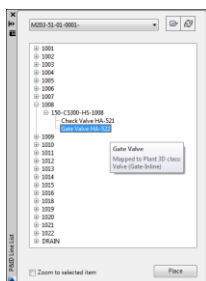# AutoCAD Plant 3D – P&ID Valve Object Mapping

AutoCAD Plant 3D 2014

AutoCAD Plant 3D provides a mechanism for placing inline fittings into a 3D model by picking them from a list derived from a corresponding P&ID. This white paper explains specifically how Plant 3D Valves are linked to their corresponding P&ID symbols.
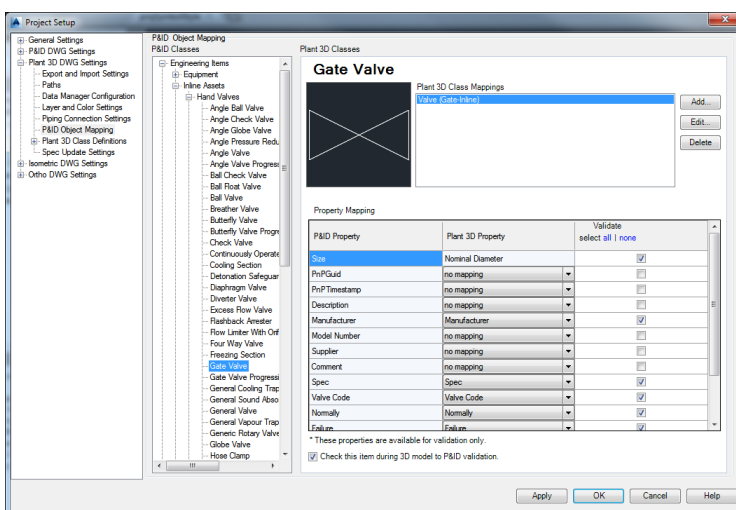
P&ID Line List Window

The P&ID Line List window lists the process lines that are defined in each P&ID and the fittings that have been placed into those lines.

By picking an item from the list and choosing the Place button, Plant 3D chooses a corresponding component of the given size from the defined Pipe Spec ready for insertion into the 3D model. The size and spec are determined from the size and spec of the process line – 150mm, CS300 in the above example.
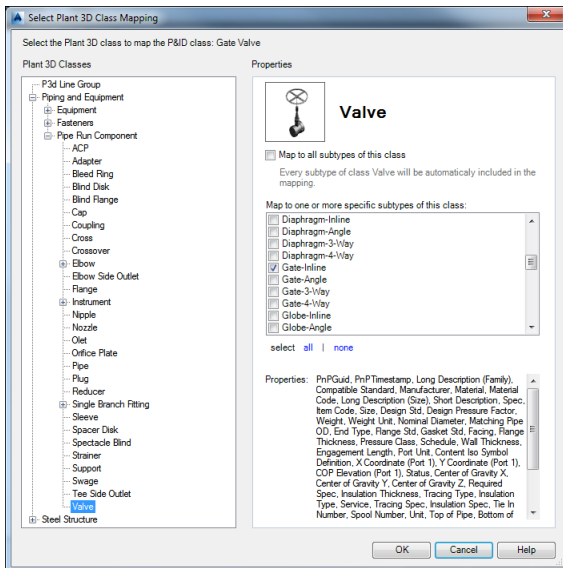
P&ID Object Mapping Window

The link between the class of fitting in the P&ID and that in the 3D Pipe Spec is made through the P&ID Object Mapping window in Project Setup. In this example, the P&ID Gate Valve is mapped to a 3D Valve of subtype (Gate-Inline).
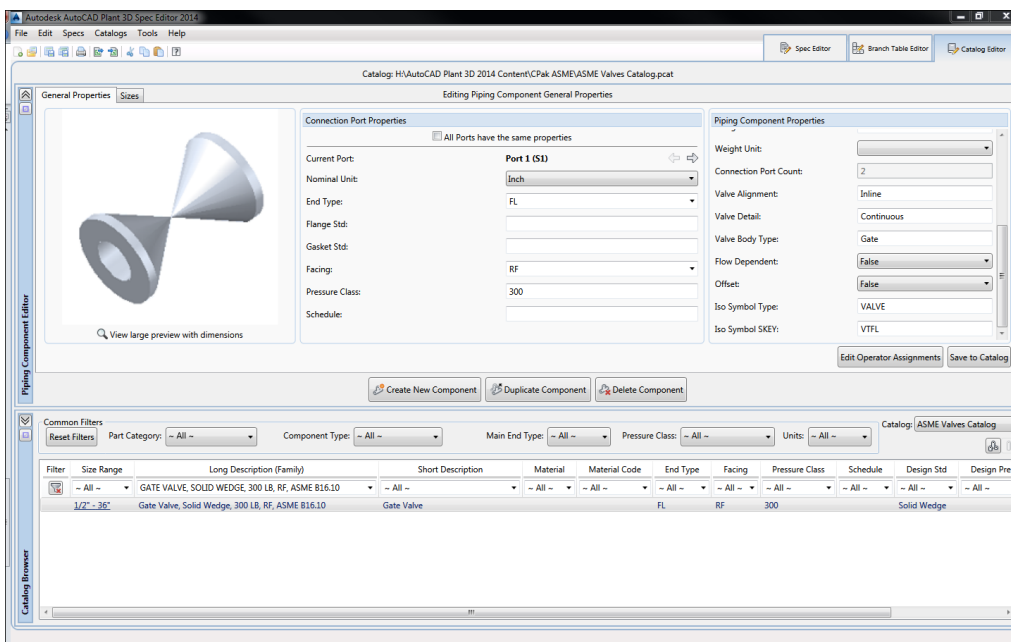
Plant 3D Class Mapping Window

Clicking the Edit… button on the P&ID Object Mapping window opens the Plant 3D Class Mapping window. This window allows one or more subtypes of Plant 3D Valve to be mapped to the P&ID Gate Valve.

Note that there is only one Valve class in the Plant 3D class list and that it is not possible to extend the list.

Different types of valve are identified by their subtype. The list of subtypes is compiled from the combination of two Plant 3D Valve property fields: ValveBodyType and ValveAlignment.

The values for these fields are entered through the Piping Component Properties panel of the Spec Editor.

The editor presents the fields as free text entry fields allowing new values to be entered. However, values that are entered here that are not currently displayed in the subtypes list of the Plant 3D Class Mapping window are not automatically added to the list. Additionally, the user interface does not provide a mechanism for adding to the list in the Plant 3D Class Mapping window or any other way to view the list of the predefined values.

P3dEnumeration.xml

The lists of predefined Valve Body Type and Valve Alignment values are stored in a configuration file named P3dEnumeration.xml located in the application folder C:\Program Files\Autodesk\AutoCAD 2014\PLNT3D\en-US. The default contents are shown below.

```xml
<?xml version="1.0" encoding="utf-8"?>
<P3dPropEnumColl xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <p3dPropEnumList>
        <!-- Valve Body and and combined Valve Actuator+Body Properties -->
        <P3dPropEnum name="ValveBodyType">
            <EnumValueList>
                <P3dEnumValue GlobalName="Ball" LocalName="Ball"/>
                <P3dEnumValue GlobalName="Butterfly" LocalName="Butterfly"/>
                <P3dEnumValue GlobalName="Check" LocalName="Check"/>
                <P3dEnumValue GlobalName="Corner" LocalName="Corner"/>
                <P3dEnumValue GlobalName="Diaphragm" LocalName="Diaphragm"/>
                <P3dEnumValue GlobalName="Gate" LocalName="Gate"/>
                <P3dEnumValue GlobalName="Globe" LocalName="Globe"/>
                <P3dEnumValue GlobalName="Needle" LocalName="Needle"/>
                <P3dEnumValue GlobalName="Plug" LocalName="Plug"/>
                <P3dEnumValue GlobalName="InclinedSeat" LocalName="Inclined Seat"/>
                <P3dEnumValue GlobalName="Tank" LocalName="Tank"/>
                <P3dEnumValue GlobalName="Float" LocalName="Float"/>
                <P3dEnumValue GlobalName="Cock" LocalName="Cock"/>
                <P3dEnumValue GlobalName="MultiPort" LocalName="Multi Port"/>
            </EnumValueList>
        </P3dPropEnum>
        <P3dPropEnum name="ValveAlignmentType">
            <EnumValueList>
                <P3dEnumValue GlobalName="Inline" LocalName="Inline"/>
                <P3dEnumValue GlobalName="Angle" LocalName="Angle"/>
                <P3dEnumValue GlobalName="3-Way" LocalName="3-Way"/>
                <P3dEnumValue GlobalName="4-Way" LocalName="4-Way"/>
            </EnumValueList>
        </P3dPropEnum>
        <P3dPropEnum name="ValveDetailType">
            <EnumValueList>
                <P3dEnumValue GlobalName="Check" LocalName="Check"/>
                <P3dEnumValue GlobalName="Continuous" LocalName="Continuous"/>
                <P3dEnumValue GlobalName="MixedProof" LocalName="Mixed Proof"/>
                <P3dEnumValue GlobalName="Throttle" LocalName="Throttle"/>
                <P3dEnumValue GlobalName="PressureRelief" LocalName="Pressure Relief"/>
                <P3dEnumValue GlobalName="PressureReducing" LocalName="Pressure Reducing"/>
                <P3dEnumValue GlobalName="Safety" LocalName="Safety"/>
                <P3dEnumValue GlobalName="Block" LocalName="Block"/>
                <P3dEnumValue GlobalName="Shuttle" LocalName="Shuttle"/>
                <P3dEnumValue GlobalName="Diverter" LocalName="Diverter"/>
                <P3dEnumValue GlobalName="Breather" LocalName="Breather"/>
            </EnumValueList>
        </P3dPropEnum>
        <!-- Actuator and combined Valve Actuator+Body Properties -->
        <P3dPropEnum name="ActuatorType">
            <EnumValueList>
                <P3dEnumValue GlobalName="Diaphragm" LocalName="Diaphragm"/>
                <P3dEnumValue GlobalName="ElectricMotor" LocalName="Electric Motor"/>
                <P3dEnumValue GlobalName="Gear" LocalName="Gear"/>
                <P3dEnumValue GlobalName="HandWheel" LocalName="Hand Wheel"/>
                <P3dEnumValue GlobalName="HandLever" LocalName="Hand Lever"/>
                <P3dEnumValue GlobalName="Spring" LocalName="Spring"/>
                <P3dEnumValue GlobalName="Hydraulic" LocalName="Hydraulic"/>
                <P3dEnumValue GlobalName="Pneumatic" LocalName="Pneumatic"/>
                <P3dEnumValue GlobalName="Solenoid" LocalName="Solenoid"/>
            </EnumValueList>
        </P3dPropEnum>
        <P3dPropEnum name="OperatorType">
            <EnumValueList>
                <P3dEnumValue GlobalName="Manual" LocalName="Manual"/>
                <P3dEnumValue GlobalName="Automatic" LocalName="Automatic"/>
            </EnumValueList>
        </P3dPropEnum>
    </p3dPropEnumList>
</P3dPropEnumColl>
```

This configuration file provides a translation between a value that is entered into the Spec Editor (the GlobalName) and the corresponding value that is displayed in the subtypes list in the Plant 3D Class Mapping window (LocalName).

New subtypes of valve may be added to the list by inserting new lines into the "ValveBodyType" and "ValveAlignmentType" sections of the file as required. For example to add a new Piston valve to the list of ValveBodyTypes and to add a ChangeOver value to the list of alignments, the following lines could be inserted:

```
…
<P3dPropEnum name="ValveBodyType">
    <EnumValueList>
        <P3dEnumValue GlobalName="Ball" LocalName="Ball"/>
        <P3dEnumValue GlobalName="Butterfly" LocalName="Butterfly"/>
        <P3dEnumValue GlobalName="Check" LocalName="Check"/>
        <P3dEnumValue GlobalName="Corner" LocalName="Corner"/>
        <P3dEnumValue GlobalName="Diaphragm" LocalName="Diaphragm"/>
        <P3dEnumValue GlobalName="Gate" LocalName="Gate"/>
        <P3dEnumValue GlobalName="Globe" LocalName="Globe"/>
        <P3dEnumValue GlobalName="Needle" LocalName="Needle"/>
        <P3dEnumValue GlobalName="Plug" LocalName="Plug"/>
        <P3dEnumValue GlobalName="InclinedSeat" LocalName="Inclined Seat"/>
        <P3dEnumValue GlobalName="Tank" LocalName="Tank"/>
        <P3dEnumValue GlobalName="Float" LocalName="Float"/>
        <P3dEnumValue GlobalName="Cock" LocalName="Cock"/>
        <P3dEnumValue GlobalName="MultiPort" LocalName="Multi Port"/>
        <P3dEnumValue GlobalName="Piston" LocalName="Piston"/>
    </EnumValueList>
</P3dPropEnum>
<P3dPropEnum name="ValveAlignmentType">
    <EnumValueList>
        <P3dEnumValue GlobalName="Inline" LocalName="Inline"/>
        <P3dEnumValue GlobalName="Angle" LocalName="Angle"/>
        <P3dEnumValue GlobalName="3-Way" LocalName="3-Way"/>
        <P3dEnumValue GlobalName="4-Way" LocalName="4-Way"/>
        <P3dEnumValue GlobalName="ChangeOver" LocalName="Change-Over"/>
    </EnumValueList>
</P3dPropEnum>
…
```

The existing list of GlobalName values should not be modified, but the LocalName values may be modified if required.

The configuration file is read when the AutoCAD Plant 3D application is launched so changes will not be seen until the application is closed and restarted. The Piston and Change-Over values added above can be seen in the subtypes list of the Plant 3D Class Mapping window shown in the example, below.