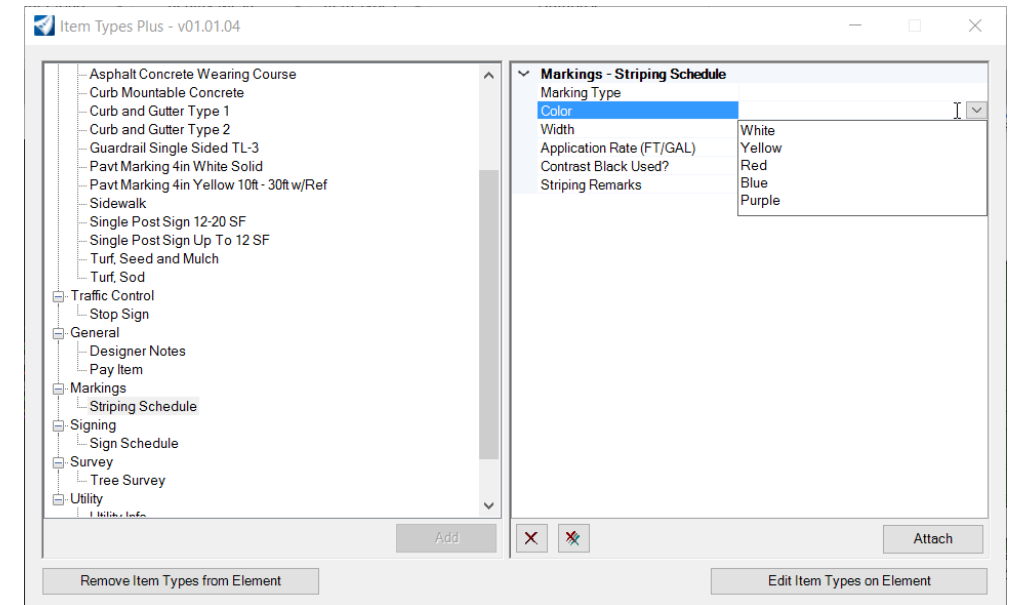
Item Types Plus Installation



Creating Picklists in Item Types Plus

To create a picklist for a Property

- Item Type Must Be Created
- Add Item Type and its Properties to the Supplemental Info spreadsheet.
- Enter the options for the list, separated by commas, in the Property Options field

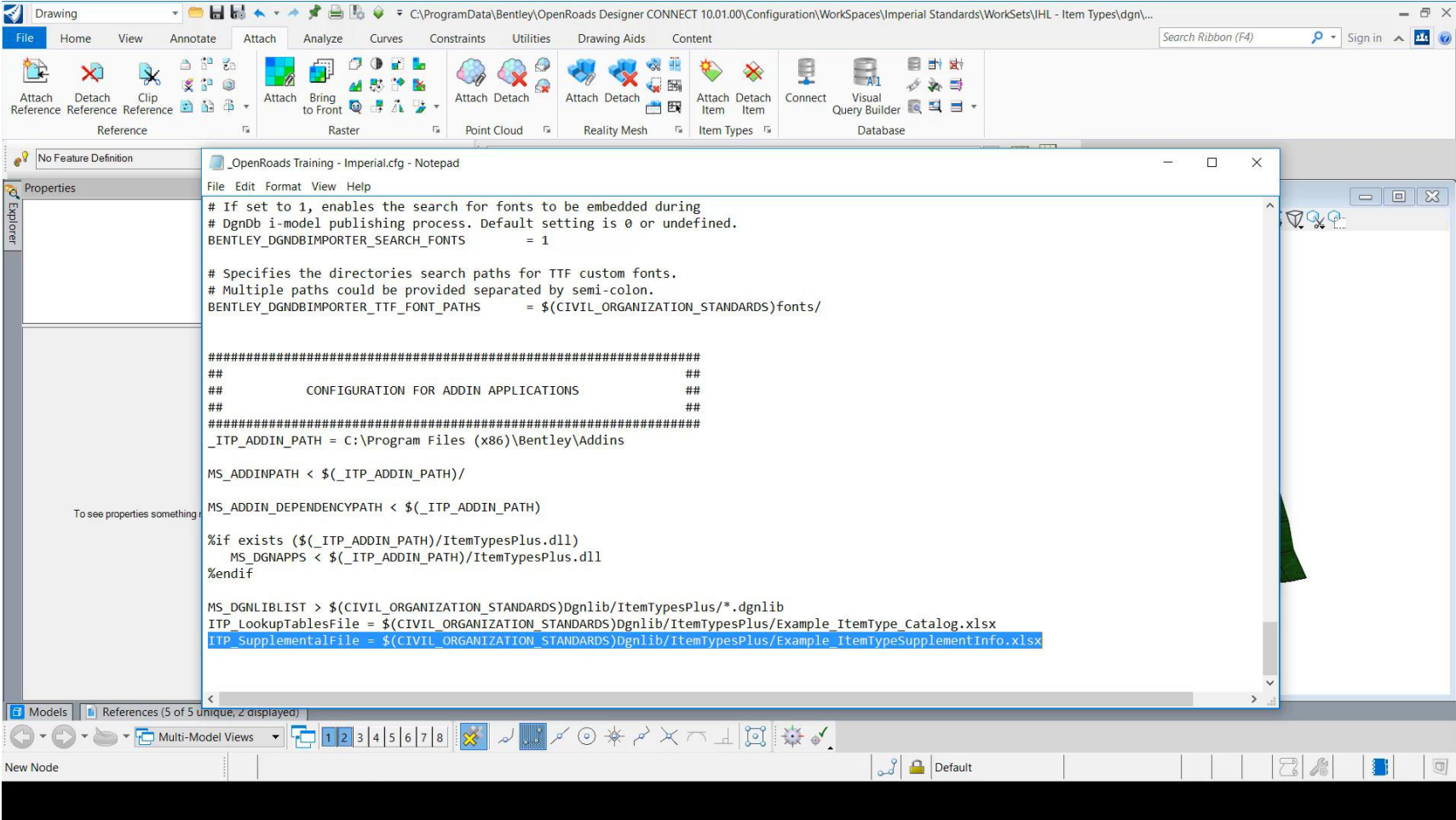


Creating Picklists in Item Types Plus

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Creating Picklists in Item Types Plus



Configuring Lookup Tables in Item Types Plus

- The value of one property can be used to look up values for other properties.

The screenshot illustrates the configuration of lookup tables in Item Types Plus. It shows an Excel spreadsheet with property definitions and a screenshot of the software interface.

Excel Spreadsheet: Item Type Definitions

Item Type Library Name	Item Type Name	Property Type	Property Name	Property Calculated Expression	Property Options
General	Pay Item		Pay Item Number		
General	Pay Item		Units of Measure	PAYITEM_LOOKUP[Pay Item Number]	
General	Pay Item		Pay Item Description	PAYITEM_LOOKUP[Pay Item Number]	
General	Designer Note		Note		
Signing	Sign Schedule		Sign Number		
Signing	Sign Schedule		Sign Description		
Signing	Sign Schedule		Sign Code		
Signing	Sign Schedule		MUTCD Code		
Signing	Sign Schedule		Sign Color		
Signing	Sign Schedule		Sign Size		

Software Interface: Item Types Plus - v01.01.04

The software interface shows a tree view of item types. The 'General - Pay Item' section is expanded, showing properties: Pay Item Number (value: 285-701-000), Units of Measure (value: CY), and Pay Item Description (value: AGGREGATE TYPE A). Red dashed lines indicate the lookup process from the 'Pay Item Number' property value to the 'Units of Measure' and 'Pay Item Description' values in the lookup table.

Lookup Table: Example_ItemType_Cata...

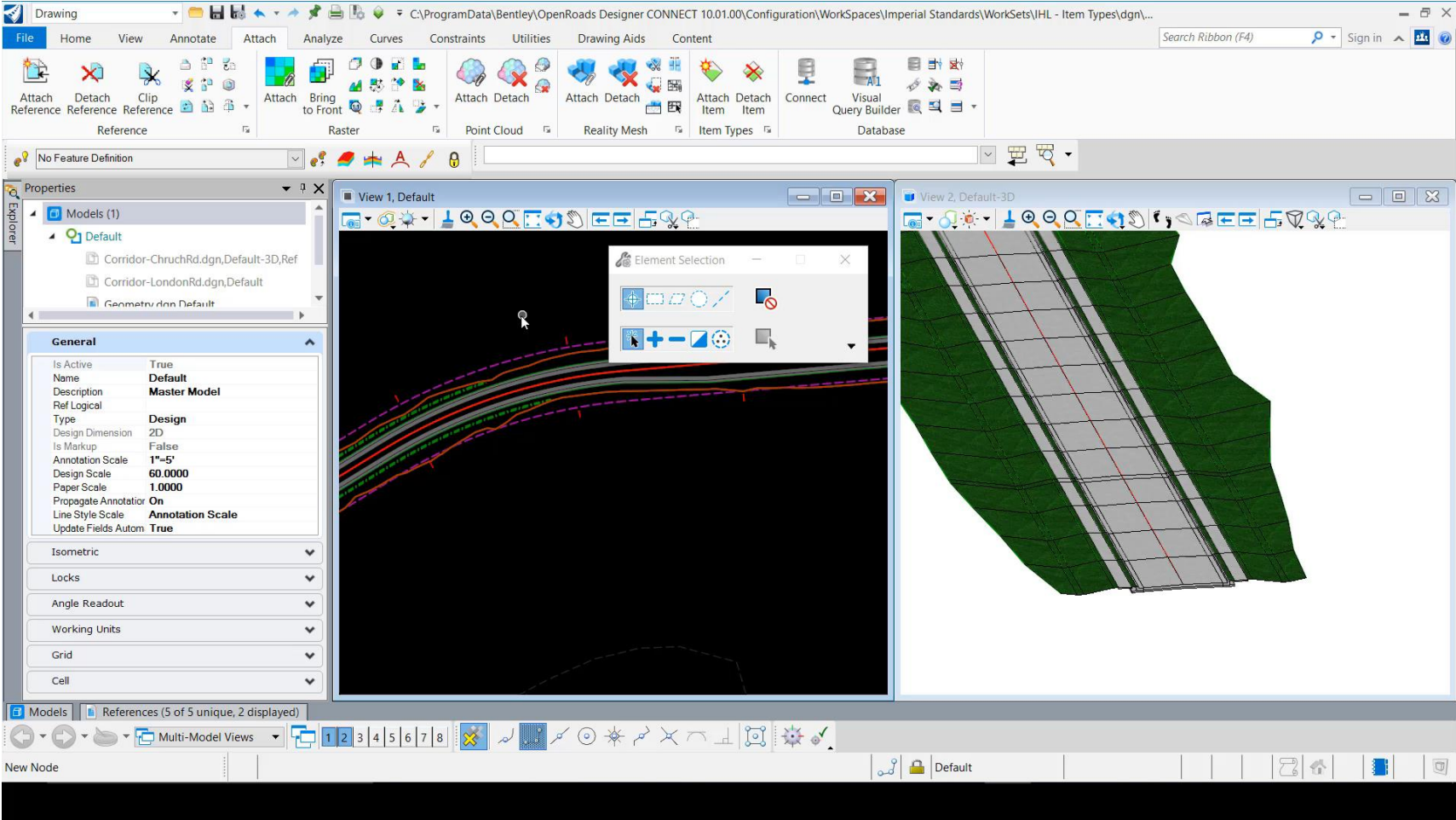
Pay Item Number	Units of Measure	Pay Item Description
285-701-000	CY	AGGREGATE TYPE A
287-001-000	CY	ASPHALT TREATED PERMEABLE BASE
334-001-011	CY	ASPHALT TREATED CONCRETE INTERMEDIATE COURSE
337-007-025	CY	ASPHALT TREATED CONCRETE WEARING COURSE
350-003-001	CY	PLAIN CEMENT CONCRETE PAVEMENT, 6"
350-003-007	CY	PLAIN CEMENT CONCRETE PAVEMENT, 9"
520-011-000	LF	CONCRETE CURB, MOUNTABLE
520-021-000	LF	CONCRETE CURB AND GUTTER TYPE 1
520-022-000	LF	CONCRETE CURB AND GUTTER TYPE 2

Configuring Lookup Tables in Item Types Plus

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Configuring Lookup Tables in Item Types Plus



Using Expressions in Item Types Plus

The E column (Property Calculated Expression) in the supplemental info spreadsheet can contain expressions using property names within the same Item Type to create calculated values.

- Length * Width
- Price Per Area Unit * Area
- Area / 9

The screenshot displays two windows. The top window, titled 'Item Types Plus - v01.01.04', shows a tree view on the left and a property list on the right. The property list is for 'General - Asphalt Pavement Miscellaneous' and includes the following properties:

Property Name	Value
PAY ITEM NUMBER	339-001-000
PAY ITEM DESCRIPTION	Asphalt Pavement Miscellaneous (100lb/sy)
UNITS	TN
LENGTH	3
WIDTH	3
QUANTITY	0.05
THICKNESS	1

The bottom window is an Excel spreadsheet titled 'Example_ItemTypeSupplementInfo.xlsx'. The formula bar for cell E14 shows the expression: $LENGTH * WIDTH / 9 * 100 / 2000 * THICKNESS$. The spreadsheet table is as follows:

	A	B	C	D	E	F
	Item Type Library Name	Item Type Name	Property Type	Property Name	Property Calculated Expression	Property Option
8	General	Asphalt Pavement Miscellaneous		PAY ITEM NUMBER		
9	General	Asphalt Pavement Miscellaneous		PAY ITEM DESCRIPTION		
10	General	Asphalt Pavement Miscellaneous		UNITS		
11	General	Asphalt Pavement Miscellaneous		LENGTH		
12	General	Asphalt Pavement Miscellaneous		WIDTH		
13	General	Asphalt Pavement Miscellaneous		THICKNESS		
14	General	Asphalt Pavement Miscellaneous		QUANTITY	$LENGTH * WIDTH / 9 * 100 / 2000 * THICKNESS$	
15	Signing	Sign Schedule		Sign Number		
16	Signing	Sign Schedule		Sign Description		
17	Signing	Sign Schedule		Sign Code		N-New Sign,R-R
18	Signing	Sign Schedule		MUTCD.Code		

A red arrow points from the 'QUANTITY' value of 0.05 in the property list to the formula in cell E14 of the spreadsheet.



Enhanced Engineering Model Attribution

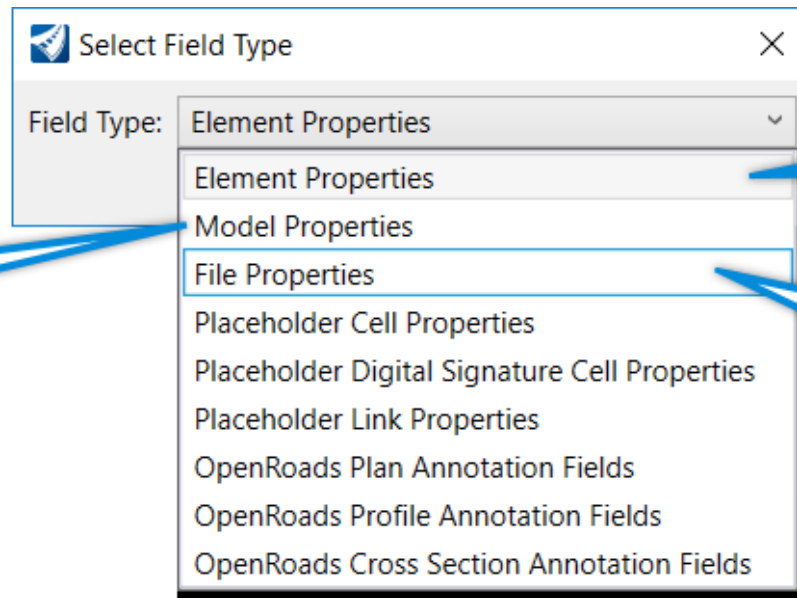
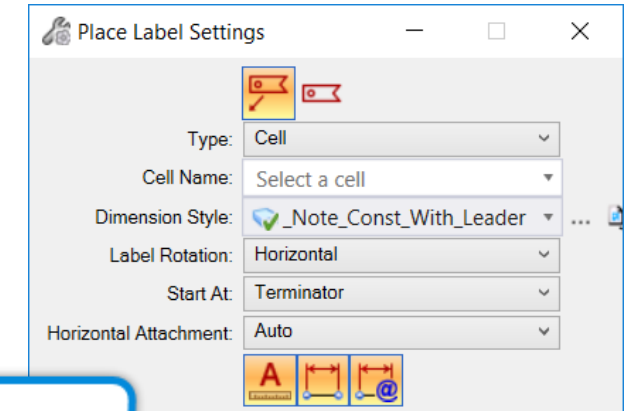
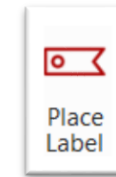
Property Driven Annotations



Property Driven Annotations

Take advantage of added intelligence with property driven annotation.

- Place Labels using Cells or Text Favorites
- Use “Fields” to retrieve properties



-Item Types
-Geometry

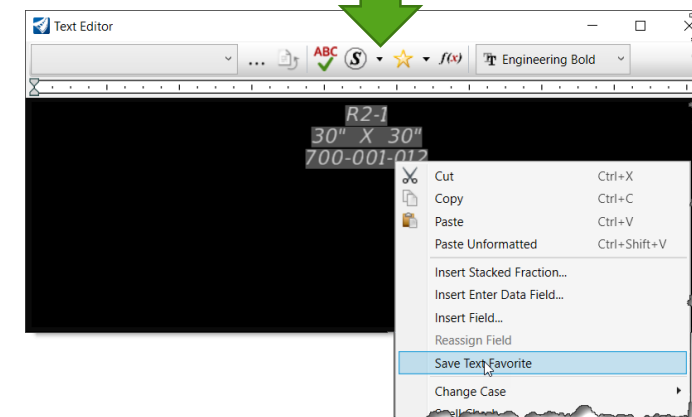
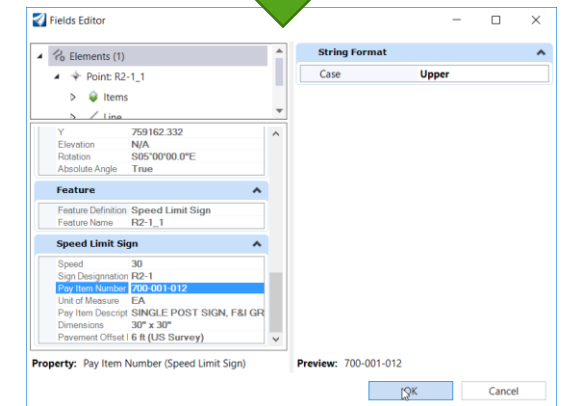
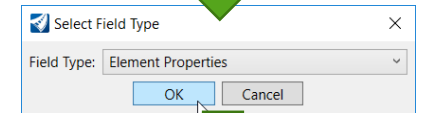
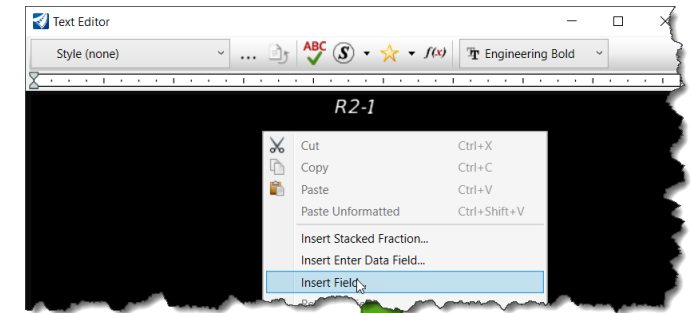
-Annotation Scale

[WorkSet Properties]
-Project Number
-Project Manager (custom)

Creating Property Driven Annotations

If a label contains only text and fields a Text Favorite can be created

- Use Text Editor to build a string
 - Can combine text and fields
- Select sample element to choose property
 - Label can be used on any elements with common properties
 - If used on element without the property the value of the sample element will be retained

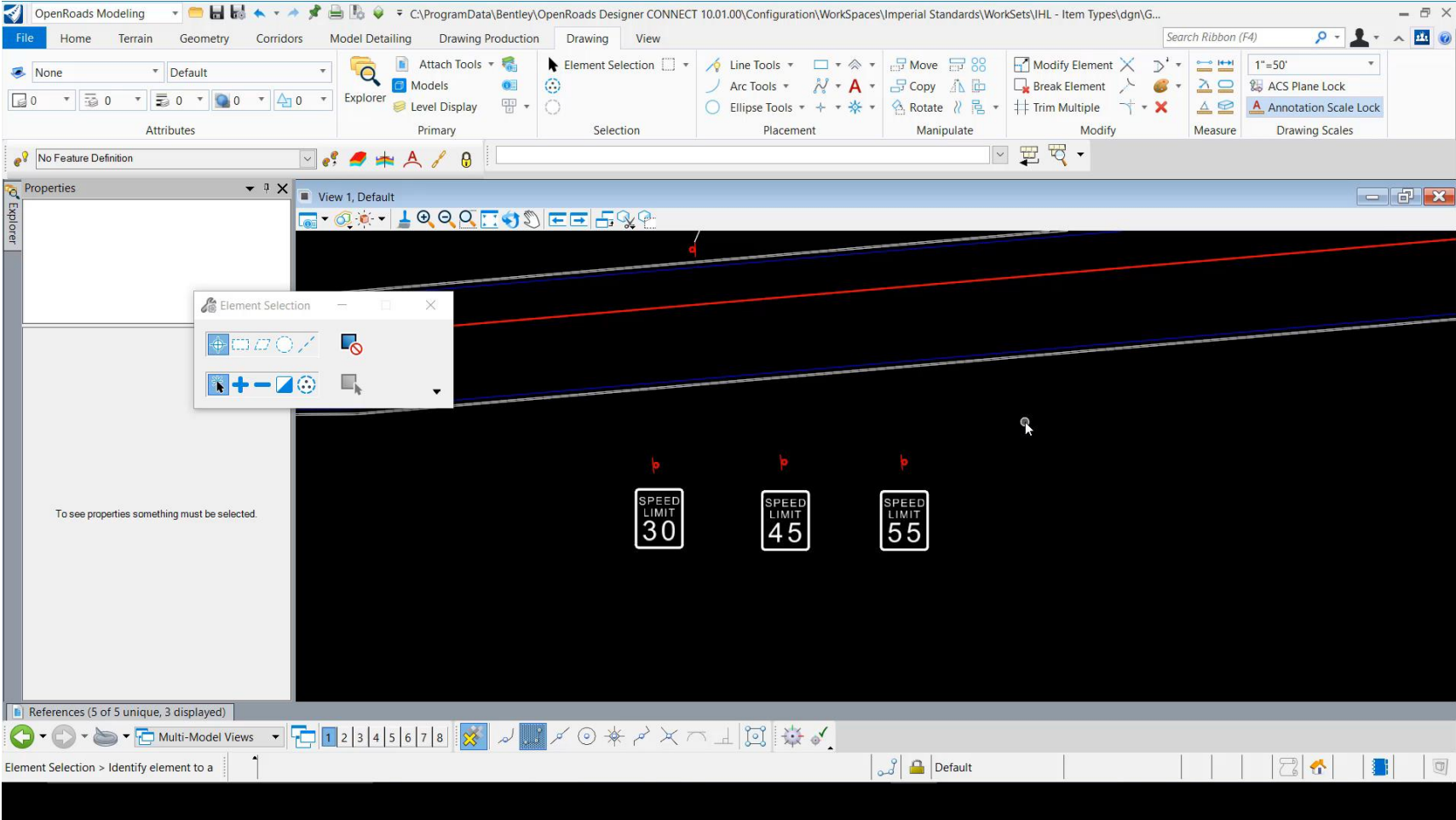


Creating Property Driven Annotations - Text Favorites

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

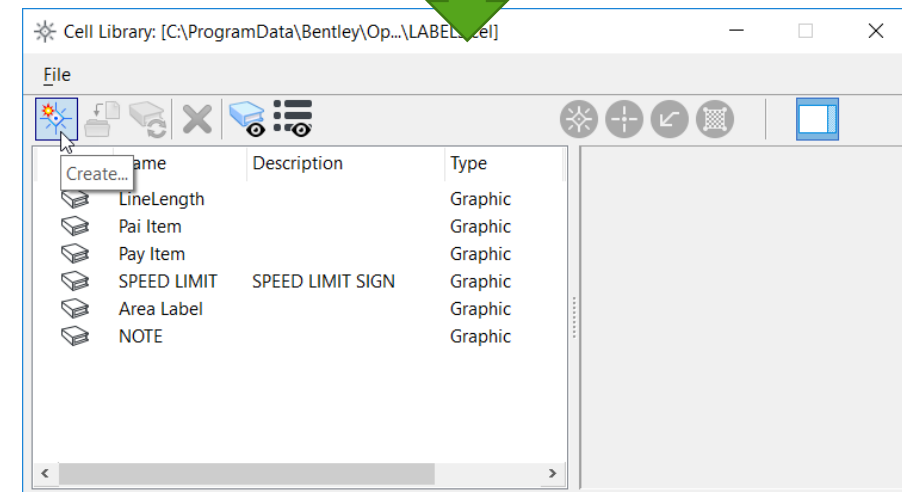
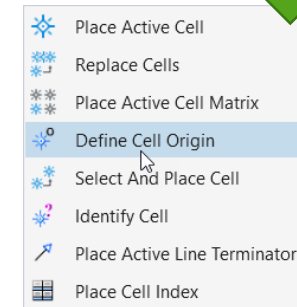
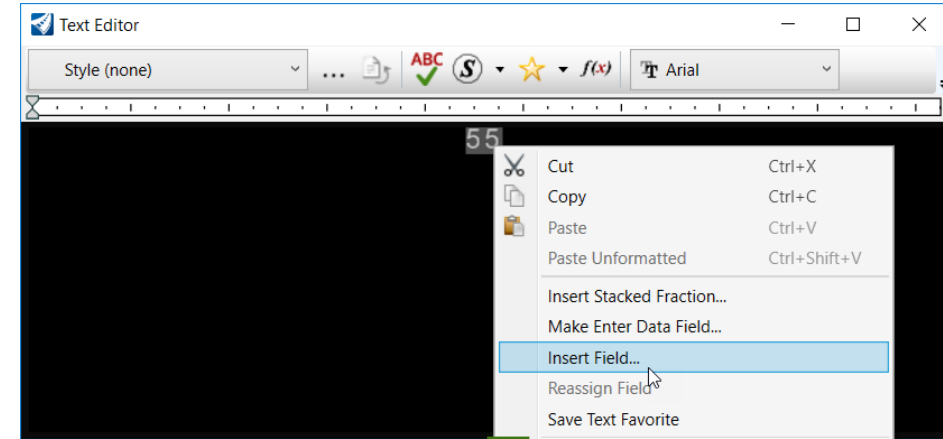
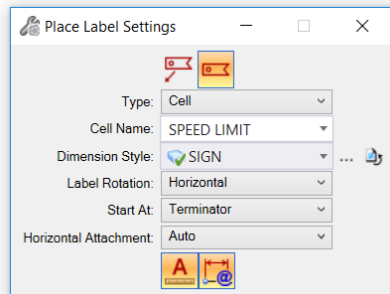
Creating Property Driven Annotations - Text Favorites



Creating Property Driven Cells

When combining text with other graphics a cell can be created for use with the Place Label tool.

- Insert Text and Fields in graphics
- Make Selection Set
- Define Cell Origin
- Create new Cell

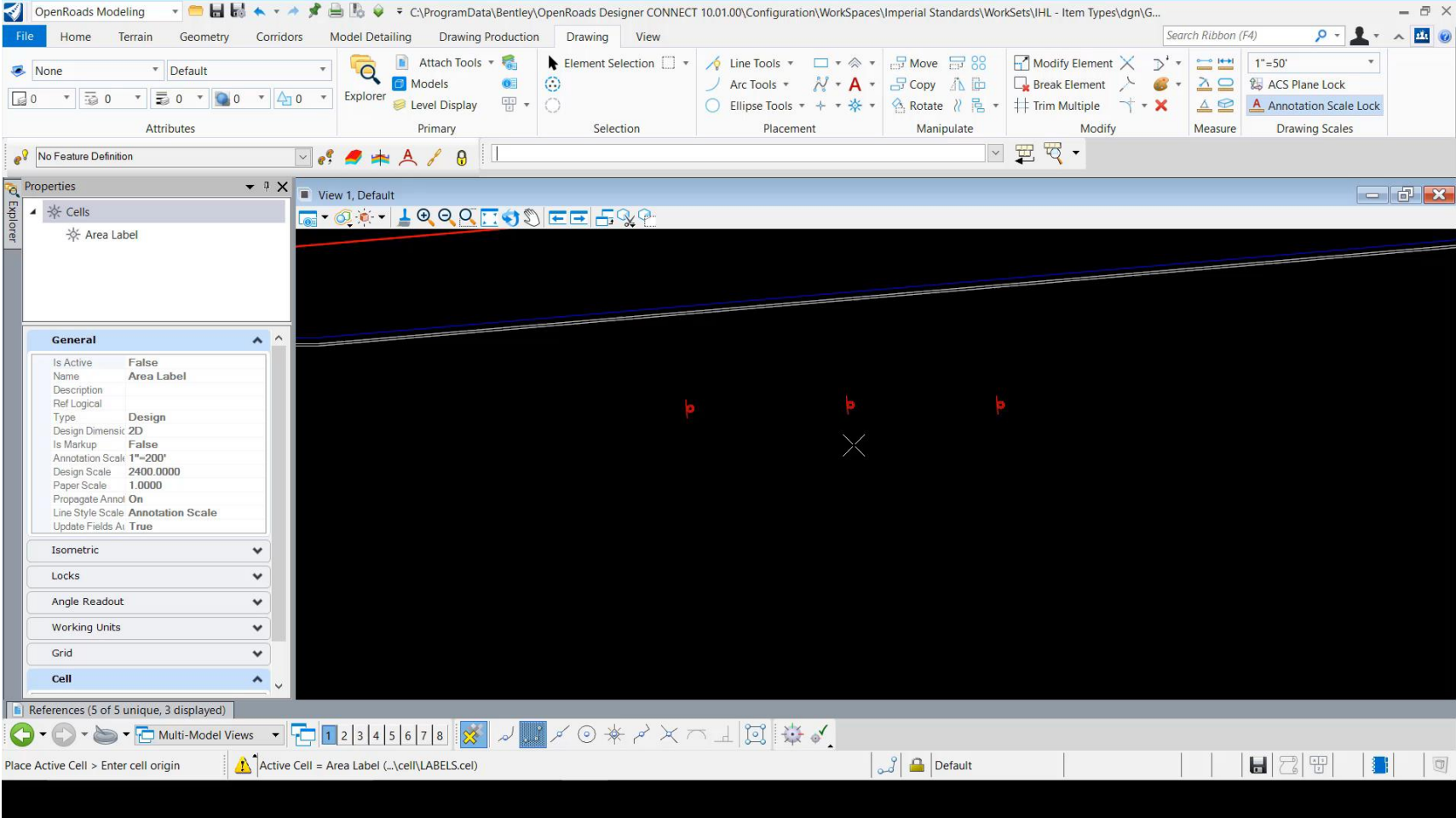


Creating Property Driven Annotations Cells

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Creating Property Driven Annotations Cells





Enhanced Engineering Model Attribution

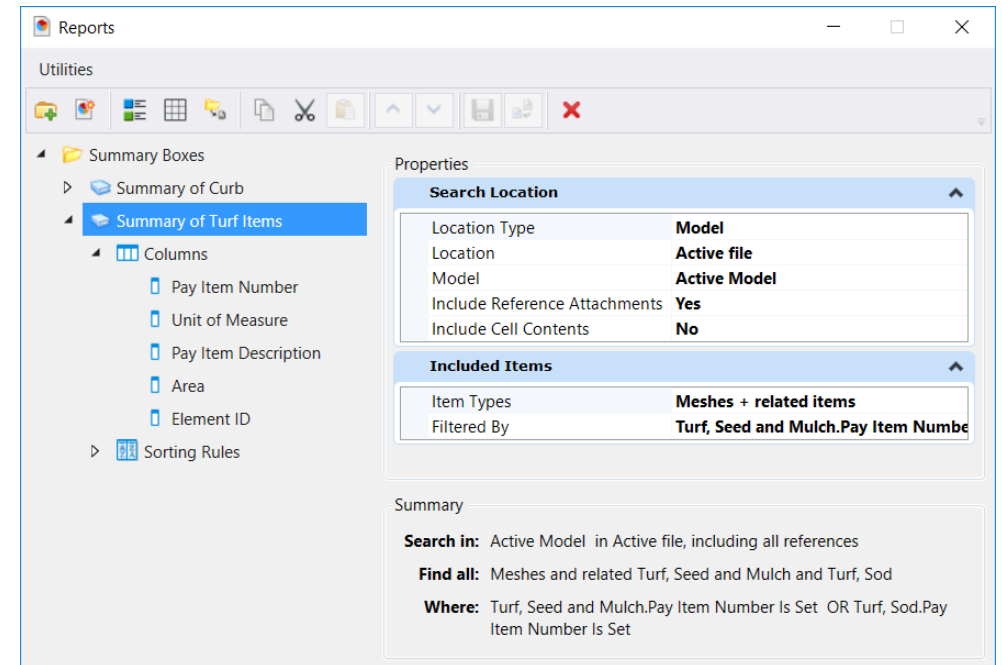
Reports



Report Definitions

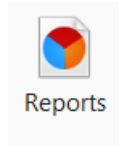
A “Report Definition” is a way to extract data from a DGN file in tabular format. The result is a report that can be placed as a table or exported to an Excel workbook or *.csv files.

- Reports can also join related sets of properties into a single row
 - Design file properties
 - WorkSet properties
 - Item Type properties and properties of an element to which the item is attached can be listed together in a report
- Define sorting and formatting options

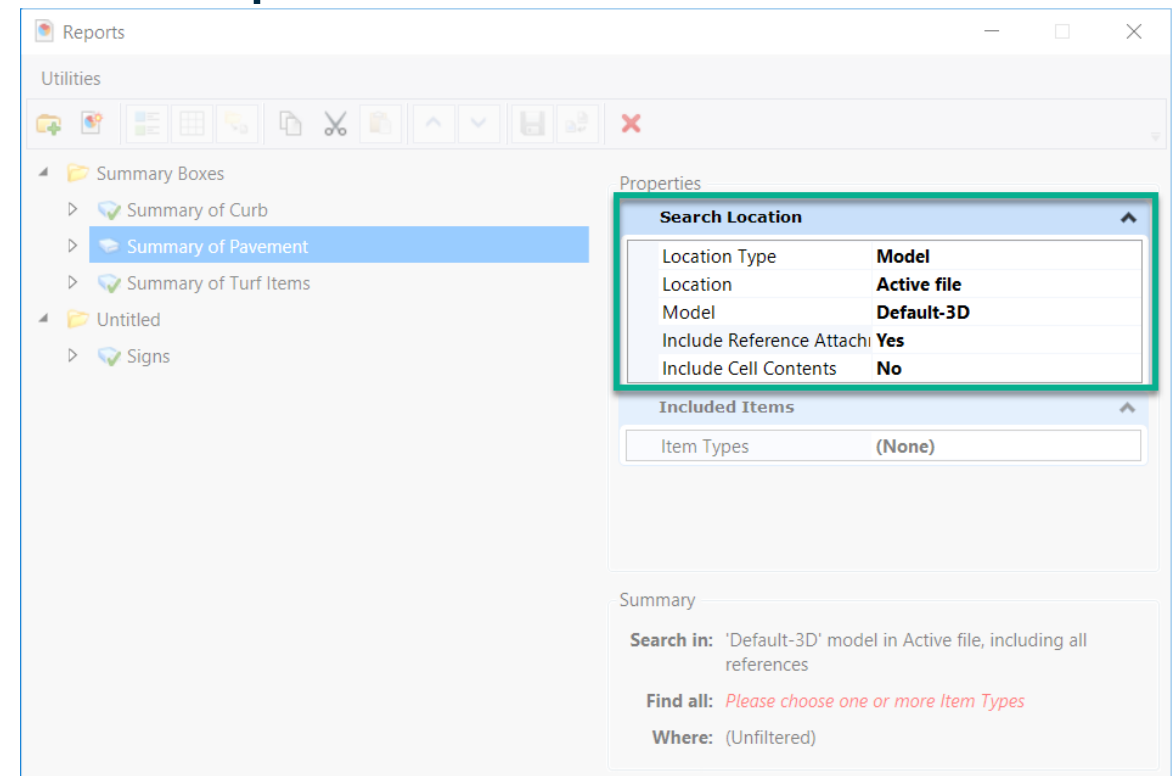


Creating Report Definitions – Search Locations

The Reports tool can be found on the Analyze tab of the Drawing and Modeling workflows



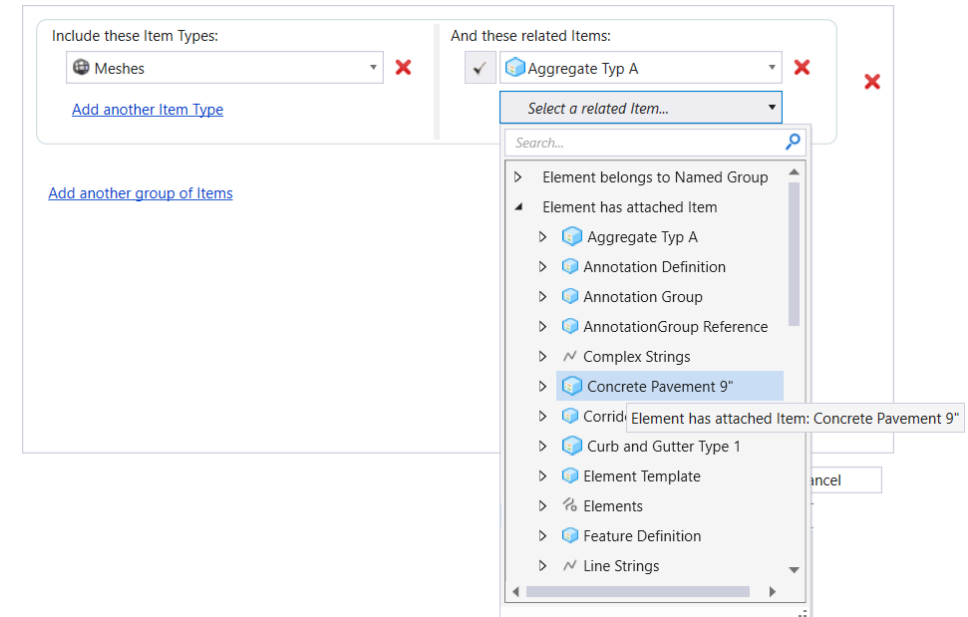
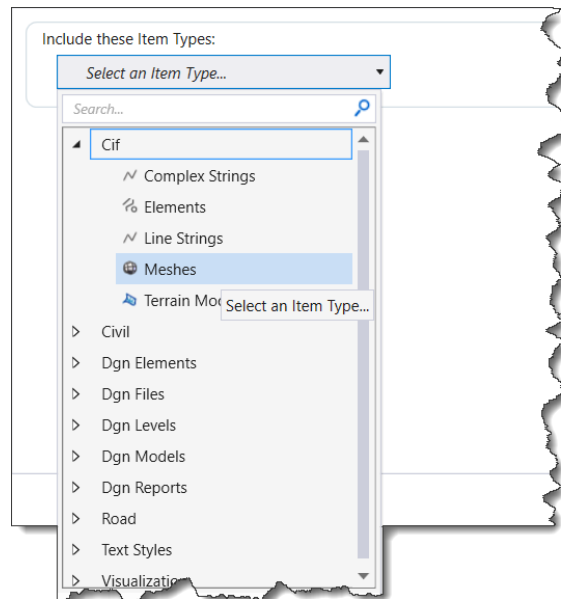
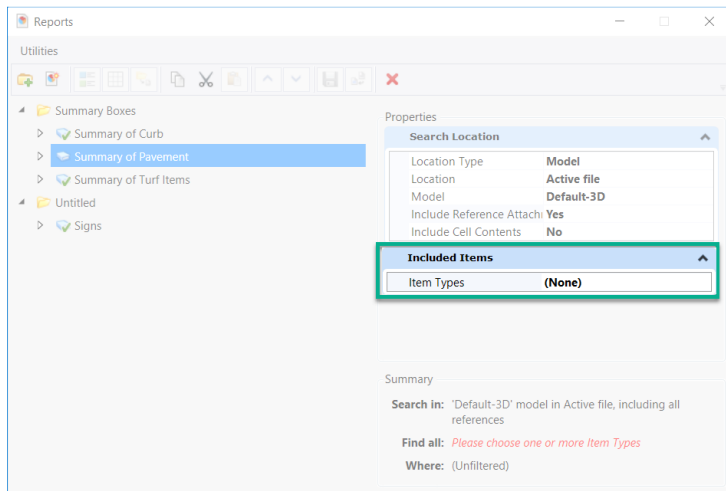
1. Create a Category (folder) to organize reports
2. Create a new Report Definition
3. Configure Search Location
 - Search whole file or a model
 - Active file or specify file
 - Active model or specify model
 - Search in references
 - Search in cells



Creating Report Definitions – Add Included Items

4. Add Included Items

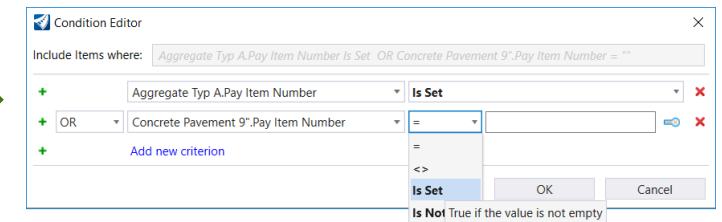
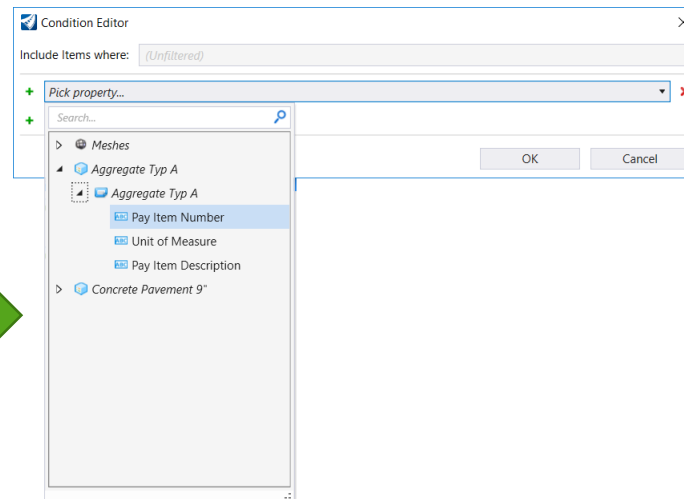
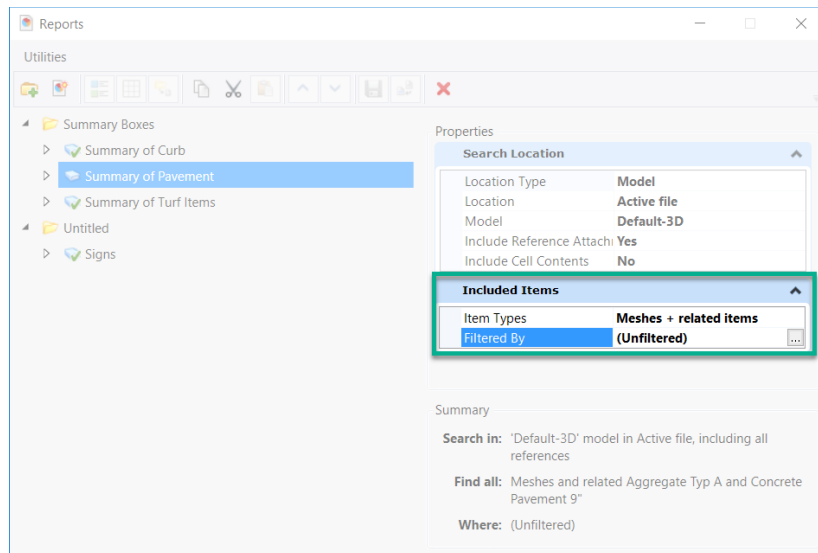
- Click Item Types pick list
- Select type of item(s) to search for
- Select Related items
- Click OK to apply selections



Creating Report Definitions – Filter Unwanted Items

5. Filter Unwanted Items

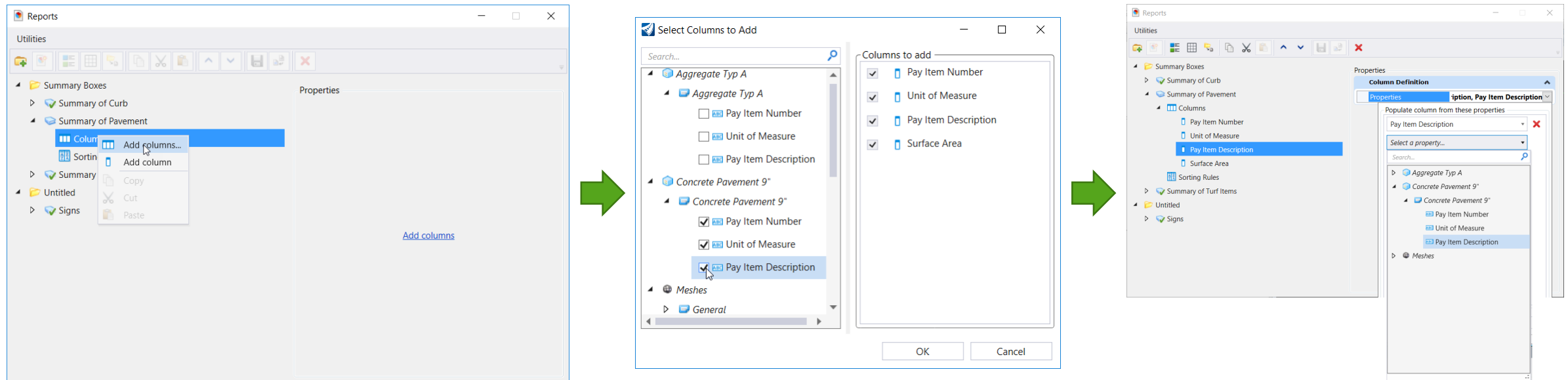
- Click “Filtered By” browse button
- Pick a property to conditionally filter by
- Choose comparison operator
- Define comparison value (if necessary)



Creating Report Definitions – Add Columns

5. Add Columns from Available Properties

- Right-click and select add columns
- Select desired columns
 - NOTE: If multiple items have same columns, select only from one item
- Select column properties to add like columns from other items

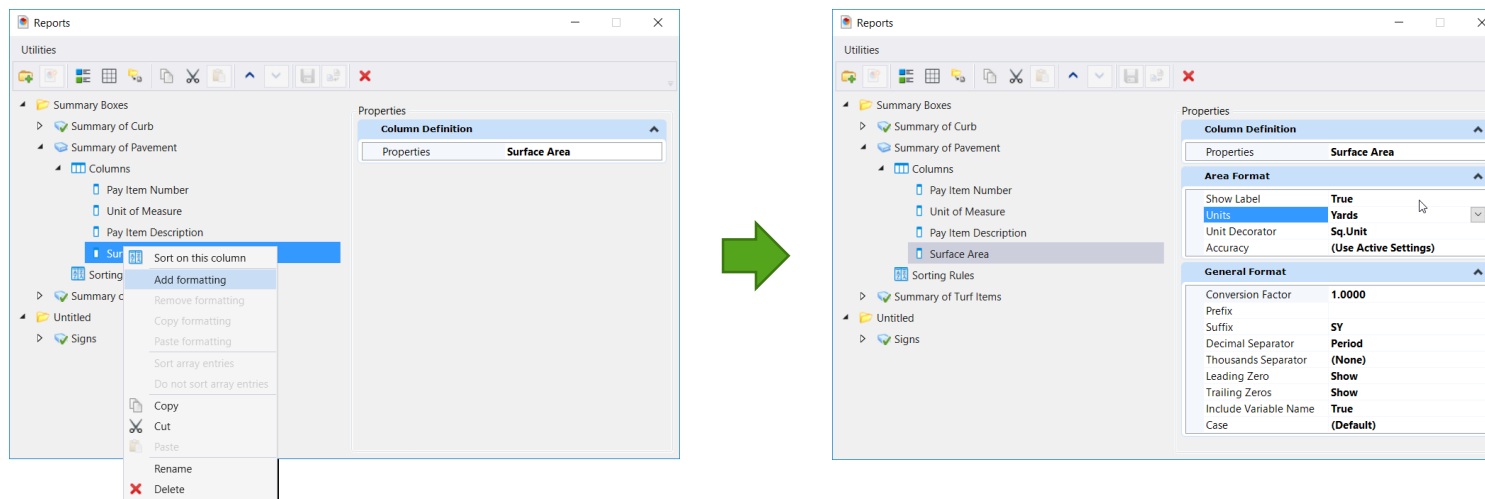


Creating Report Definitions – Add Formatting

Provides a way to set case on text or for numerical properties
i.e. define units, decimals, prefix, ...

6. Add Formatting to Columns

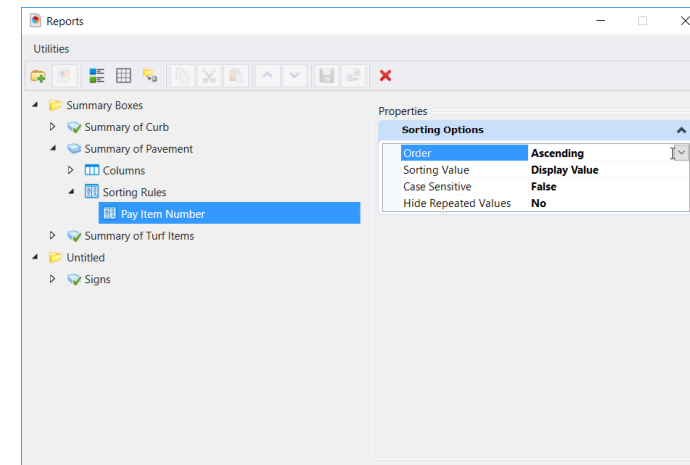
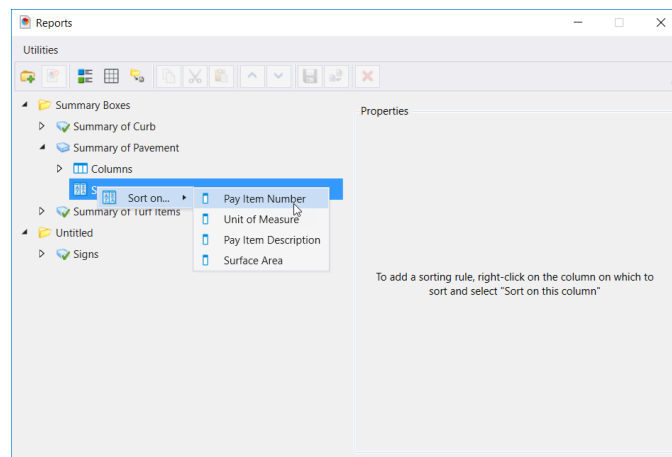
- Right-click on column and select “Add Formatting”
- Set formatting properties



Creating Report Definitions – Sorting Rules

7. Define Sorting Rules

- Right-click on Sorting Rules and select desired column
- Select desired Sorting Options

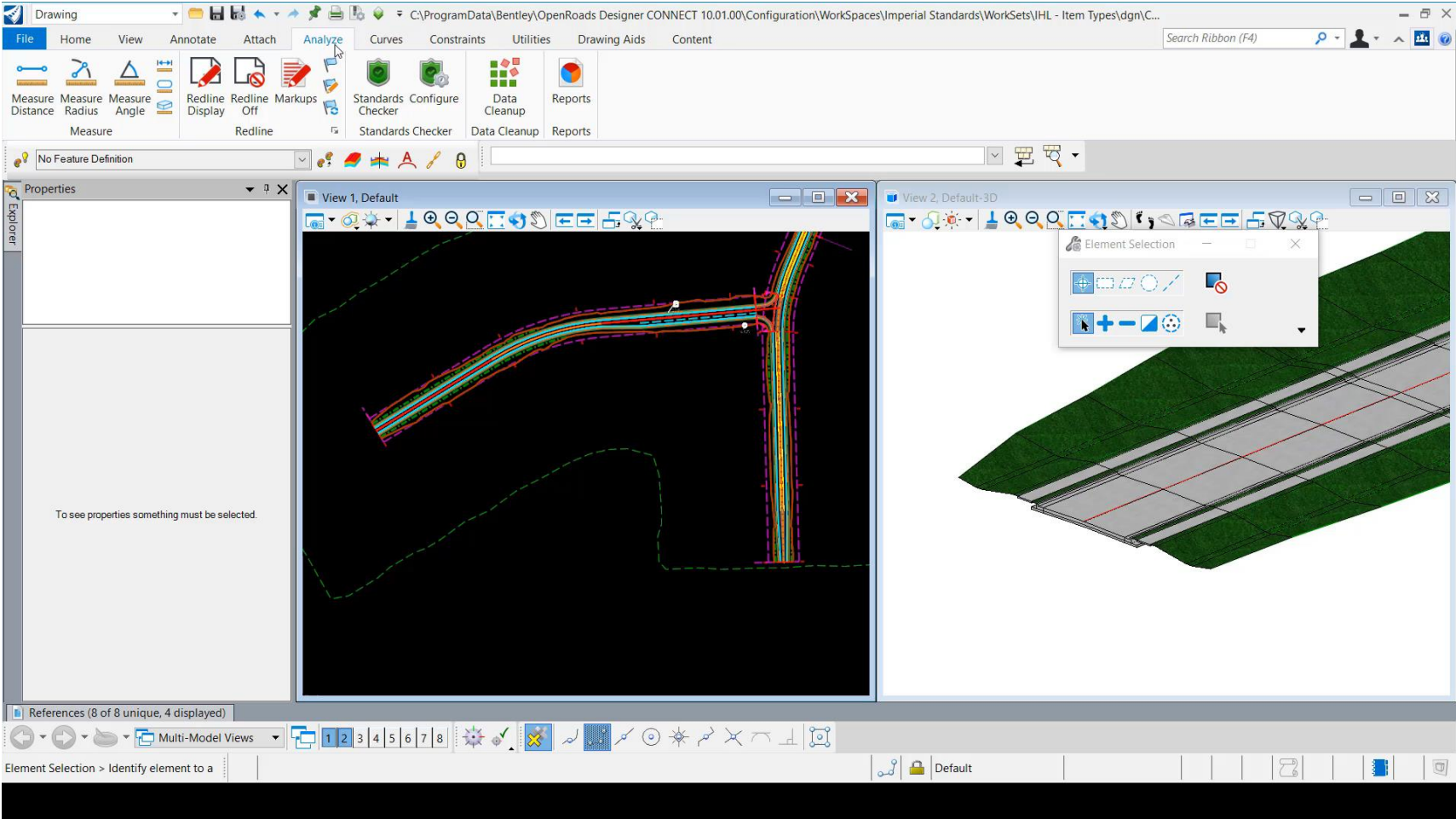


Creating Report Definitions

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

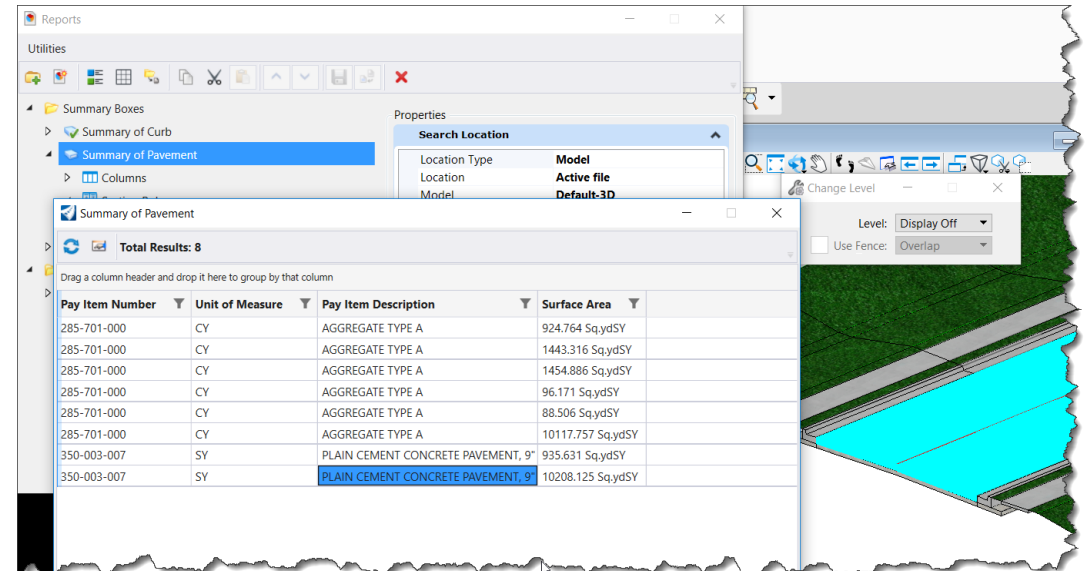
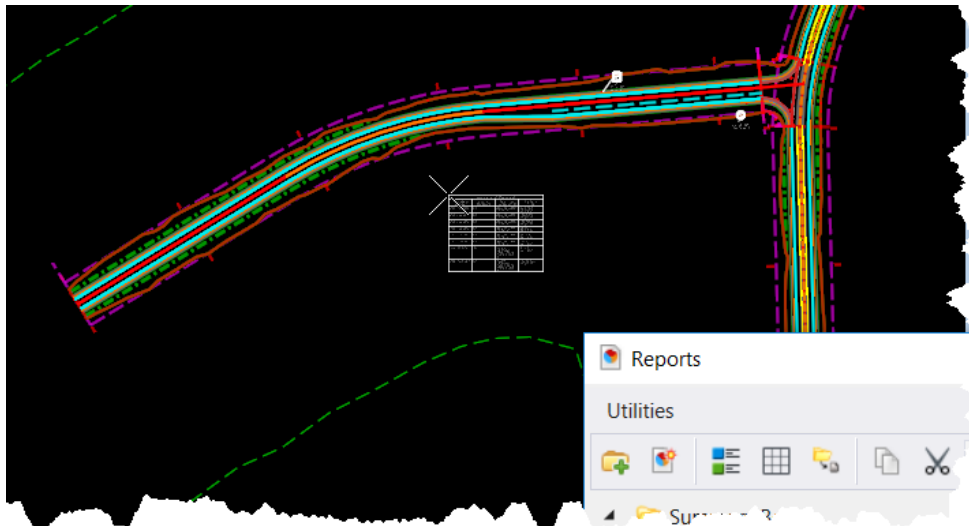
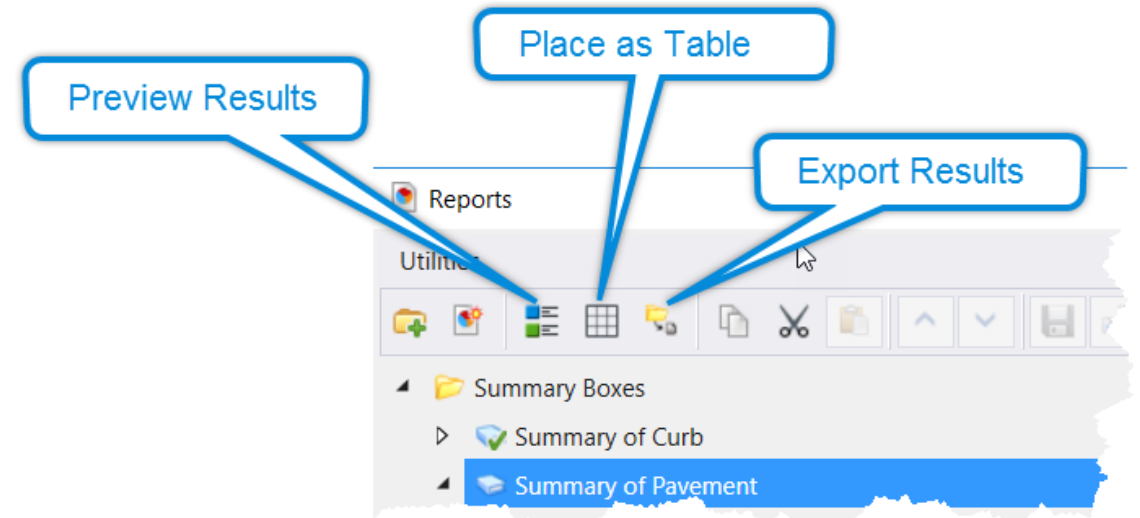
Creating Report Definitions



Report Results

What can you do with the report?

- Preview Results
 - Select rows to highlight element
- Place as Table
- Export Results

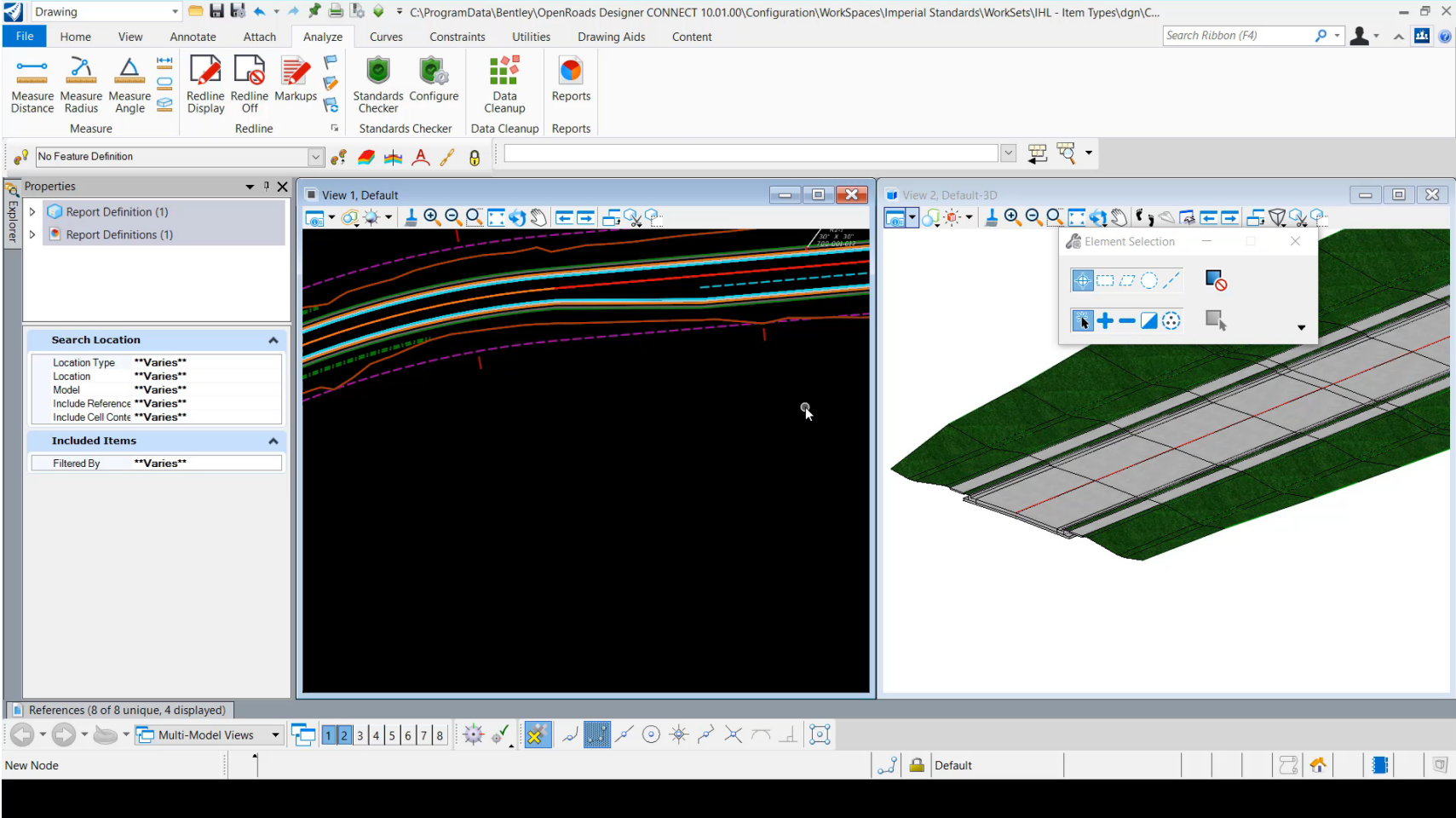


Report Results

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Report Results



Distributing Report Definitions

It's a best practice to deploy Report Definitions in a DGN Library.

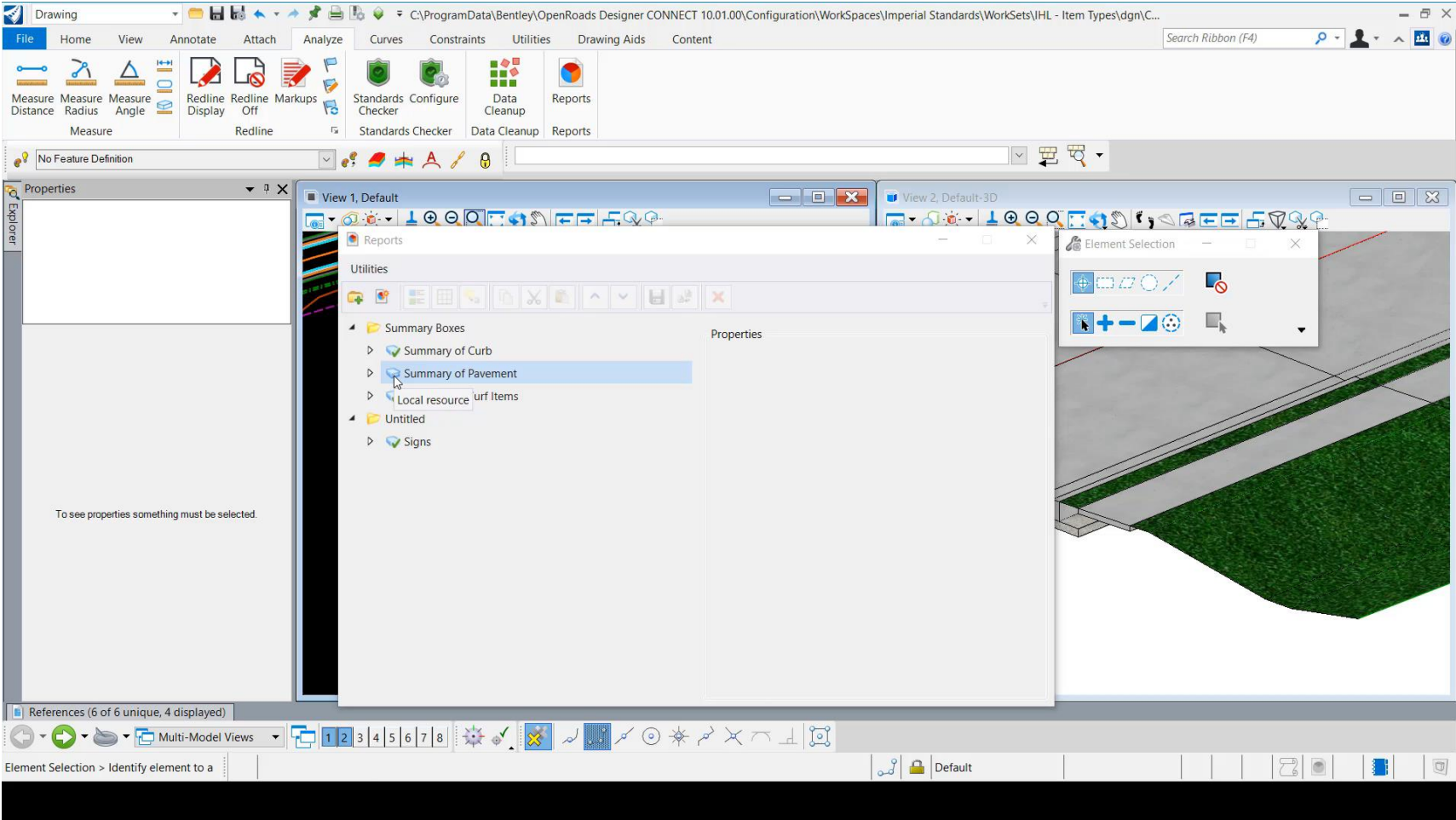
- The Item, File, WorkSet and Element properties must be available when creating the Report Definitions.
 - Create them in DGN containing properties, then Import into DGNLIB.

Distributing Report Definitions

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Distributing Report Definitions





Enhanced Engineering Model Attribution

Display Rules

What are Display Rules

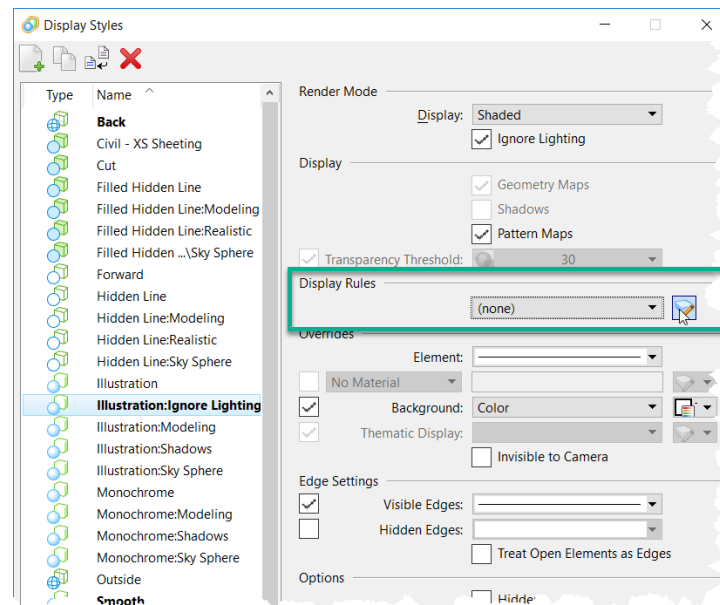
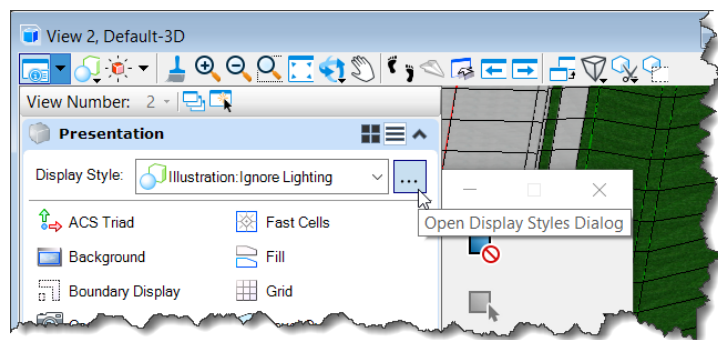
Display rules allow you to control the symbology, appearance, and display of design elements based on the property of an element, named group, view, model, reference, or file.

- Display Rules contain a condition and an action
- Can be used to:
 - Change display of elements when used in other disciplines
 - Quality Control files by highlighting items based on a level
- Can be applied through a Display Style

Creating Display Rules

The Display Rules dialog is launched from the Display Styles dialog

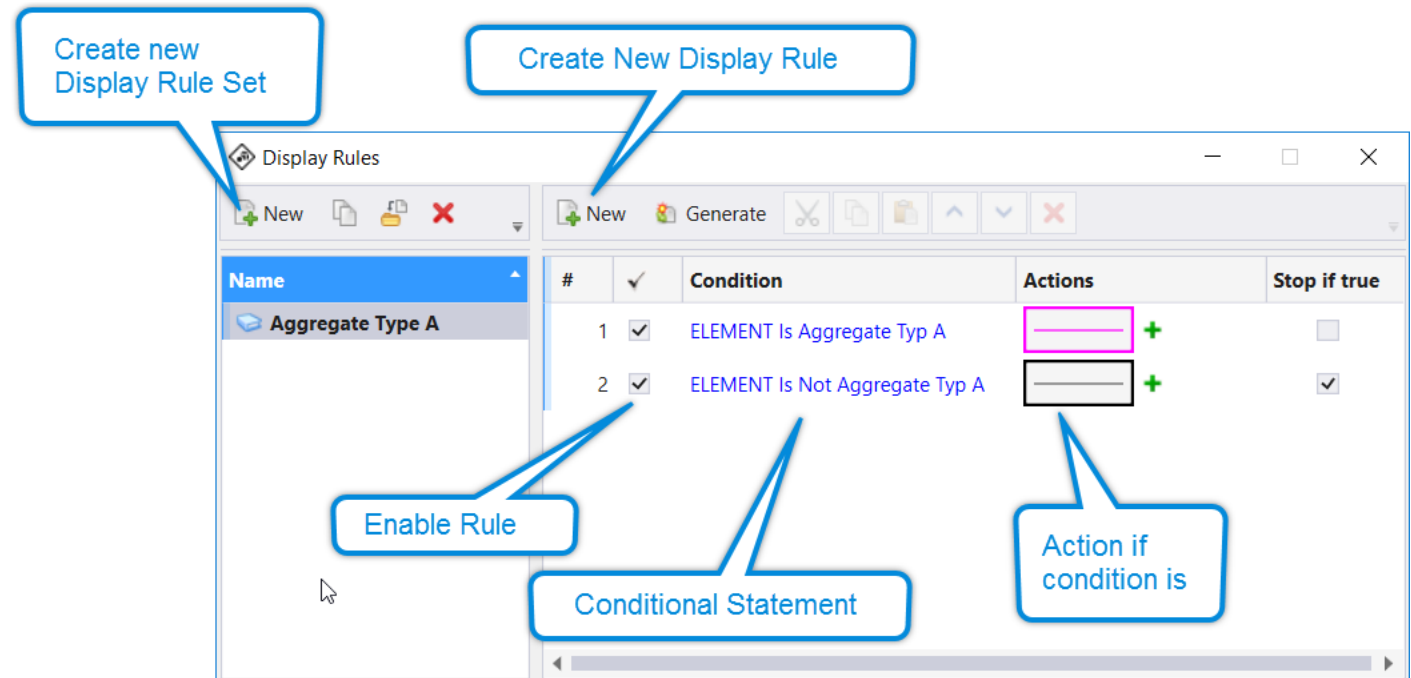
- Display styles are accessed from the “Apply Display Styles” tool or from the View Attributes as shown to the right.



Creating Display Rules

Multiple Display Rules will often be applied at once so they are combined into a Display Rule Set that is applied to a Display Style

- Conditional properties must be in active file or reference
- Should be delivered in DGN Libraries
 - Can be created in other files and imported

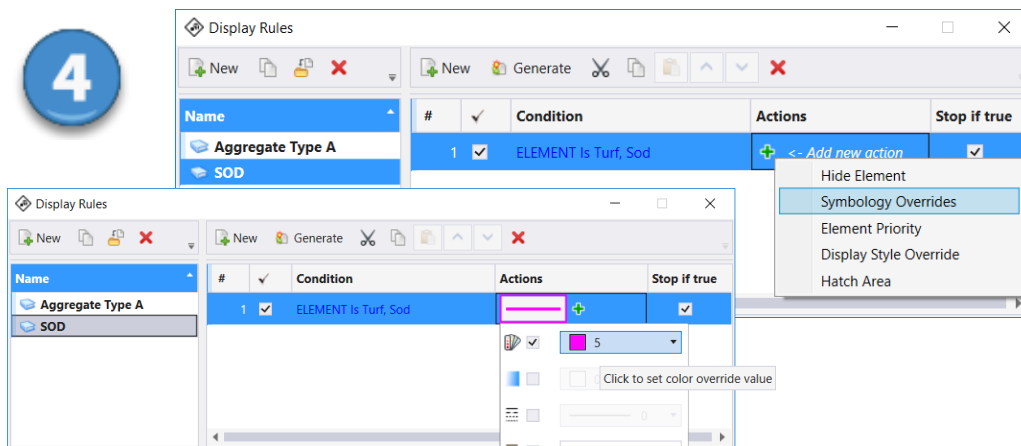
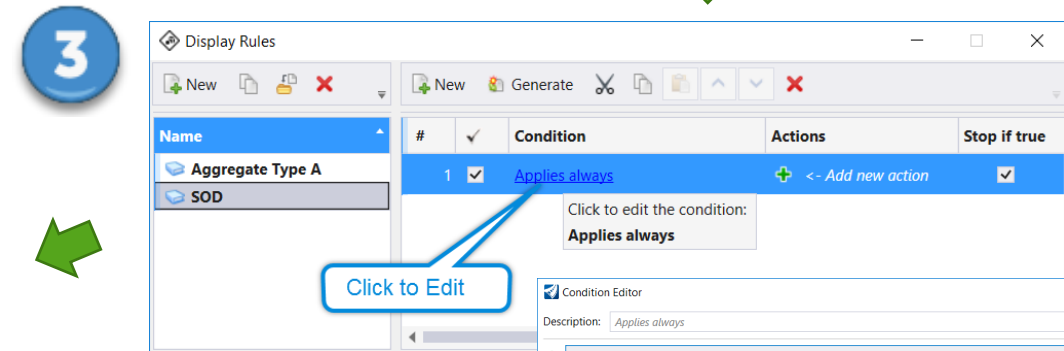
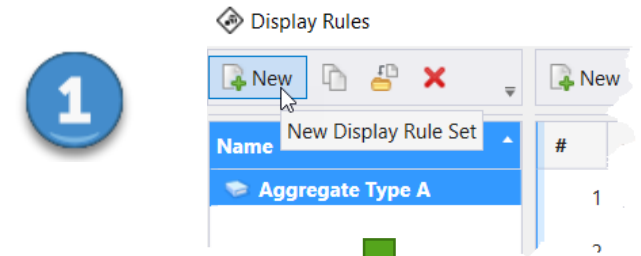


Creating Display Rules

The steps are:

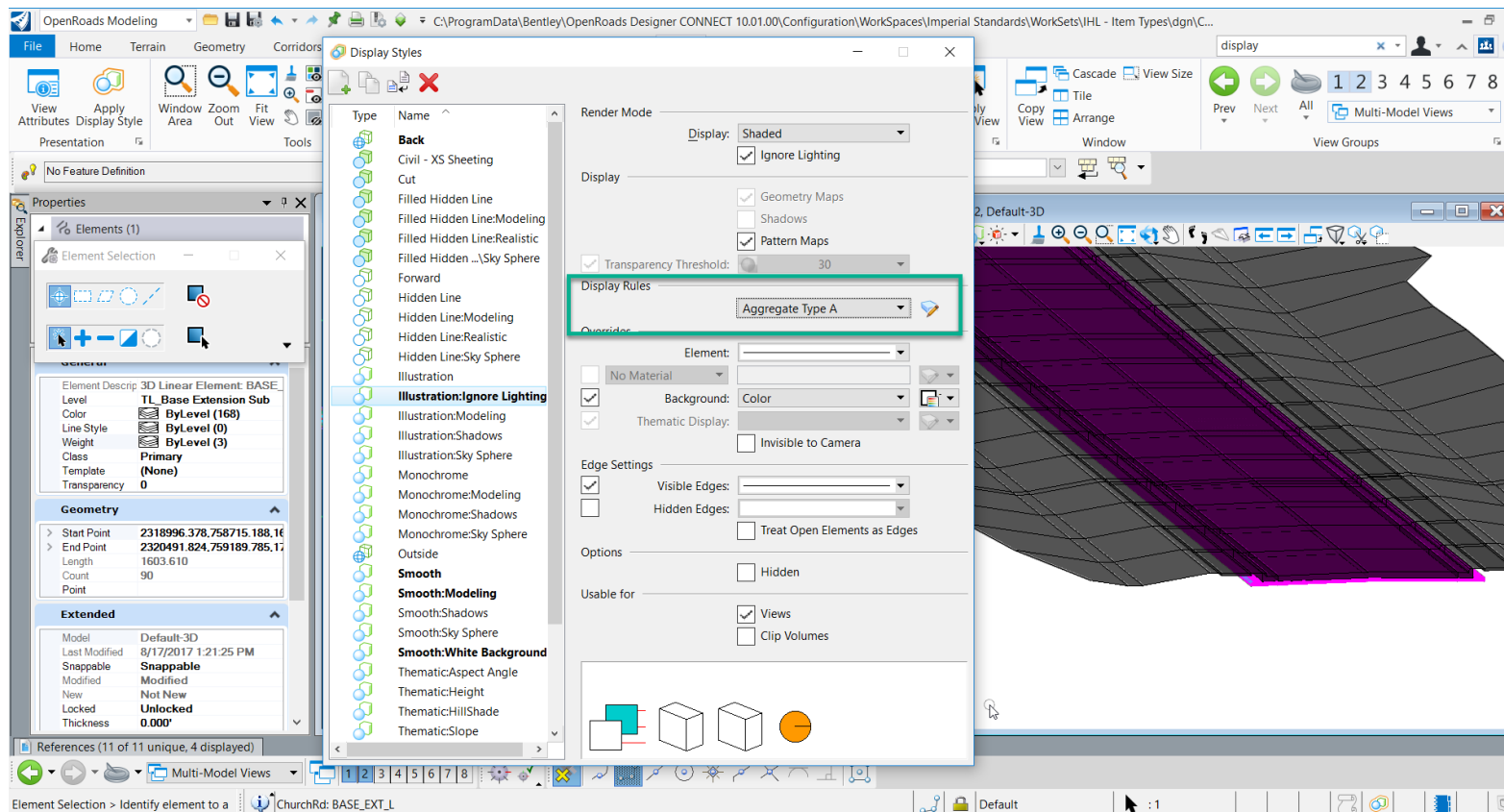
1. Create a Display Rule Set
2. Create Display Rule
3. Edit Condition
4. Define Action

(Repeat 2-4 to complete Display Rule Set)



Applying Display Rules

You can either create a new Display Style that can be applied to any view or simply define a rule for the active Display Style in a view.



The display rule applied here shows how Display Rules can be used to QC which elements have quantities applied

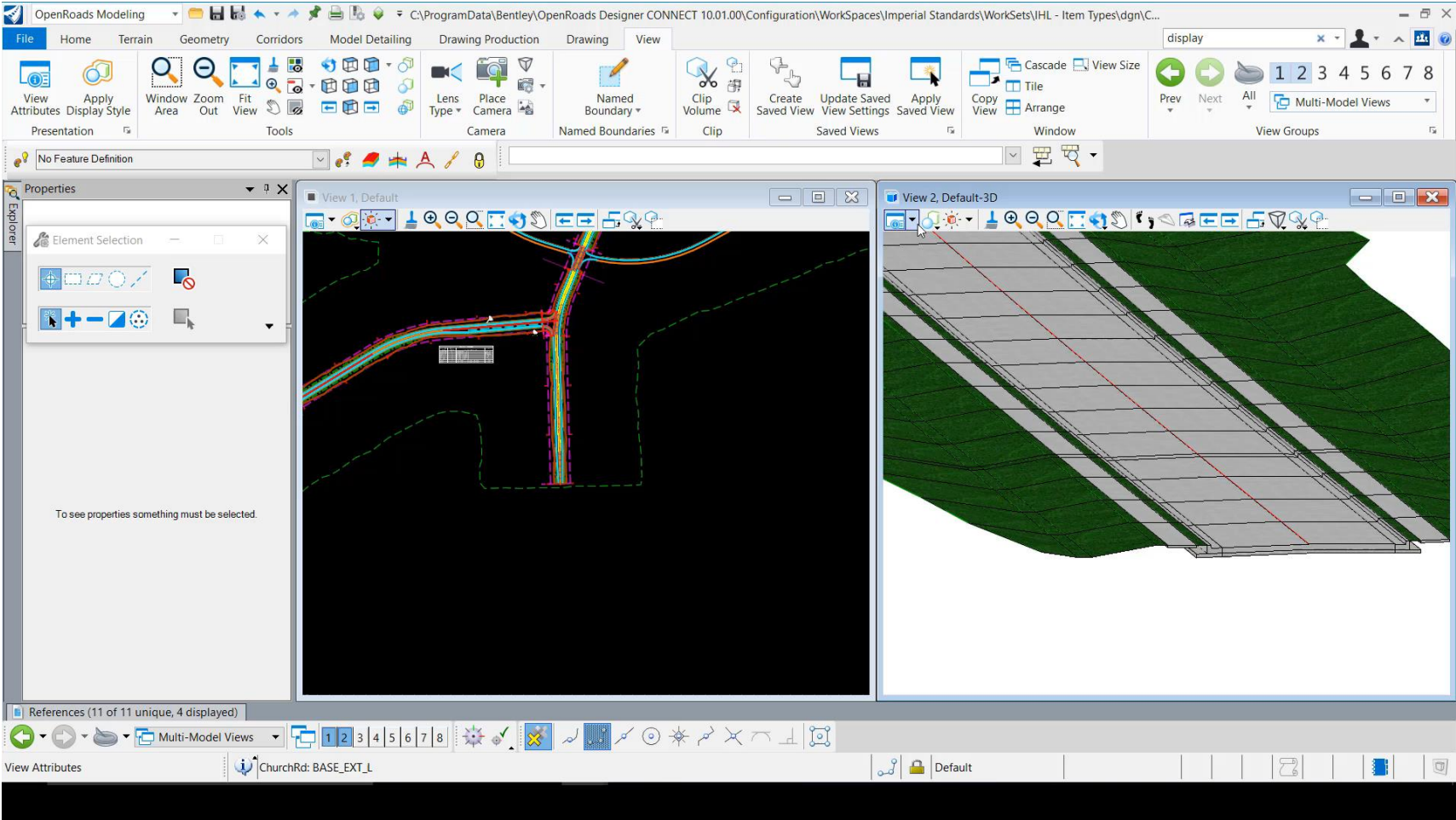
Aggregate Type A is highlighted and everything else is grayed out.

Display Style Demo

Demo

[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Display Style Demo





Thank You!