Build Custom Parts for Use in AutoCAD® Civil 3D and InfraWorks®

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Learning Objectives

• Discover the new Infrastructure Parts Editor software and how it can be used to help advance your models
• Learn how to use existing built-in parts to create custom infrastructure model content
• Learn how to model your very own parametric shape content to build custom infrastructure model content
• Discover how to use Inventor® and the Inventor® Plug In, Infrastructure Part Shape Utilities, to extend the built-in part library with custom parametric models
About the Speaker

- Autodesk™ AutoCAD® / AutoCAD® Civil 3D® Certified Professional

- Eighteen years of professional experience in Autodesk™ products

- Project types range from traditional site / civil to industrial sites and landfills.

- Project design experience includes various stages from overall planning to the detailed construction including site design, site grading, complex volume calculations, utility and pond sizing, soil erosion control measures, and details.

- With my LLC, Red Transit Consultants, I develop applications and workflow management tools for AutoCAD®, Civil 3D®, and Map 3D® as well as small Windows stand-alone applications with various programming languages.
Overview of Infrastructure Parts Editor
The Infrastructure Parts Editor (IPE) is a parametric shape editing tool for creating parts catalogs that are compatible with Autodesk InfraWorks® and AutoCAD® Civil 3D. (Autodesk, 2017).

IPE graduated this year from Autodesk Labs previously known as Project Kameleon.
IPE Terminology

- **Part Catalog**
  - A collection of part families containing the definitions of all the parts that can be inserted into a model or drawing. (Autodesk | Civil 3D, 2017)

- **Part Family**
  - A group of similar parts that vary by size. Each part in the part family uses the same general shape, with both geometric and non-geometric properties varying across the size range. (Autodesk, 2017)
How to Launch IPE

- Windows Start
- Autodesk InfraWorks®
  - Open Autodesk InfraWorks®
  - Open an Autodesk InfraWorks® model from InfraWorks® Home
  - Click
  - Click
  - IPE launches and opens to the Catalog tab.

- AutoCAD® Civil 3D
  - Open AutoCAD® Civil 3D 2018 (Must have 2018.1 minimum installed)
  - Open a drawing file.
  - On the home tab, go to the Create Design Panel, and select the drop down
  - Click the Infrastructure Parts Editor button
  - IPE launches and opens to the Catalog tab.
Overview of IPE

• Catalog tab
  o For Opening catalogs via file or model, and saving catalogs
• Parts tab
  ▪ For editing the parts within an open catalog
• Publish tab
  o For publishing the edited catalog
Overview of IPE – Catalog Tab

- IPE can be utilized to manage part catalogs for both Pipe Networks and Pressure Pipe Networks. It can be also used for managing Bridge components and other shapes for Autodesk InfraWorks®.

- Structure Domain
  Composed of Inlet or Access Structures, Grates or Covers, Underground Structures, and Pipes or Culvert Barrels.

- Piping Domain
  Composed of Olets, Fasteners, Flanges, Instruments, Fittings, Pipes, Valves and Operators, and Miscellaneous parts.
Overview of IPE – Parts Tab

- **Structure**
  - 3 Classes: Surface Structure, Underground Structure, and Grates or Covers

- **Culvert**
  - 2 Classes: Pipes or Culvert Barrels and Culvert End Treatments

- **Assembly**
  - 2 Base Type Components:
    - Inlets or Access Structures
    - Culverts
Overview of IPE – Parts Tab

• Structure
  o Surface Structures
    ▪ Primary Controlling Feature
    ▪ Used to place part on surface
    ▪ Includes frame in where cover/grate attaches
    ▪ Includes connection to underground structure
Overview of IPE – Parts Tab

- Structure
  - Underground Structures
    - Base portion of structure where pipes would connect and base slab
Overview of IPE – Parts Tab

- Structure
  - Grates or Covers
    - Does not include the frame the grate or cover sits on
Overview of IPE – Parts Tab

• Culvert
  ○ Pipes or Culvert Barrels
    ▪ Pipe shape, walls, dimensions
Overview of IPE – Parts Tab

- Culvert
  - Culvert End Treatments
    - Head walls, flared end sections, wing walls, and energy dissipaters
Overview of IPE – Parts Tab

• Assembly
  - Inlets or Access Structures
    - Combined Surface Structure, Underground Structure and a Grate or Cover
  - Culverts
    - Combined Pipe or Culvert (multiple) and Culvert End Treatment
Overview of IPE – Publish Tab

- Use Publish tab when ready to publish the catalog.
- Key Points on Publishing
  - Look for errors at top of dialog
  - For Autodesk InfraWorks®, we can publish to shared content folder or directly to a model
  - For AutoCAD® Civil 3D, we can publish catalog to a different directory, but need to remember to point AutoCAD® Civil 3D to that directory in order to find the catalog.
Modifying Existing Content Provided in Infrastructure Parts Editor
Modifying Existing Content

Launch IPE and Live Demonstrate
Create Custom Content
Create Custom Content

• Requires Autodesk Inventor® and a Basic Understanding of the Software
  o Cartesian Coordinate System
    • A three-dimensional space “in which the location of a point is given by coordinates that represent its distances from perpendicular lines that intersect at a point called the origin.” (Dictionary.com, 2017)
  o Work Planes
    • Templates default with 3 planes: YZ, XZ, and XY planes; all tied to the center point of the cartesian coordinate system
    • Other work planes can be added as necessary tied to the model or existing work planes
Create Custom Content

- Sketches
  - Used to define a 2D shape that will be used for extrusion
  - Must start from a model face or work plane

- Parametric Constraints
  - Added to sketches or extrusions to define how various components can be adjusted within the model and how they should interact with other components

- 3D Objects
  - Created by selecting the profile (2D drawing) from a sketch
  - Define length, rotation, and type of extrusion
Create Custom Content – Inventor® Template

- Default Inventor® template is wrong
- UCS should be oriented to view down the Z axis

- To set view correctly, rotate view cube to front, then set the current view as Top via the View Cube

- Save as a new Template for future use
Create Custom Content – Parameter Names

- IPE looks for specific Parameter names to create assemblies
- List of Preferred Parameter names

<table>
<thead>
<tr>
<th>Class Type</th>
<th>Parameter</th>
<th>Value Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface Structure</strong></td>
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<tr>
<td></td>
<td>FlangeTh</td>
<td>Base Flange Thickness</td>
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<tr>
<td></td>
<td>WallTh</td>
<td>Wall thickness of Inlet</td>
</tr>
<tr>
<td></td>
<td>CrossSlope</td>
<td>Roadway Cross Slope</td>
</tr>
<tr>
<td></td>
<td>GutterSlope</td>
<td>Roadway Gutter Slope</td>
</tr>
<tr>
<td></td>
<td>SSHeight</td>
<td>Height of Inlet</td>
</tr>
<tr>
<td></td>
<td>SSDiameter*</td>
<td>Diameter of Inlet</td>
</tr>
<tr>
<td></td>
<td>SSWidth**</td>
<td>Width of Inlet</td>
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<tr>
<td></td>
<td>SSLength**</td>
<td>Length of Inlet</td>
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<tr>
<td></td>
<td>SPDiameter*</td>
<td>Structure Port Diameter</td>
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<tr>
<td></td>
<td>SPWidth**</td>
<td>Structure Port Width</td>
</tr>
<tr>
<td></td>
<td>SPLength**</td>
<td>Structure Port Length</td>
</tr>
<tr>
<td></td>
<td>CGDiameter*</td>
<td>Diameter of Cover</td>
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<tr>
<td></td>
<td>CGWidth**</td>
<td>Width of Cover</td>
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<td>CGLength**</td>
<td>Length of Cover</td>
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<tr>
<td></td>
<td>CGHeight</td>
<td>Height of Cover</td>
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<tr>
<td><strong>Underground Structure</strong></td>
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<tr>
<td></td>
<td>WallTh</td>
<td>Wall Thickness of Catchment Structure</td>
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<tr>
<td></td>
<td>BaseTh</td>
<td>Base Thickness of Catchment Structure</td>
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<tr>
<td></td>
<td>USHeight</td>
<td>Height of Catchment Structure</td>
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<tr>
<td></td>
<td>USBaseHeight</td>
<td>Base Height (region where pipes connect)</td>
</tr>
<tr>
<td></td>
<td>USDiameter*</td>
<td>Total Diameter of Structure</td>
</tr>
<tr>
<td></td>
<td>USWidth**</td>
<td>Total Width of Structure</td>
</tr>
<tr>
<td></td>
<td>USLength**</td>
<td>Total Length of Structure</td>
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<tr>
<td></td>
<td>SPDiameter*</td>
<td>Structure Port Diameter</td>
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<td>SPWidth**</td>
<td>Structure Port Width</td>
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<td></td>
<td>SPLength**</td>
<td>Structure Port Length</td>
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<tr>
<td><strong>Cover or Grate</strong></td>
<td>CGDiameter*</td>
<td>Diameter of Cover</td>
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<td></td>
<td>CGWidth**</td>
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<td>CGLength**</td>
<td>Length of Cover</td>
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<tr>
<td></td>
<td>CGHeight</td>
<td>Height of Cover</td>
</tr>
</tbody>
</table>

*For round objects only
**For rectangular objects only

Bold parameters above are used to match up the assembly in Infrastructure Parts Editor
Create Custom Content – Infrastructure Part Shape Utilities plugin for Inventor®

- Must use the Infrastructure Part Shape Utilities plugin to finalize and export the parts for use in IPE
Create Custom Content – Model Oil Water Separator

- Live model in Autodesk Inventor® and Import into IPE
Questions
References


