Process, Power and Marine Division

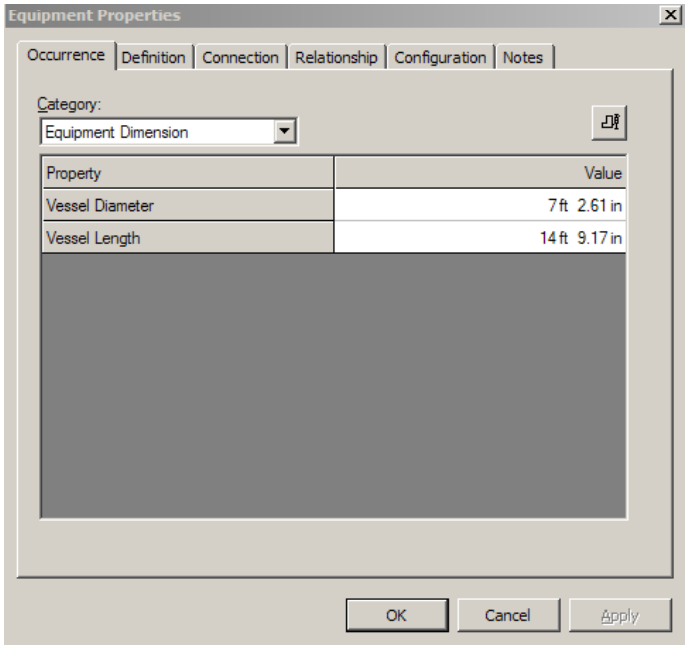
SP3D Equipment Task

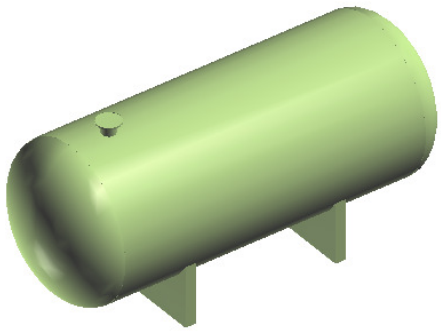


INTERGRAPH

What is SmartPlant Equipment

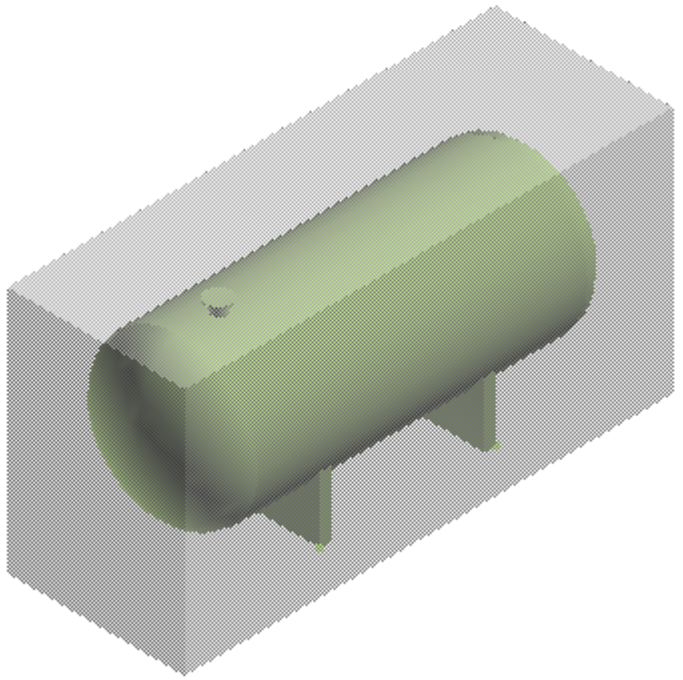
- SmartPlant Equipment is an integrated equipment modeling environment that provides:
- Parametric Equipment placement
- Modeling of equipment using primitive shapes or equipment components
- Importing of equipment from external sources





What is SmartPlant Equipment

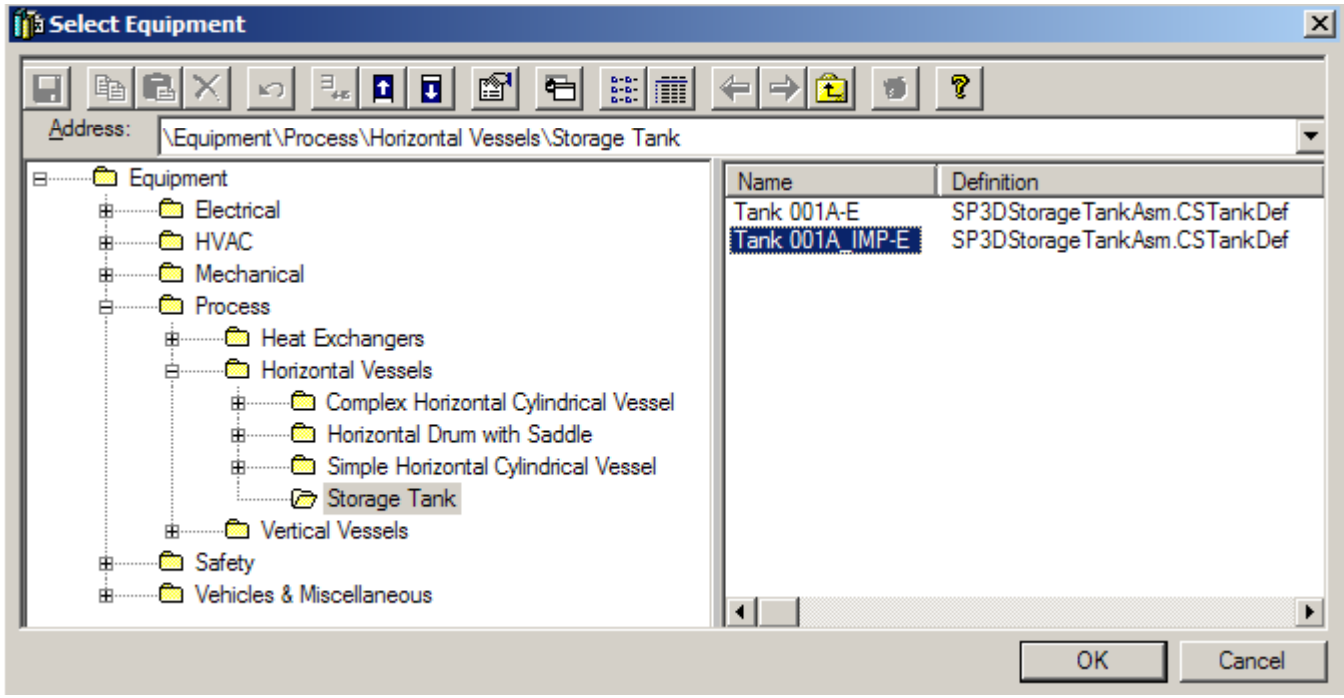
- Aspects: Physical, Insulation, Maintenance, and Operation
- Ports (connection points) available:
  - Piping port
  - Ducting port
  - Cabletray port
  - Conduit port
  - Cable port
  - Foundation Port



Equipment Task

Place Equipment Command

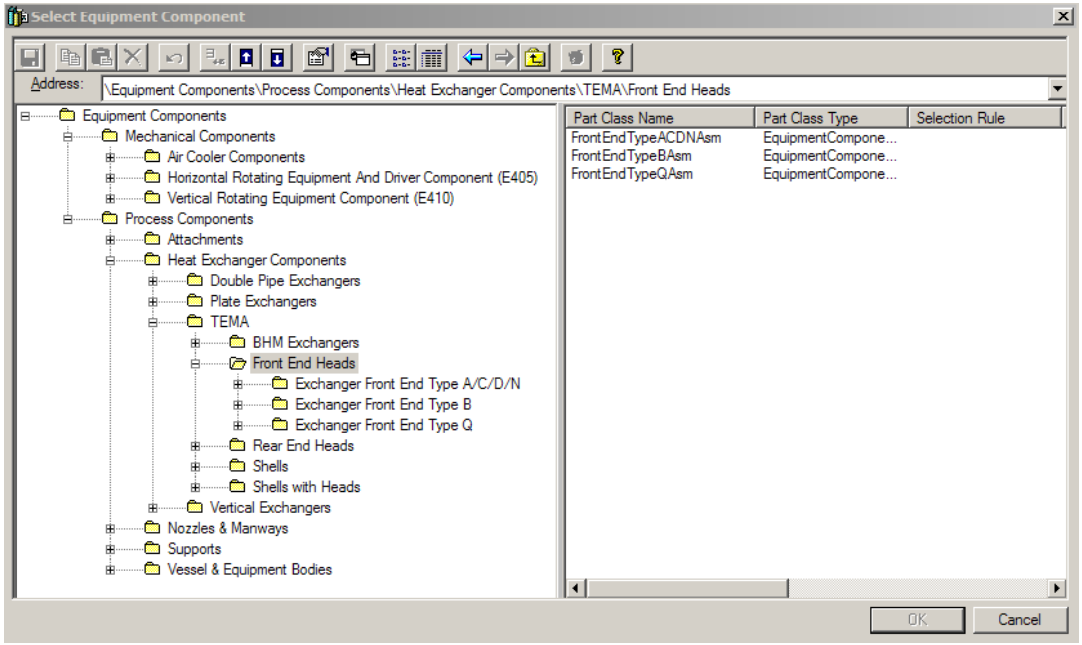
- The place equipment command activates the Select Equipment dialog box (Catalog Browser) that **provides access to equipment parametrics that have been defined in the Reference Data aka the Catalog Database**



Equipment Task

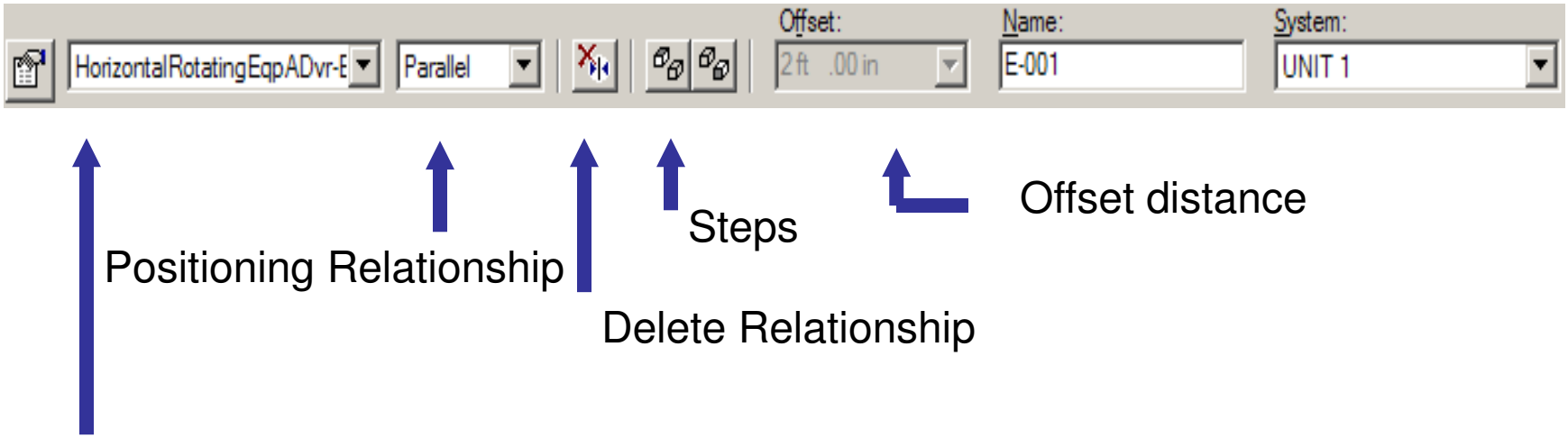
Place Equipment Component Command

- The place equipment component command activates the Select Equipment Component dialog box (Catalog Browser) that provides access to the equipment component hierarchy
- To use this command, the user is prompted to select a parent eqp item previously created (using the command in the previous slide)



Equipment Task

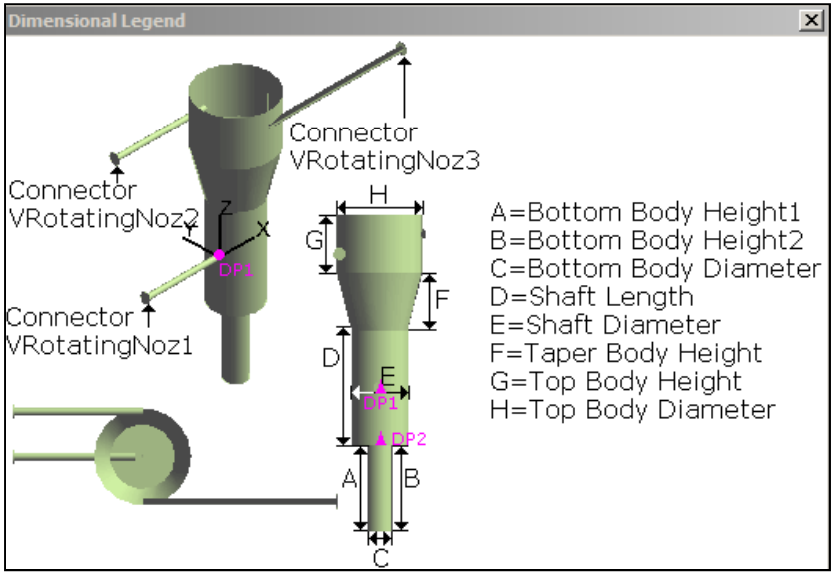
Place Equipment SmartStep Ribbon Bar

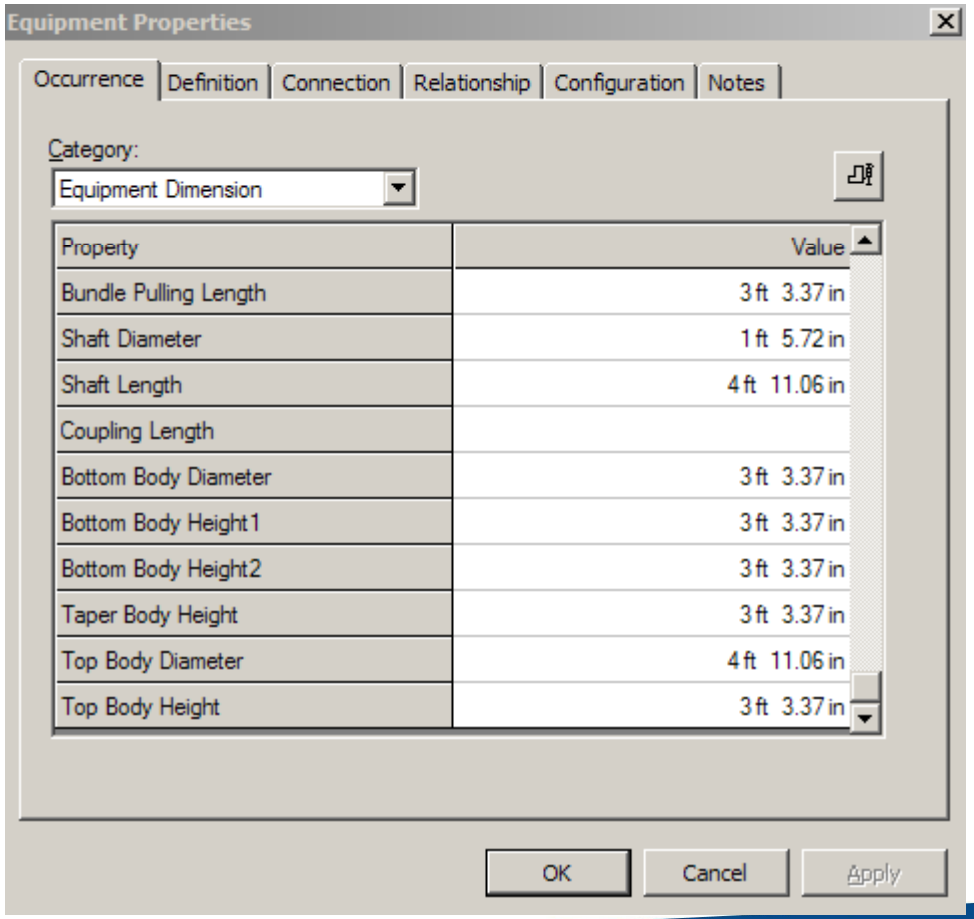


- Set the Positioning Relationship
- Shows the last relationship added in the relationship combo box

Equipment Task

Equipment Properties Page

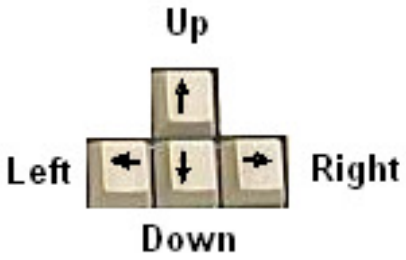


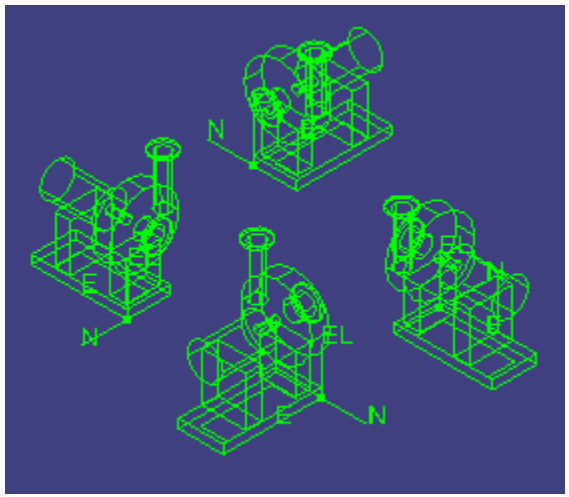


Equipment Task

Place Equipment Command

- The arrow keys on the keyboard are to be used to rotate, and set the axis of rotation for any equipment object that supports a local coordinate system. These keys should work on initial placement of an object, as well as subsequent editing of objects
- Up Arrow - change active axis in the recurring sequence of X, Y, Z

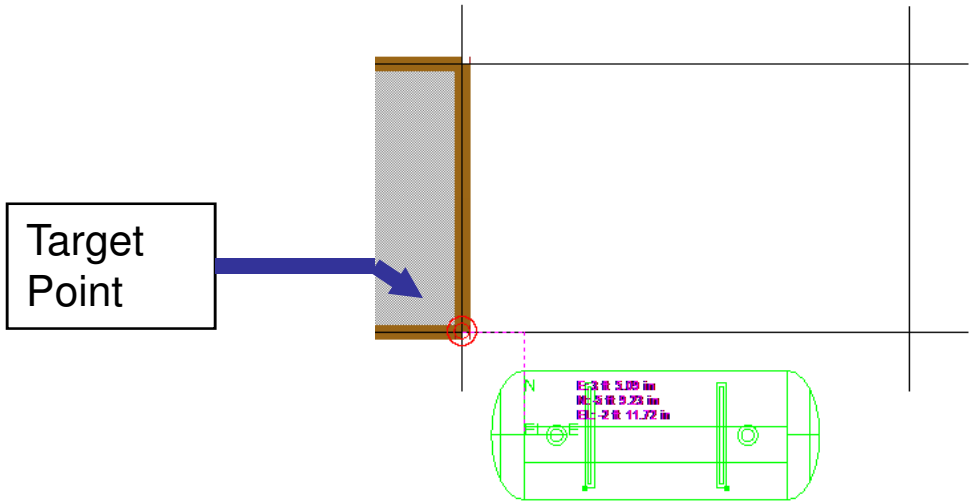




Equipment Task

PinPoint Tool

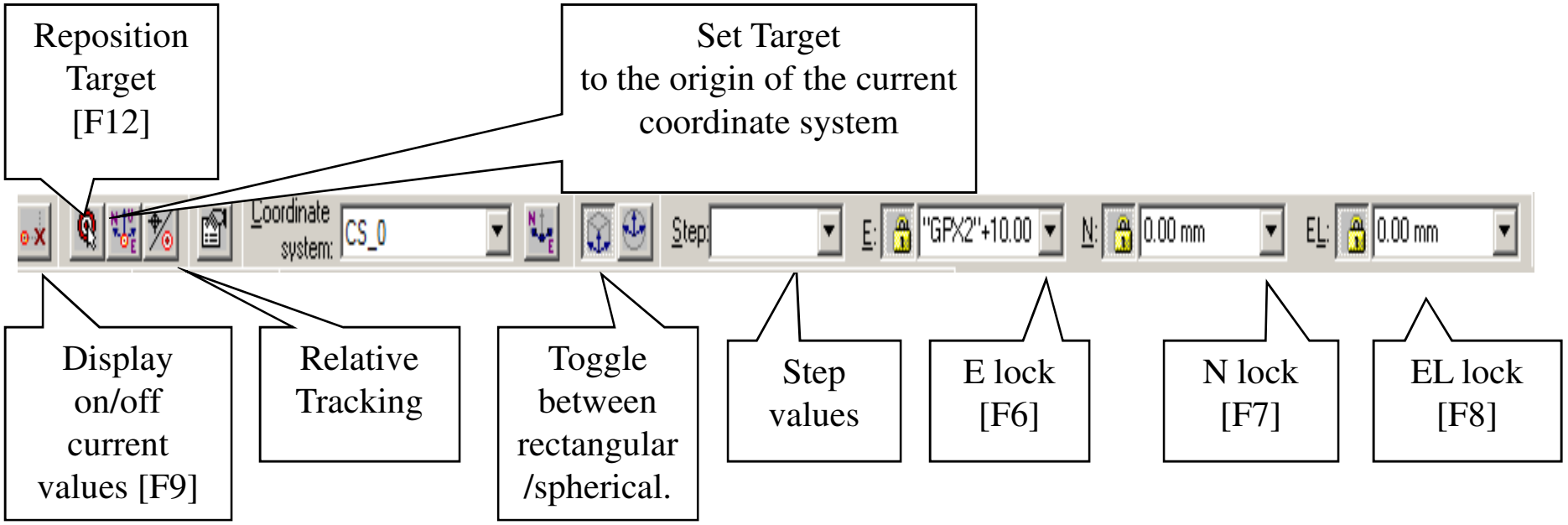
- Provides coordinate inputs to the active command
- x,y,z coordinates are relative to Target Point (see example below)
- Dynamically displays the coordinate/distance values
- Locks the coordinate/distance values



Equipment Task

PinPoint Tool

- Use the [F#] keys to lock the coordinates from the cursor's location
- Supports of mathematical operations and reference plane names. E.g. in Northing box user may enter " + 2ft" at the end of the coordinate readout, this would be automatically calculated and the resulting value becomes the new active Northing coordinate.

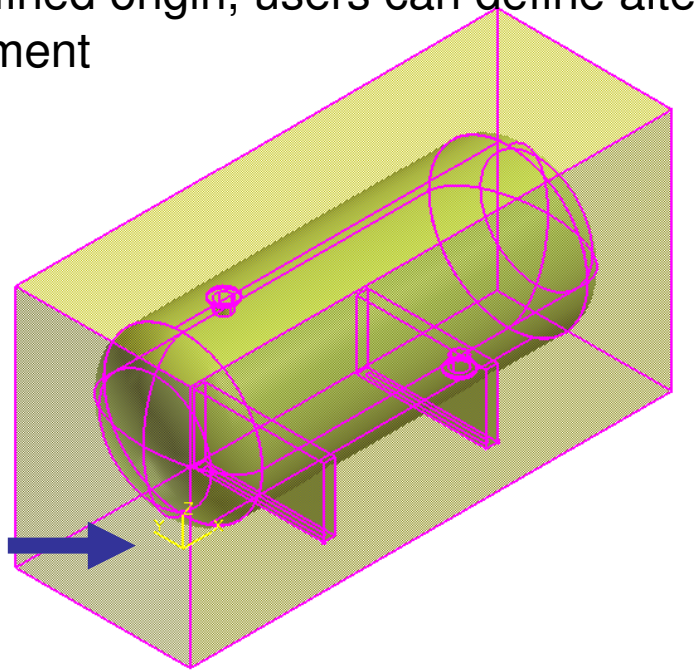


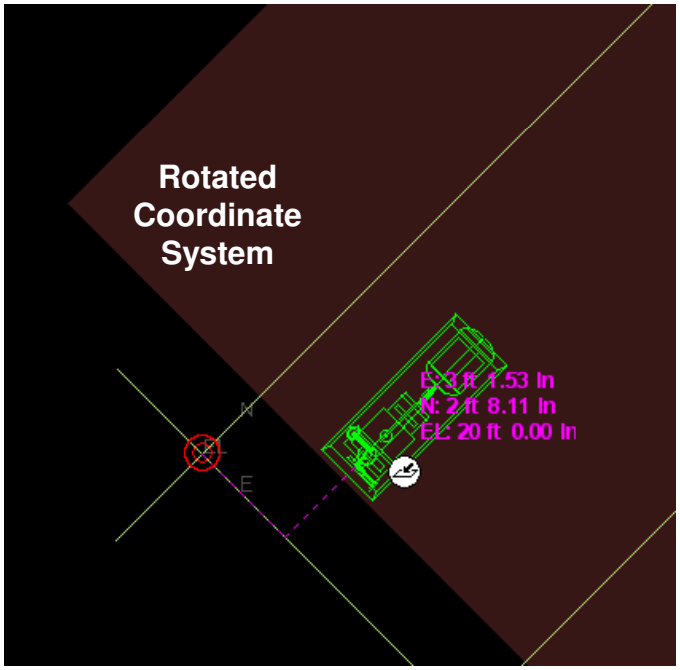
Equipment Task

Place Equipment Command

- Uses active coordinate system during placement
- Equipment is placed using Symbol Origin by default. All items have a predefined origin, users can define alternate points of origin after initial placement

origin

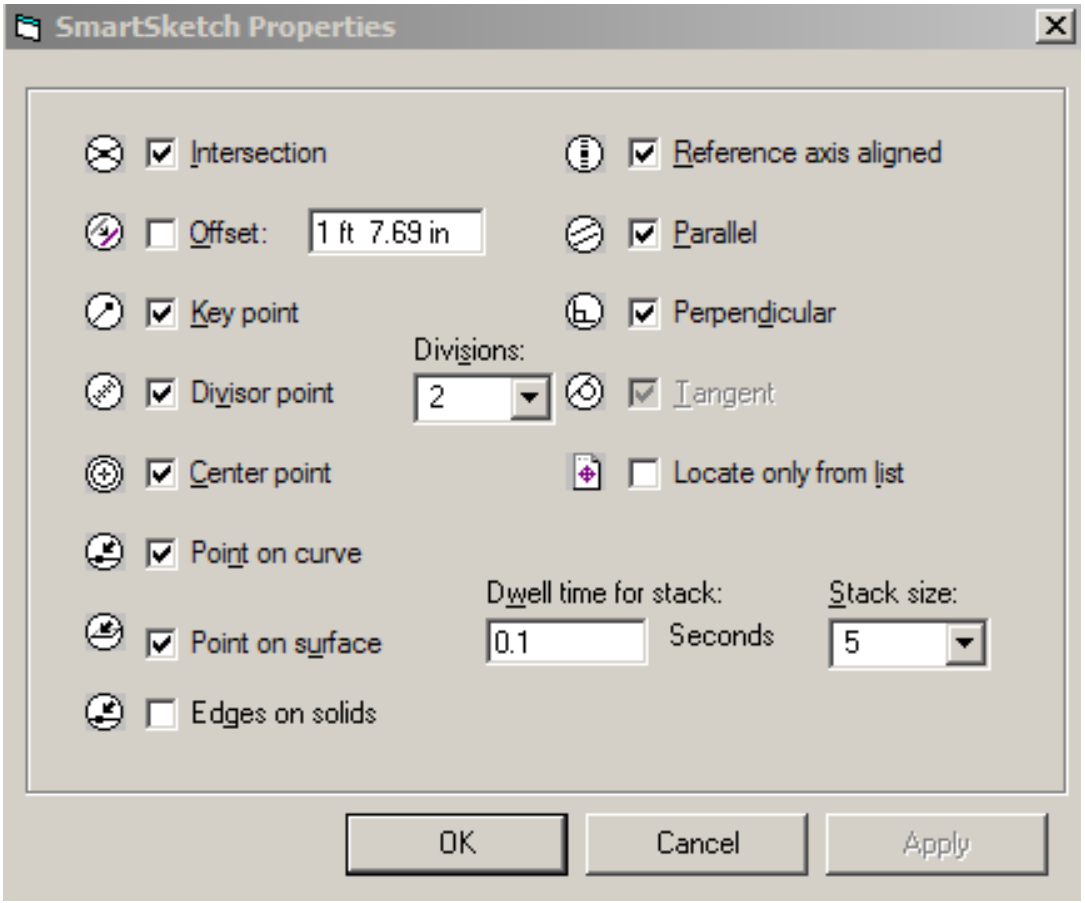




Equipment Task

SmartSketch Options: Common locks used during graphics placement/modification

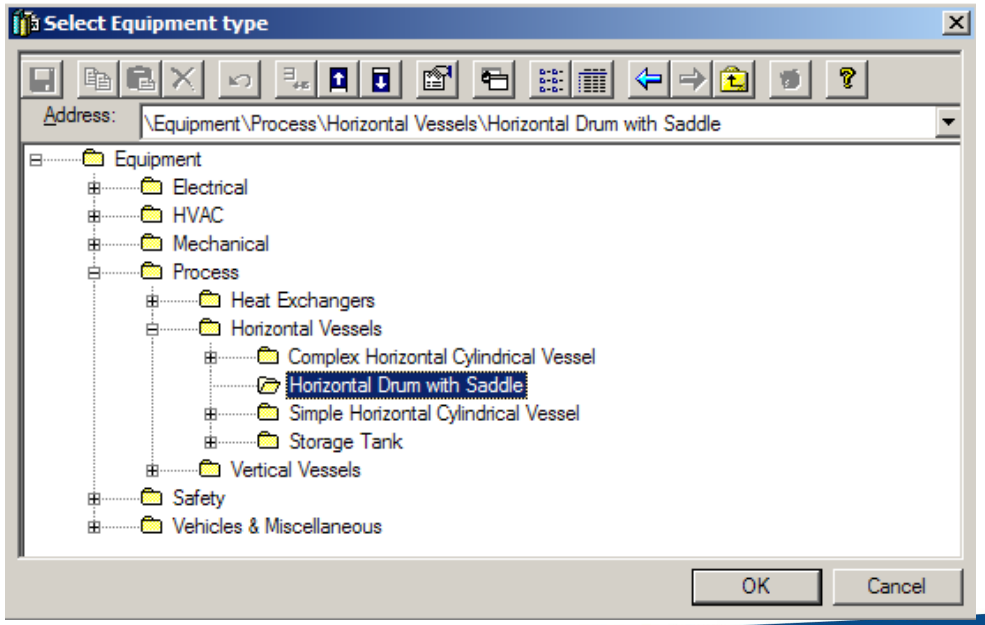
- Point on curve
  - 3D lines
  - 3D Arcs
- Point on surface
  - 3D Planes
  - 3D Projections
  - 3D Revolutions
  - 3D Cones
  - Ruled Surfaces & B-Splines



Equipment Task

Place Designed Equipment Command

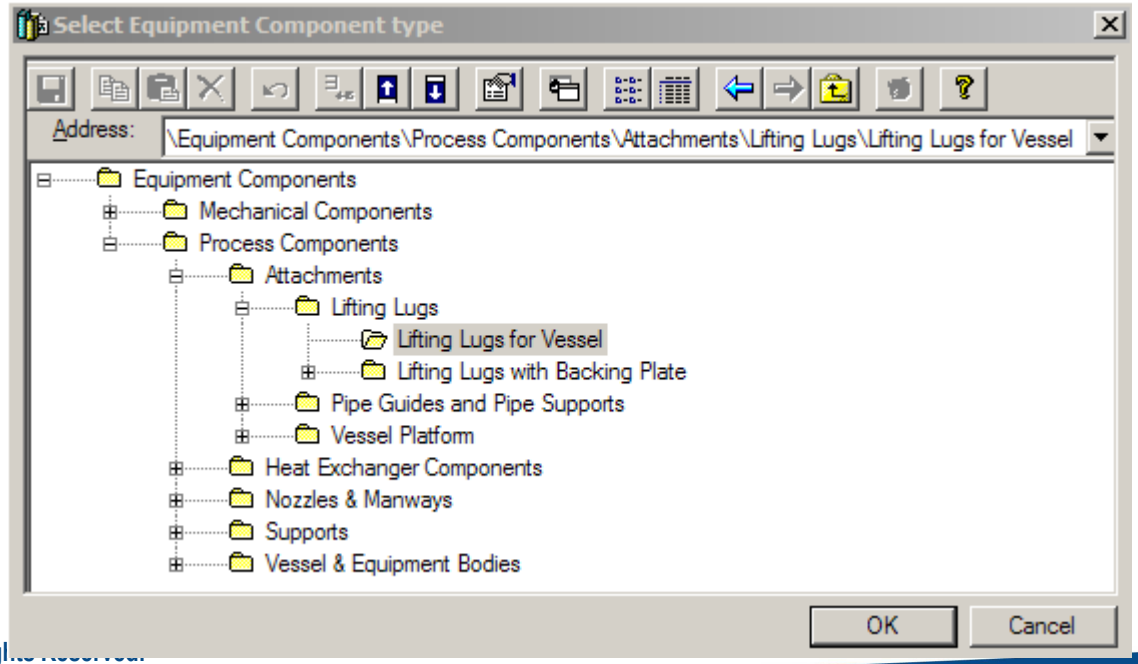
- The place designed equipment command activates the Select Equipment Type dialog box (Catalog Browser) that provides access to the designed equipment hierarchy
- This command only defines the nature of an equipment item yet to be placed. The only graphic it produces is the placement location point. The rest of the graphics are placed as a secondary step using primitive shapes or imported shapes.



Equipment Task

Place Designed Equipment Component Command

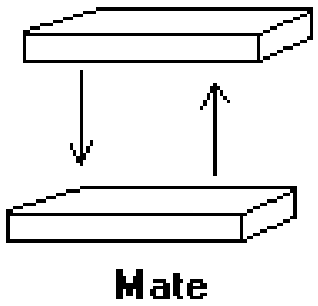
- The place designed equipment component command activates the Select Equipment Component Type dialog box (Catalog Browser) that provides access to the designed equipment component hierarchy
- This only describes the component to be placed, actual graphics are placed later and associated with this definition

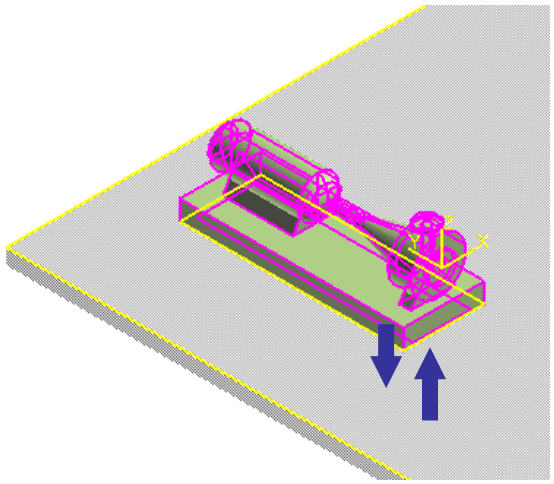


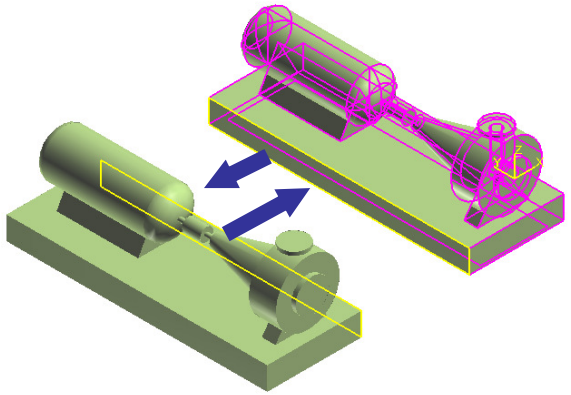
Equipment Task

Positioning Relationships

- Mate Relationship
  - Between planar surface and planar surface
  - Surface Normal vectors point to each other



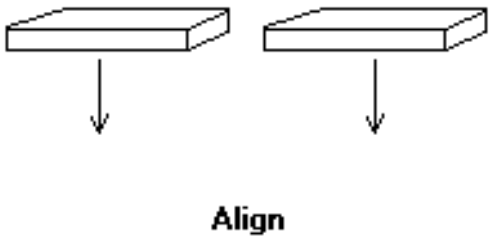


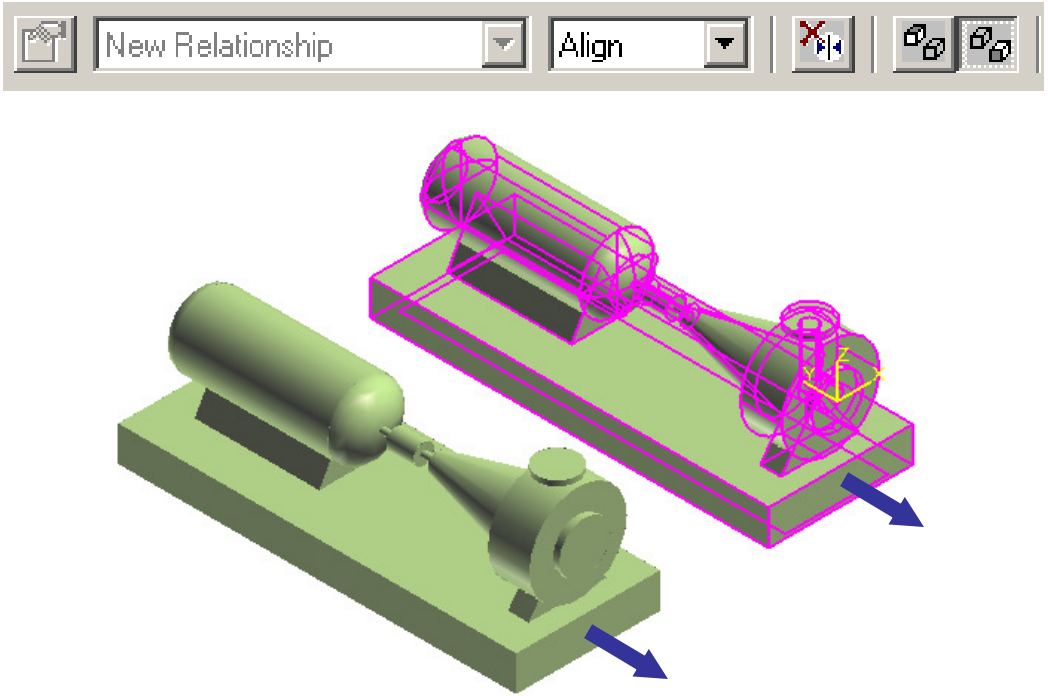


Equipment Task

Positioning Relationships

- Align Relationship
  - Between planar surface and planar surface
  - Surface normal vectors point in the same direction

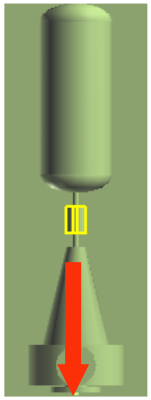


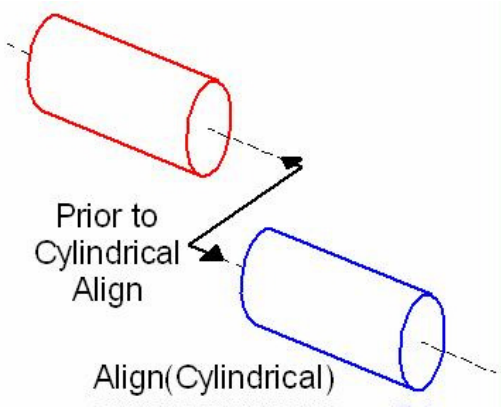


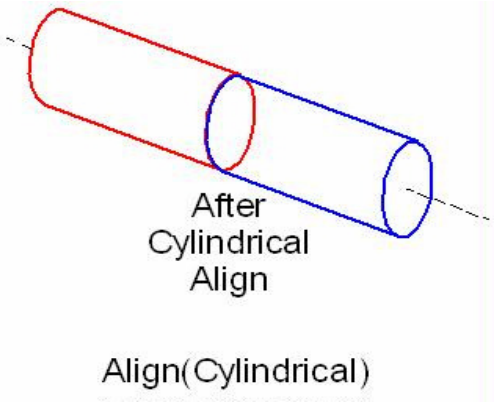
Equipment Task

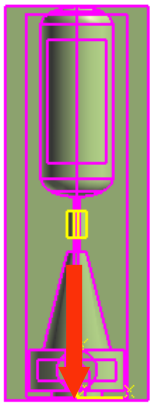
Positioning Relationships

- Mate/Align Relationship
  - When you select cylindrical objects, the system uses the axes to create the relationship
  - Make the two axes collinear







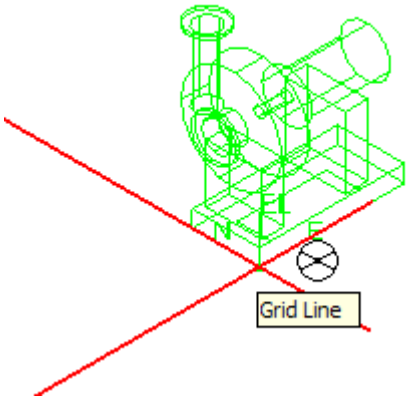


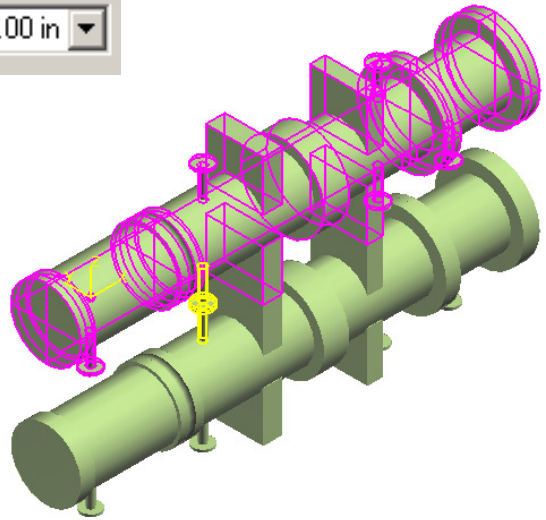
Equipment Task

Positioning Relationships

- Connect Relationship
  - Forces a port on an equipment to be coincident with a port on another equipment

  - Implicit move command

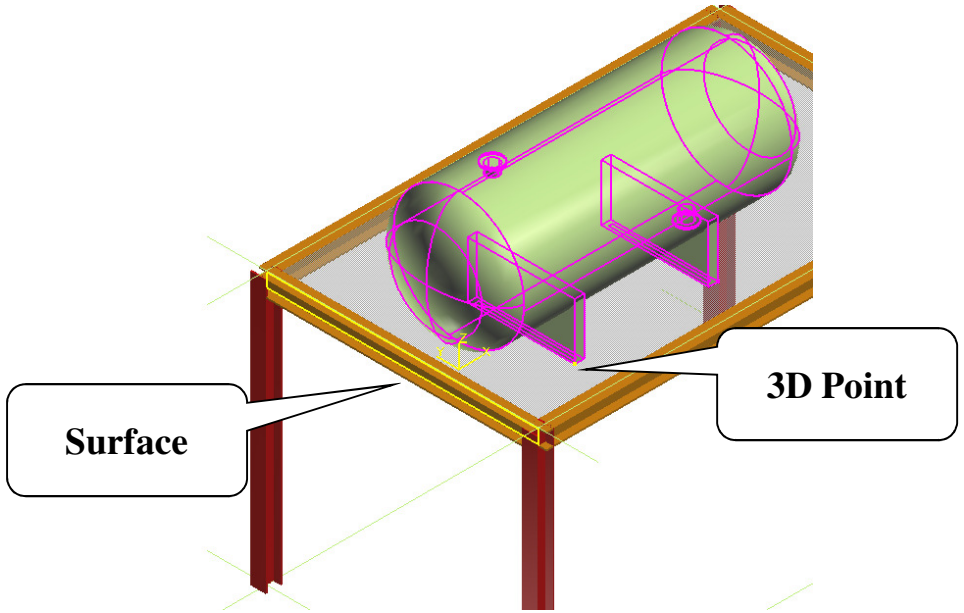




Equipment Task

Positioning Relationships

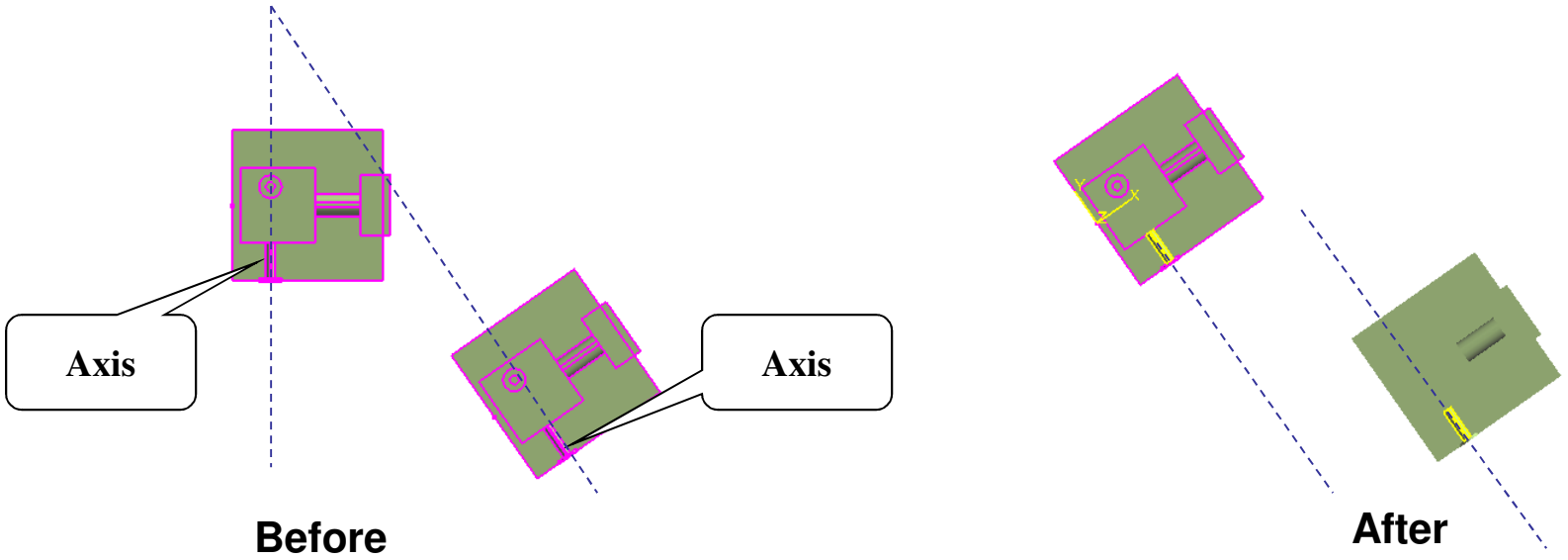
- Minimum Distance Relationships (E-W, N-S, Vertical)
  - Between 3D points and planar surface (example: 3D plane entities, slabs, etc)



Equipment Task

Positioning Relationships

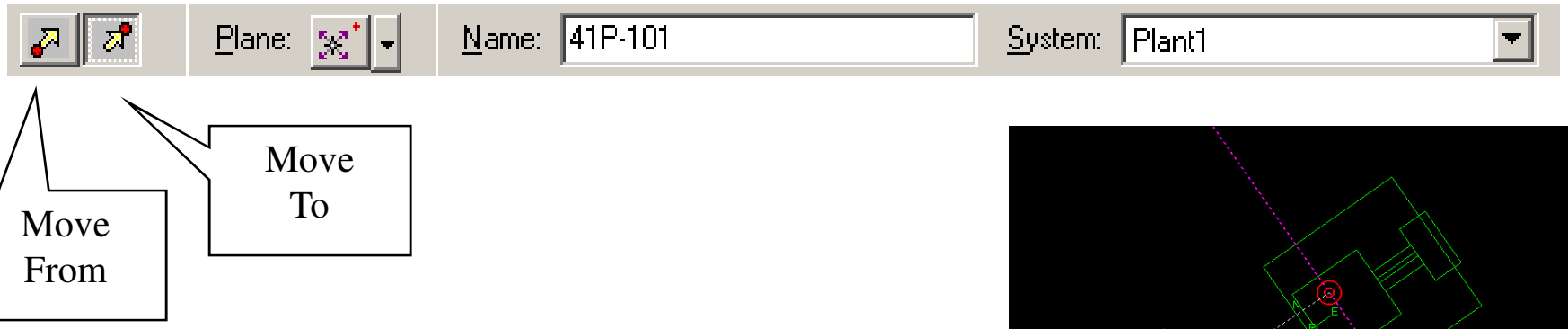
- Parallel Relationship
  - Only rotate the selected equipment to create the constraint



Equipment Task

Common Move command

- Linear SmartSketch points are enabled in the move command. This functionality allows easy movement along major axis/ or parallel to other objects

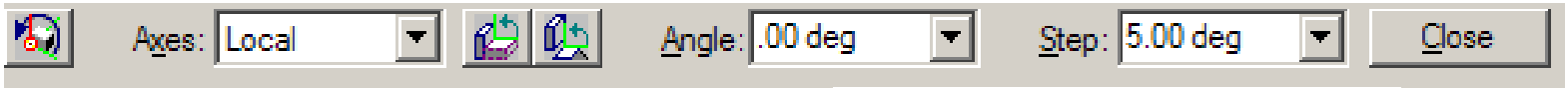


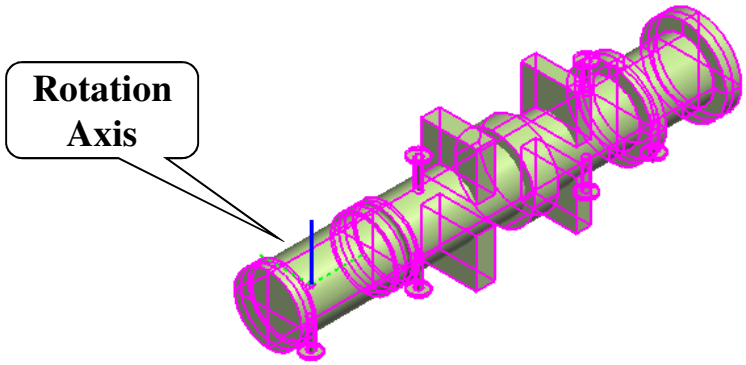
- The origin of the item is used by default as the *Move From* point
- Select Move From button first if the defaulted point of reference needs changing

Equipment Task

Rotate Equipment: 2 rotate commands

- Rotate Equipment Command: Rotation axis taken from eqp parts





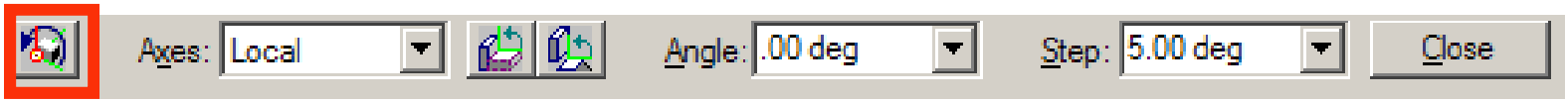
- Common Rotate Command: Rotation axis taken from coordinate system

Equipment Task

Rotate Equipment

- Change the Rotation Point

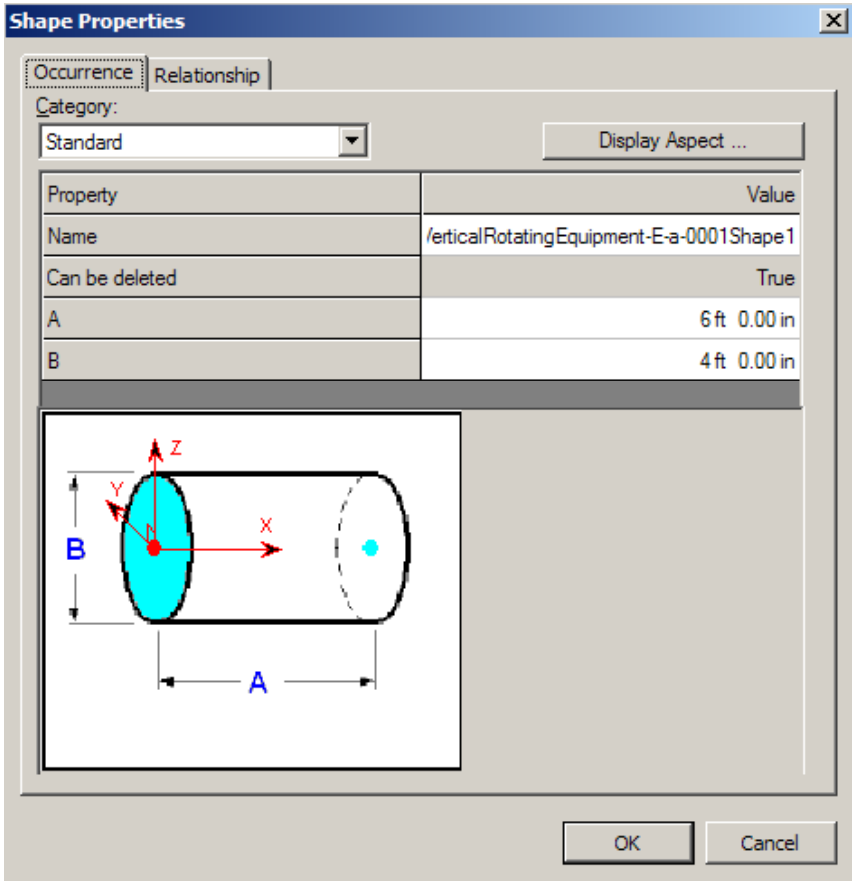
  The rotation point **by default is the first foundation port of the equipment** by default. If no foundation port exists, the origin of the equipment (local coordinate system origin) becomes the default point of rotation.
  Use this option to select an alternate rotation point from other existing graphics



Equipment Task

Shapes

- One-click placement
- Arrow keys for rotate during placement
- Must be associated to a parent graphic or a Designed Equipment



Equipment Task

Place Shape SmartStep Ribbon Bar

- Relationships/Constraints

  Add constraints to further positioning the shape

- Positioning relationships (constraints):

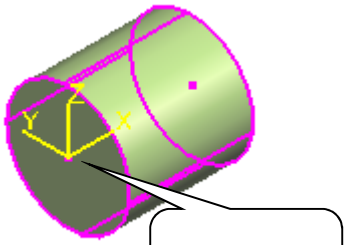
  - Mate
  - Align
  - Connect

Equipment Task

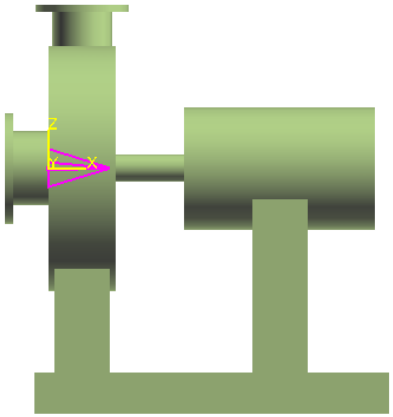
Shapes

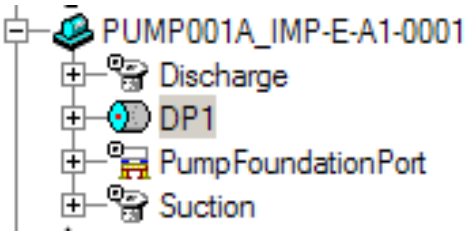
- Place Shape using Symbol Origin by default
- Shape (Datum Shape)
- Catalog Equipments and Equipments Components come with datum shapes

Datum Shape



Origin



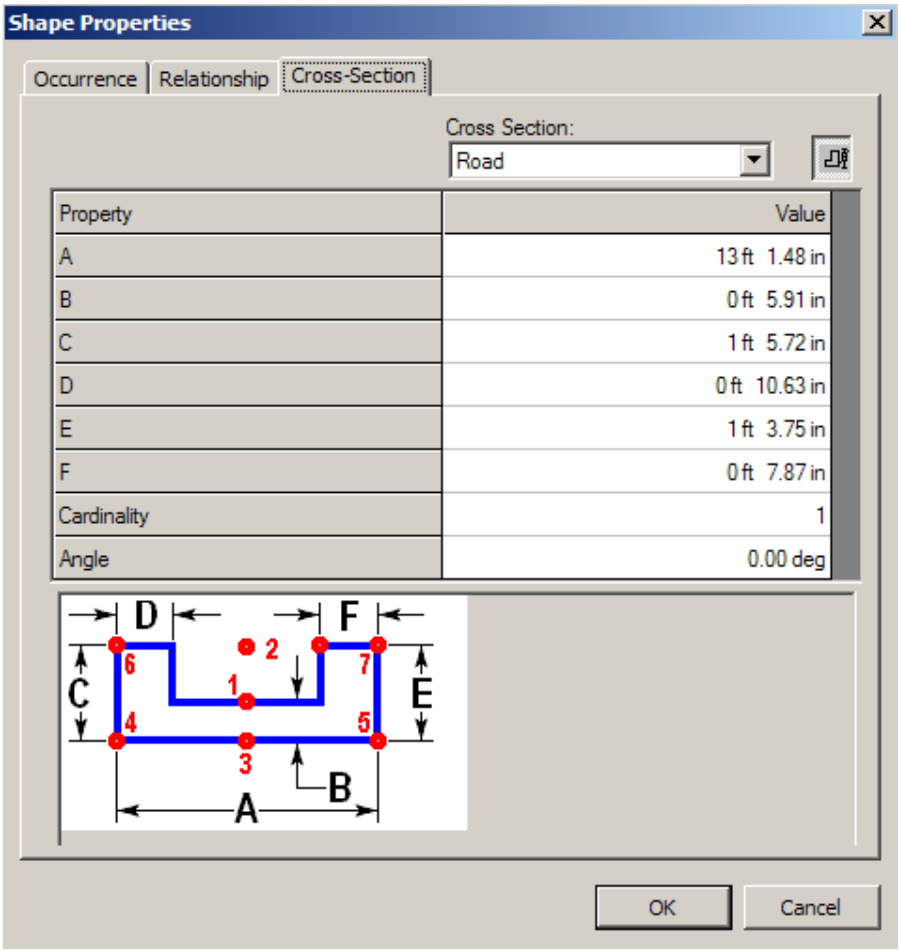


Equipment Task

Shapes

- Availability of Prismatic (projected) Shapes

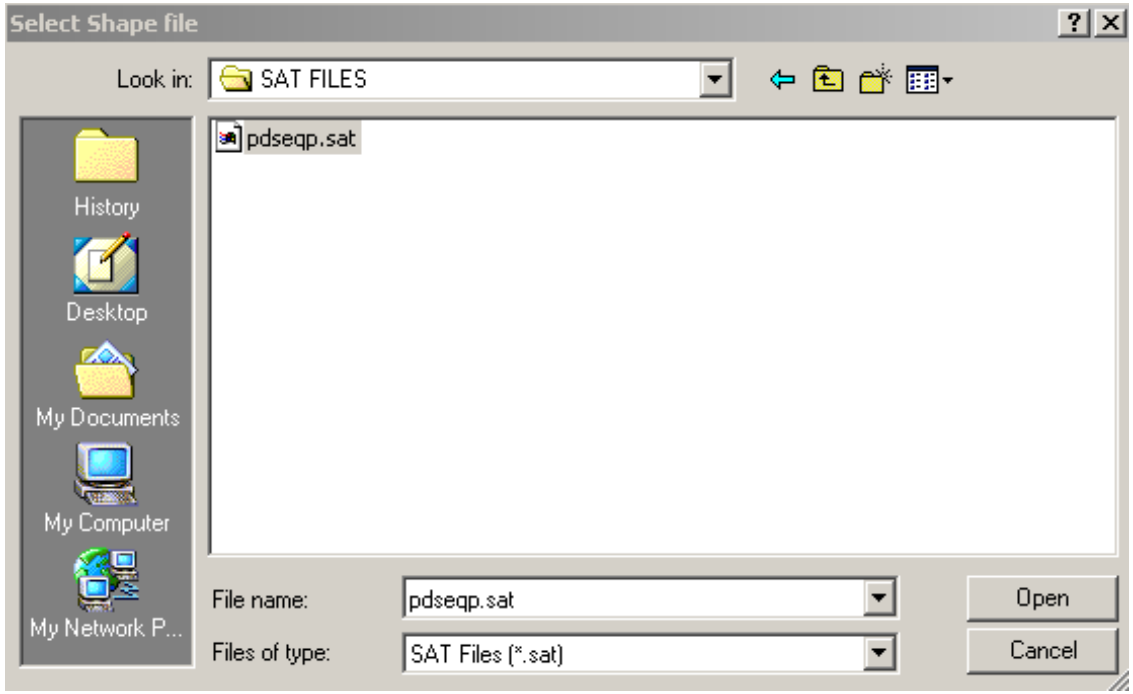
Prismatic Shape



Equipment Task

Place Imported Shape from File Command

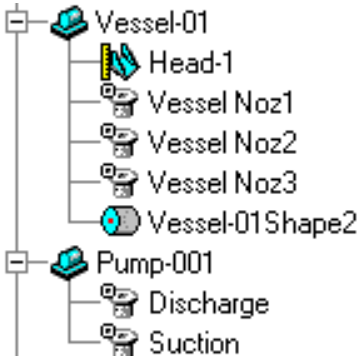
- This command imports the graphics from a **SAT** format file or **DGN** file as the geometry for a shape
- The geometry will be converted to G-type format in the model
- The shape's origin is defined by the coordinate system of the imported file



Equipment Task

Place Nozzle Command

- All nozzles become objects with their own identity. They are not nested outputs of the symbol. This allows users to turn off nozzles but leave the equipment display ON, for example
- Support occurrence properties for nozzles in catalog equipment
- Positioning relative to Equipment, Equipment Component and Shapes
- Ports are displayed in Workspace Explorer

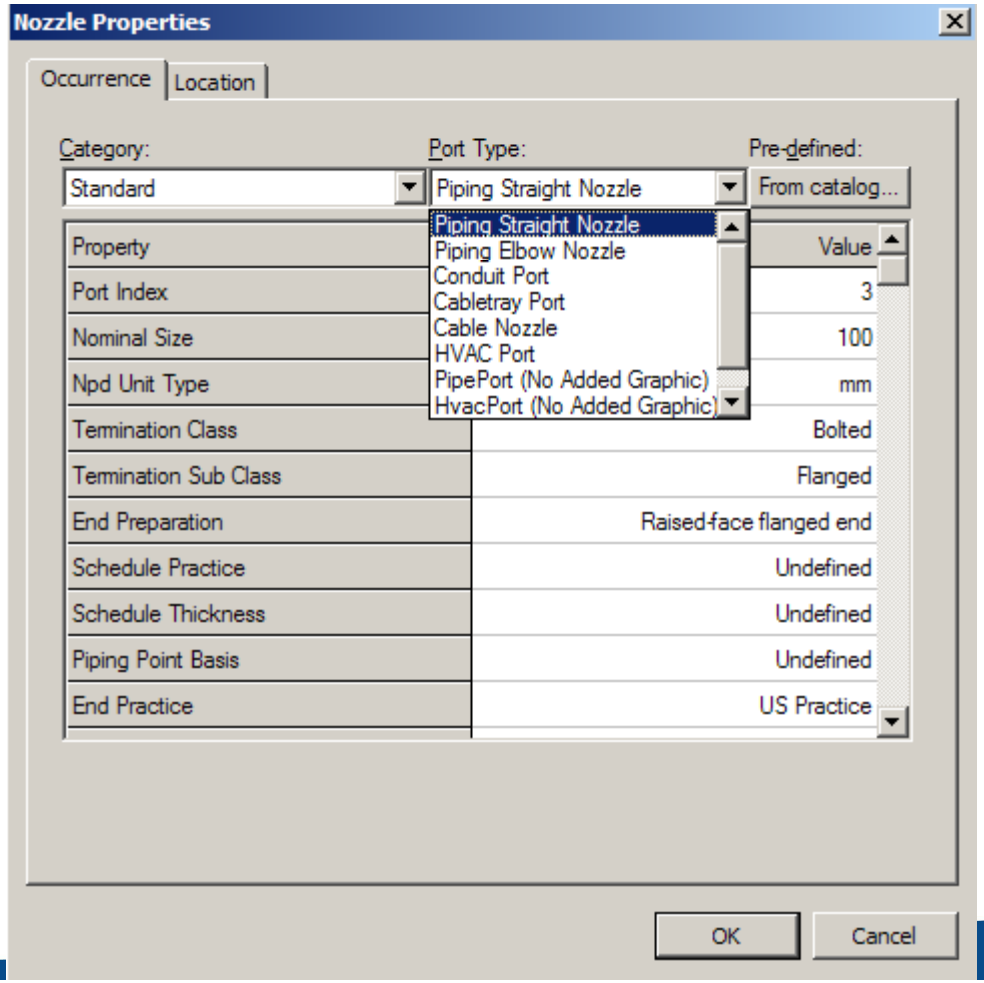


Equipment Task

Place Nozzle Command: Despite the name, it's not only used for piping nozzles. This command will place connection points for all disciplines

Port Connection Types:

- Piping Straight Nozzle
- Piping Elbow Nozzle
- Conduit port
- Cabletray port
- Cable port
- Hvac port
- Foundation port
- Pipe Port (No Graphic)
- Hvac Port (No Graphic)

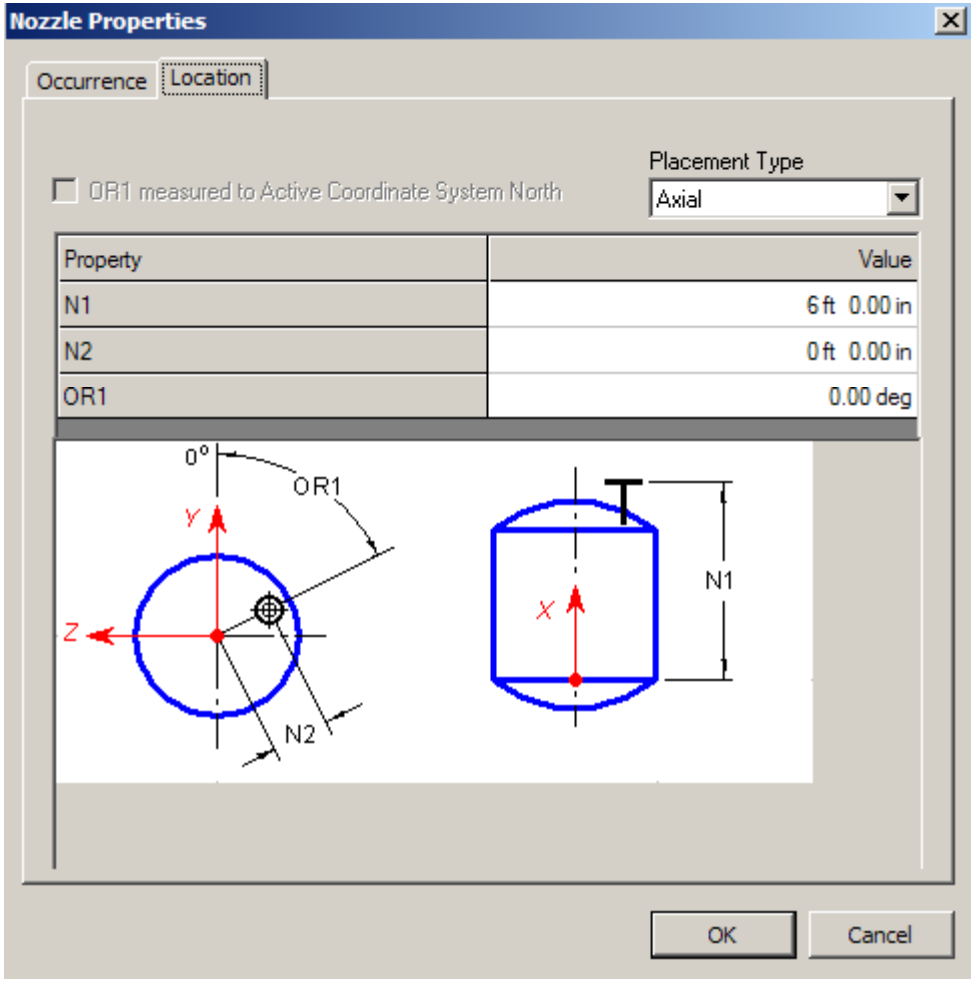


Equipment Task

Place Nozzle Command

Placement Type:

- Radial
- Axial
- Tangential
- Skew
- Offset Skew
- Position by Plane and Axis
- Position by Point



Equipment Task

Replace Equipment Command

- Exchanges a selected equipment or equipment component in the model for a different item from the catalog
- System keeps the position and orientation properties the same, everything else is based on the new item's definition

Equipment Task

Summary - Modeling

- Catalog Equipments and Designed Equipments have the same structure and are treated the same by SP3D
- Catalog Equipments can have interactively added shapes, nozzles, Equipment components etc… just like Designed Equipments
- Designed Equipments have a symbol reduced to a single control point. Their parts are defined in the model as a secondary step using other placement commands
- Designed Equipments require a placement point at creation time
- Nozzles are filterable (but show/hide and style rules are not applicable)

Equipment Task

Summary - Modeling

- Equipment Components follow the same logic as Equipments
- Equipment Components cannot be placed standalone, they must have an Equipment as parent
- Equipment Components are Assemblies
- Equipment Components cannot have children Equipment Components
- Equipments cannot have children Equipments
- Constraint system works on homogeneous object types:
  - Equipment to Equipment
  - Shape to Shape (for siblings of an Equipment or Equipment component)
  - Equipment Component to Equipment Component (for siblings of an Equipment)