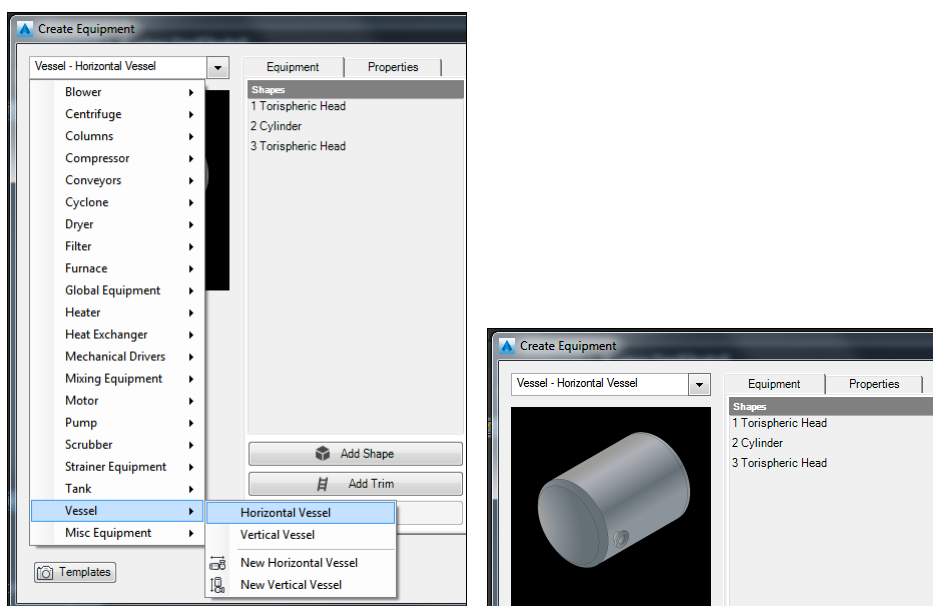# Equipment Models in AutoCAD Plant 3D - Part 2

AutoCAD Plant 3D 2016

In AutoCAD Plant 3D, you can create plant equipment, such as tanks, pumps, boilers, and filters, by combining one or more primitive geometric shapes. Some types of equipment have pre-defined models already provided.

For example, simple Horizontal and Vertical vessels are provided.

The dropdown on the Create Equipment window displays the current equipment type and a list of the types of equipment you can select when creating a piece of equipment. A flyout menu allows you to create a new piece of equipment or build from an existing pre-defined model.

Although the list of equipment types is fixed, you can create your own pre-defined models to include on the flyout menu.

In the following discussion, we will add a new Treatment Vessel to the list of pre-defined equipment.

Pre-defined Equipment Models

The list of pre-defined equipment models is recreated each time that the AutoCAD Plant 3D application is launched. The list is created from a collection of definition files (*.peqx) located in the *CPAK Common\equipment* subfolder of the Plant 3D Shared Content Folder.

Each *.peqx* file is a *zip archive* that contains 3 folders and an XML file at its core.

content
preview
_rels
[Content_Types].xml
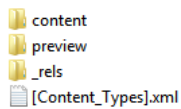
Within the **content** folder is a file called ***EquipmentType.xml*** that contains the definition of an equipment model.

Within the **preview** folder is a list of the ***images files*** that are displayed in the Create Equipment window.

Within the **_rels** folder is a file called ***.rels*** that tells Plant 3D how to use the above files.

[Content_Types].xml is a system file that defines windows file extensions and how to open them.

Add a new Equipment Model

To add a new equipment model to the list we need to add a new .peqx file into the equipment folder. A simple way to do this is to copy and rename an existing file of the same type of equipment that we want to add.

For example, we will copy the pre-defined file HorizontalVessel.peqx to create the file TreatmentVessel.peqx

After we have created the new file we must edit its contents to provide a unique name and identification for our new model.
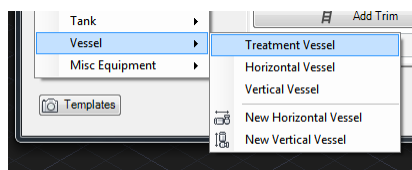
We need to modify the file ***EquipmentType.xml*** in the **content** folder of the .peqx file.

```xml
<?xml version="1.0" encoding="utf-8"?>
<EquipmentType
     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
     xmlns:xsd="http://www.w3.org/2001/XMLSchema"
     Name="VESSEL-H"
     Type="F"
     SubType="H"
     PartSubType="GeneralVessel"
     GUID="{625EBFA5-90EB-4BD2-9271-728C3C578317}"
  PartType="Vessel">
 <DisplayName>@50008</DisplayName>
 <Nozzles>
   <NozzleInfo Name="Nozzle 1" PortIndex="1">
     <DisplayName>Nozzle 1</DisplayName>
     <NozzleTypes />
     <Parameters>
       <ParameterInfo Name="LOC" DefaultValue="1" Type="List" />
       <ParameterInfo Name="R" DefaultValue="0" Type="d0" />
       <ParameterInfo Name="A" DefaultValue="0" Type="a" />
       <ParameterInfo Name="L" DefaultValue="3" Type="d" />
     </Parameters>
```

Looking at the <EquipmentType> section of the file we need to create a unique Name and GUID and also edit the <DisplayName> to reflect the value we want to see in the equipment list dropdown.

```xml
<?xml version="1.0" encoding="utf-8"?>
<EquipmentType
     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
     xmlns:xsd="http://www.w3.org/2001/XMLSchema"
     Name="TREATMENT-VESSEL"
     Type="F"
     SubType="H"
     PartSubType="GeneralVessel"
     GUID="{109dab7a-c943-cb43-054a-4d5d704aad63}"
  PartType="Vessel">
 <DisplayName>Treatment Vessel</DisplayName>
 <Nozzles>
```

After making the changes and re-launching Plant, we can see the Treatment Vessel in the list.

Tank	▶	🖩 Add Trim
Vessel	▶	**Treatment Vessel**
Misc Equipment	▶	Horizontal Vessel
		Vertical Vessel
📷 Templates		New Horizontal Vessel
		New Vertical Vessel

However, at this point we have simply created an exact copy of the pre-defined Horizontal Vessel and given it a new name.

When we first select this new definition, it will assume the default values saved for the Horizontal Vessel. If we make changes before we create the equipment model, those modified values will be cached on our workstation and will be re-used when we create another Treatment Vessel. However, the cached values will be local to our AutoCAD environment; they will not be available on other workstations or for other users.

We need to update the definition of the new Treatment Vessel in the shared content folder to provide the default values required for other users and workstations.

Define the Equipment Model

The remainder of the .xml file following the <DisplayName> defines the default geometry, nozzles and property values of the equipment item.

```xml
<Nozzles>
  <NozzleInfo Name="Nozzle 1" PortIndex="1">
    <DisplayName>Nozzle 1</DisplayName>
    <NozzleTypes />
    <Parameters>
      <ParameterInfo Name="LOC" DefaultValue="1" Type="List" />
      <ParameterInfo Name="R" DefaultValue="0" Type="d0" />
      <ParameterInfo Name="A" DefaultValue="0" Type="a" />
      <ParameterInfo Name="L" DefaultValue="3" Type="d" />
    </Parameters>
    <PortProperties>
      <PropertyInfo Name=".SizeRecordId" DefaultValue="4b77a031-115e-53ce-affc-6aa39b8177f1" />
    </PortProperties>
  </NozzleInfo>
  <NozzleInfo Name="Nozzle 2" PortIndex="2">
    <DisplayName>Nozzle 2</DisplayName>
    <NozzleTypes />
    <Parameters>
      <ParameterInfo Name="LOC" DefaultValue="2" Type="List" />
      <ParameterInfo Name="H" DefaultValue="45" Type="d-" />
      <ParameterInfo Name="A" DefaultValue="0" Type="a" />
      <ParameterInfo Name="L" DefaultValue="3" Type="d" />
    </Parameters>
    <PortProperties>
      <PropertyInfo Name=".SizeRecordId" DefaultValue="4b77a031-115e-53ce-affc-6aa39b8177f1" />
    </PortProperties>
  </NozzleInfo>
</Nozzles>
<PartProperties>
  <PropertyInfo Name="PartSizeLongDesc" DefaultValue="Vessel" />
</PartProperties>
<Categories>
  <CategoryInfo Name="EQTORISPHERICHEAD">
    <Parameters>
      <ParameterInfo Name="D" DefaultValue="45" />
    </Parameters>
  </CategoryInfo>
  <CategoryInfo Name="EQCYLINDER">
    <Parameters>
      <ParameterInfo Name="D" DefaultValue="45" />
      <ParameterInfo Name="H" DefaultValue="50" />
    </Parameters>
  </CategoryInfo>
  <CategoryInfo Name="EQTORISPHERICHEAD">
    <Parameters>
      <ParameterInfo Name="D" DefaultValue="45" />
    </Parameters>
  </CategoryInfo>
</Categories>
```

Within this section we can recognise the various parameters and values that are used to define the equipment and we could edit them manually if necessary. However, we do not need to do this.

Re-Use an Equipment Template

If we have already saved an equipment template file (*.peqs) of a pre-defined parametric model or a model defined entirely by primitive geometric shapes then we can copy the contents of the *.peqs* file into a new *.peqx* file as both files use the same definition format.

The *.peqs* file is a *zip* archive that contains just one file which has the same name as the archive but with no extension.

For example, let us assume that we have previously created a model of our treatment vessel from primitive shapes and saved it to an equipment template file called *Treatment Vessel.peqs*. We can open this archive and edit the file *Treatment Vessel* contained within it and copy the settings to replace the corresponding contents of the *EquipmentTemplate.xml* file within a new *TreatmentVessel.peqx* file.

If we compare the header sections from the .peqs and .peqx files we can see that they are very similar:

```
<EquipmentType
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    Name="_TEMPLATE-H"
    Elevation="0"
    LengthUnit="mm"
    PartType="Vessel"
    SubType="H"
    Type="F"
    GUID="109dab7a-c943-cb43-054a-4d5d704aad63">
<Nozzles>
```

Treatment Vessel . peqs file

```
<EquipmentType
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    Name="VESSEL-H"
    Type="F"
    SubType="H"
    PartSubType="GeneralVessel"
    GUID="{625EBFA5-90EB-4BD2-9271-728C3C578317}"
  PartType="Vessel">
<DisplayName>@50008</DisplayName>
<Nozzles>
```

EquipmentTemplate.xml file before modification

As we did previously, we need to create a unique Name and GUID and edit the <DisplayName> in our .xml file. We can also see that Elevation and LengthUnit parameters are present in the .peqs file and missing from the .xml file; we must add these.

After modification, the <EquipmentType> section of our .xml file looks like this:

```
<EquipmentType
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    Name="TreatmentVessel"
    Elevation="0"
    LengthUnit="mm"
    Type="F"
    SubType="H"
    PartSubType="GeneralVessel"
    GUID="{109dab7a-c943-cb43-054a-4d5d704aad63}"
  PartType="Vessel">
<DisplayName>Treatment Vessel</DisplayName>
<Nozzles>
```

To complete the definition, we simply copy the remainder of the definition from the .peqs file and replace the corresponding sections in the .xml file.

All that remains to be done now is to create the preview image of our new Treatment Vessel. We will save a preview of our model to a file called TreatmentVessel.png and copy this into the *preview* folder of our .peqx file.

If we look in the *.rels* file within the *_rels* folder we will find an entry that defines the name of the preview image file for our equipment model:

<Relationship Type="Plant/Equipment/Preview" Target="/preview/horizontal-vessel-tank.png" Id="Vessel" />

We will update this to reflect our new image file.

<Relationship Type="Plant/Equipment/Preview" Target="/preview/TreatmentVessel.png" Id="Vessel" />

Our new equipment definition is now complete.