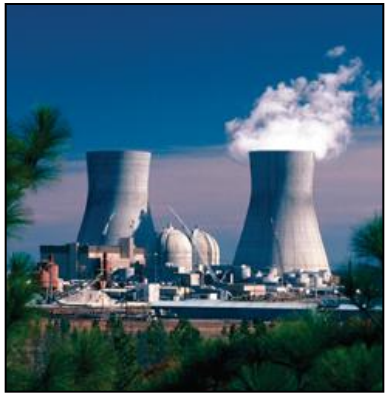
Process, Power and Marine Division

Piping Task


INTERGRAPH

Agenda

- Piping Hierarchy
- Route Pipes
- Inserting Components
- Routing a Sloped Pipe
- Routing Pipes from the P&ID
- Placing Instruments
- Placing Piping Specialty Items
- Placing Taps
- Inserting Splits

Agenda Conti’

- Manipulating Views
- Creating Spools
- Sequencing Objects
- Creating Isometric Drawings

Piping Hierarchy

- ~~Piping System~~ [System and Spec Task
  - Pipeline System
    - Pipe Run
      - Features
        - Parts/Components
        - Ports
        - Connections

Piping Hierarchy: Pipe System

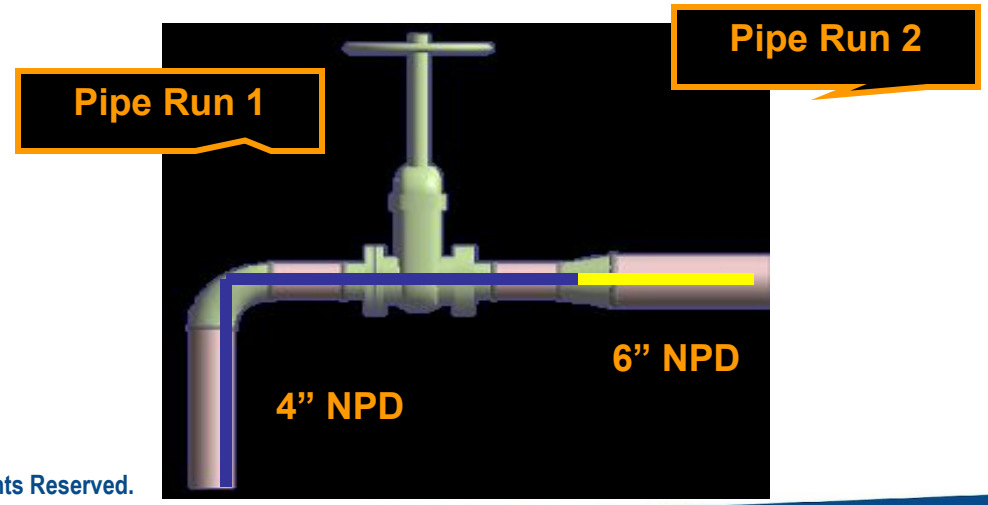
- A piping system is a way of organizing pipelines within the system hierarchy. You can base the piping system on the area where the pipelines are located or the fluid that the pipelines carry.

Piping Hierarchy: Pipeline

- A pipeline system is a way of organizing pipe runs within the system hierarchy and controlling the specifications that can be used within that system. If a pipeline system exists in a model, you can route the pipe runs and arrange them as children in the system hierarchy.

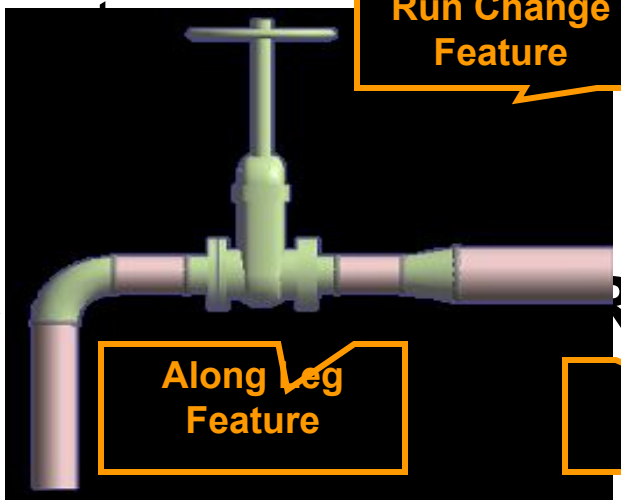
Piping Hierarchy: Pipe Run

- A pipe run is a connected series of the pipe features that normally have the same nominal piping diameter (NPD) and flow direction. All the pipe runs in a model are governed by the same piping specifications. All the pipe features belong to a pipe run. One or more pipe runs together form a pipeline.



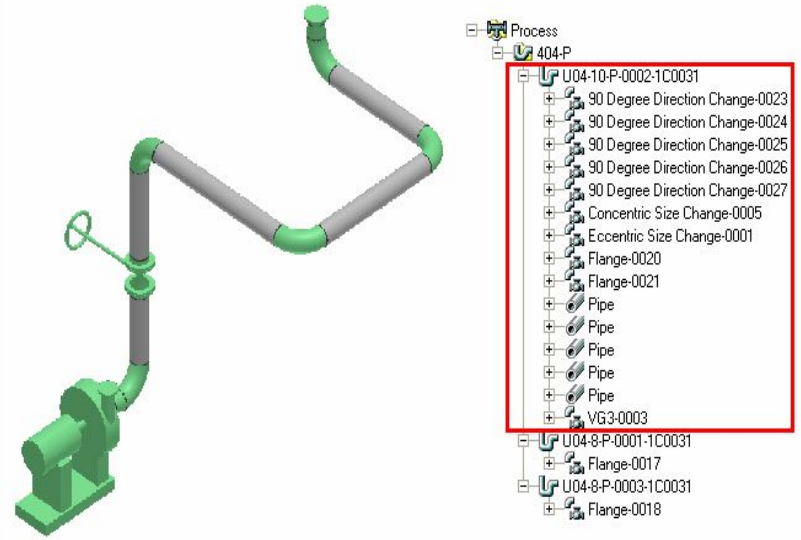
A pipe feature is a logical collection of parts driven by the pipe specification. While routing a pipe run, you can place features on the pipe; these features define high-level design information. The software automatically selects the specific parts based on the pipe specification of the pipe run. Features are not displayed in the workspace explorer because of their ability to own several

PIPING HIERARC RES



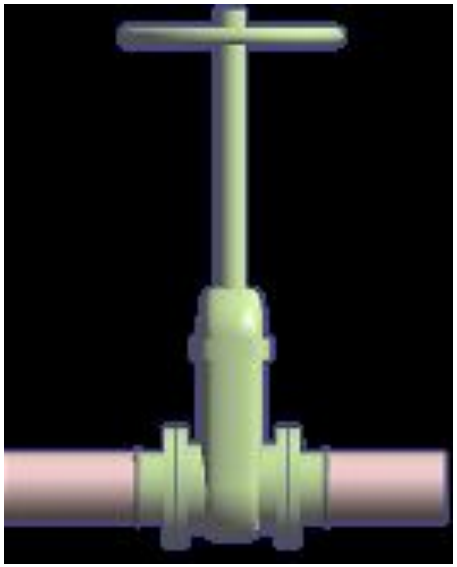
Piping Hierarchy: Pipe Parts

- A piping part is a physical component that comprises a feature and is generally selected by the software. Figure 3 shows some examples of pipe parts that represent a section of a piping system. The highlighted portion in the figure shows a section of the workspace explorer containing the hierarchy of the pipe parts.



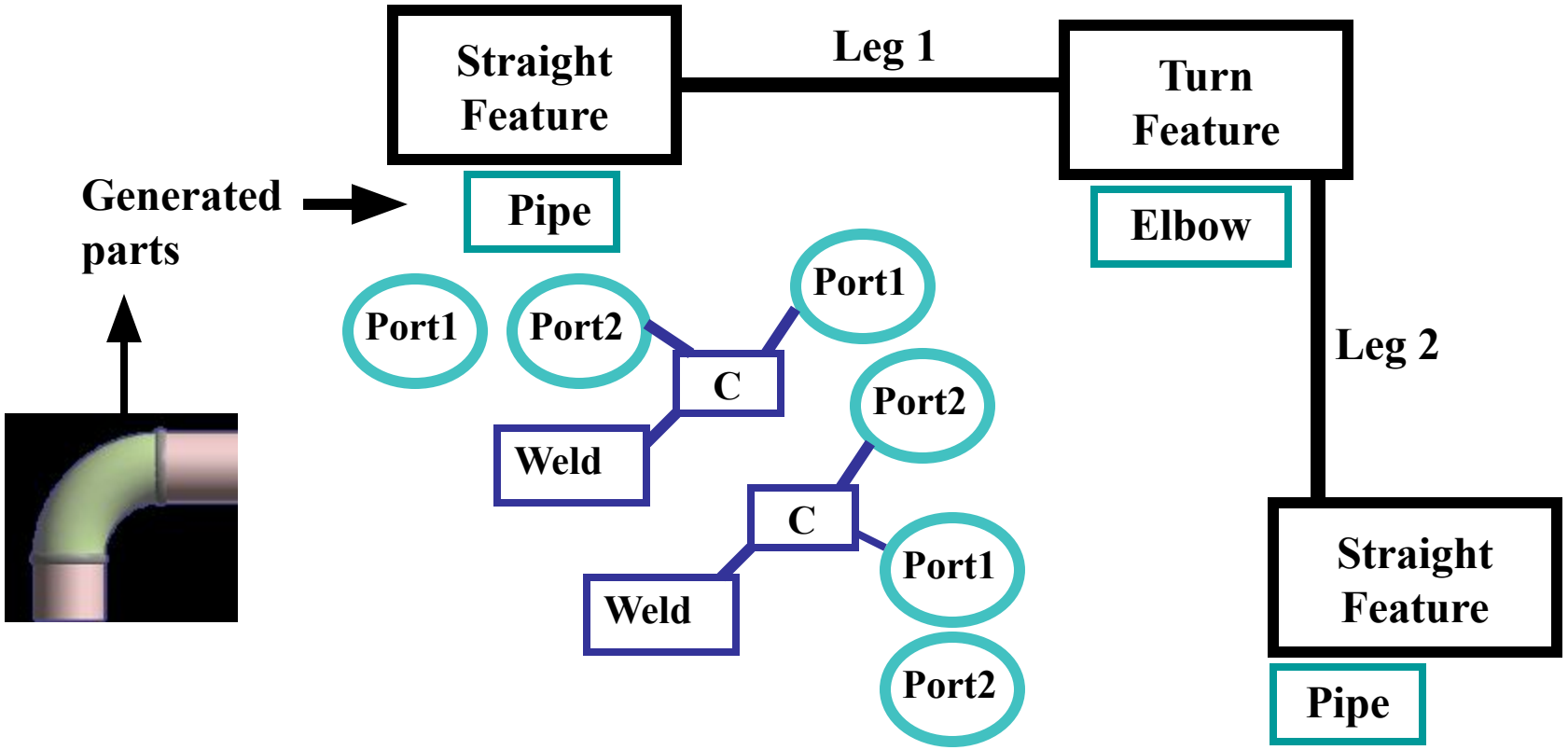
Piping Hierarchy: Pipe Port

Is the actual connection point for the part.

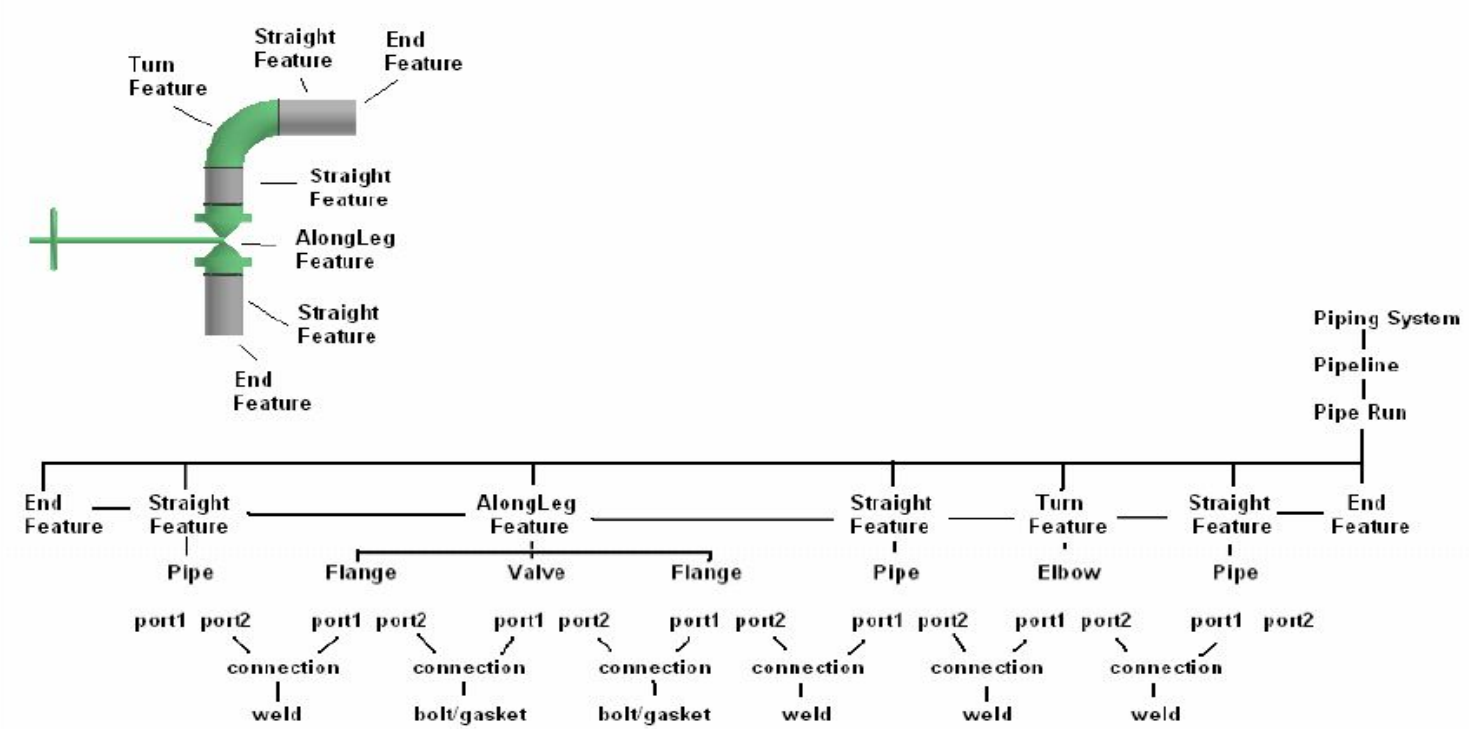


Piping Hierarchy: Pipe Connections

Provide the connectivity model between ports of different components, nozzles and pipes (welded, bolted, etc...)



Piping Hierarchy: Overview



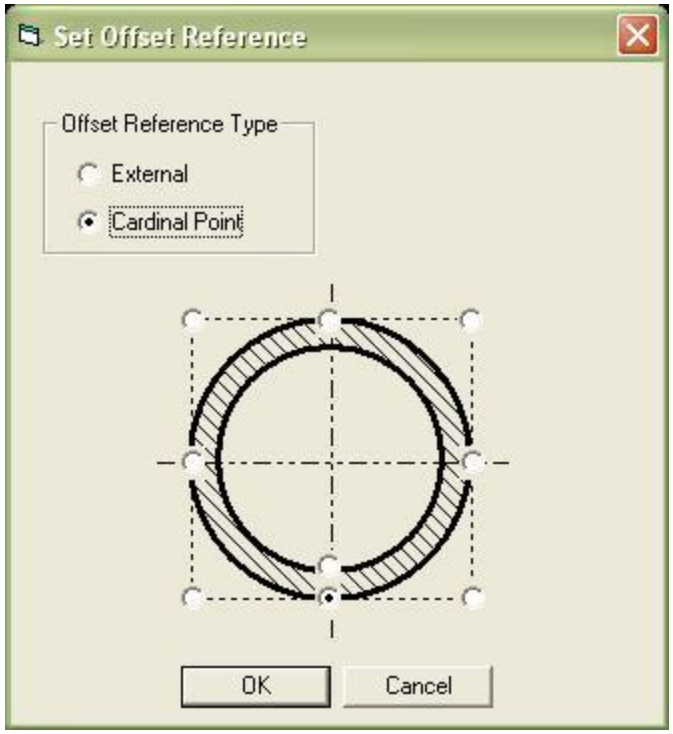
Route Pipe: Pipe Command

Start routing a Pipe Run from

- a nozzle/component port
- a point in space
- an existing pipe run

Route Pipe: Cardinal Points

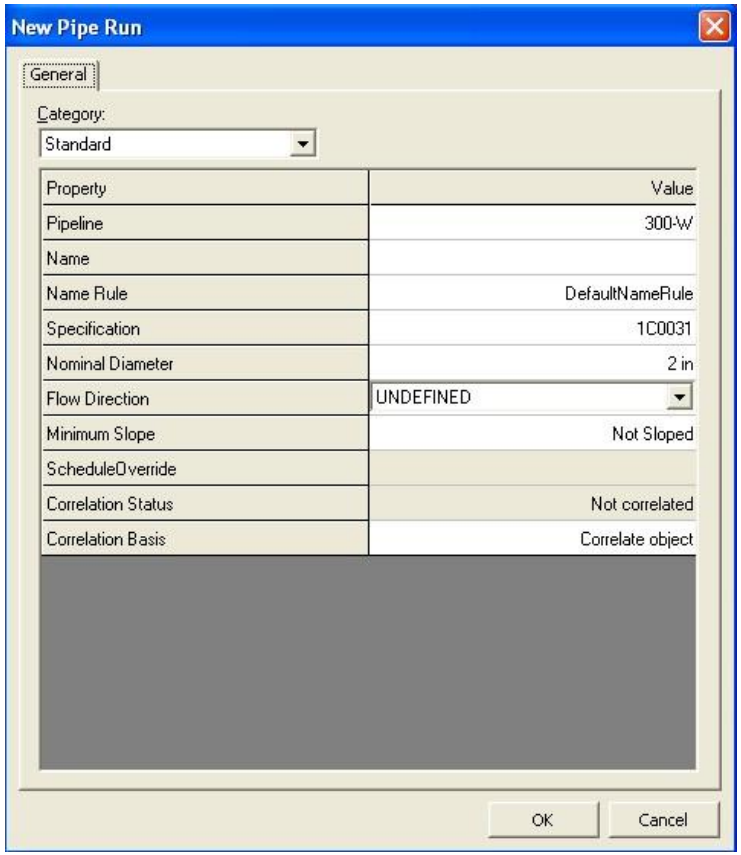
Route a pipe by the top, sides, bottom, or invert elevation of the pipe instead of the pipe centerline.

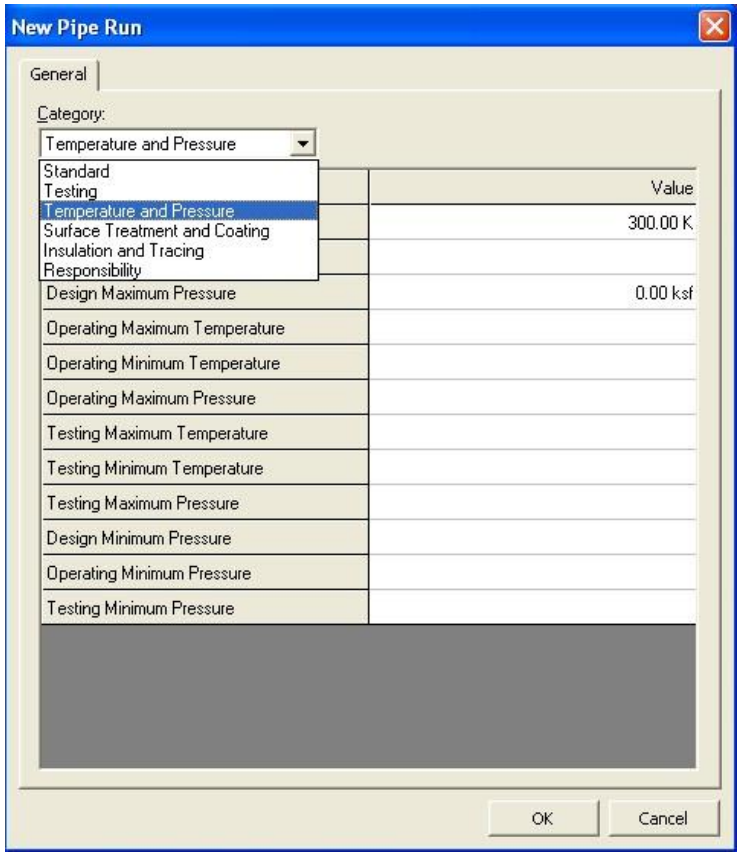


Routing by invert elevation is supported for use in modeling underground piping.

Route Pipe: Pipe Run Dialog Box

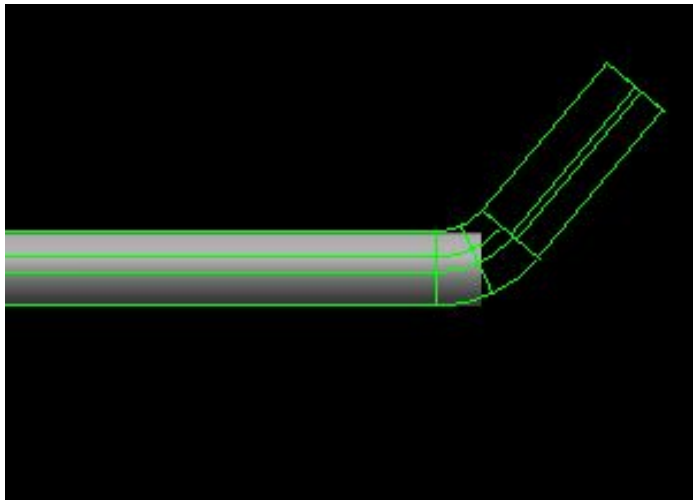
Define the Pipe Run properties





Route Pipe: Route Pipe Ribbon bar

Designation of commodity options while routing



Commodity option for turn

Commodity option for straight

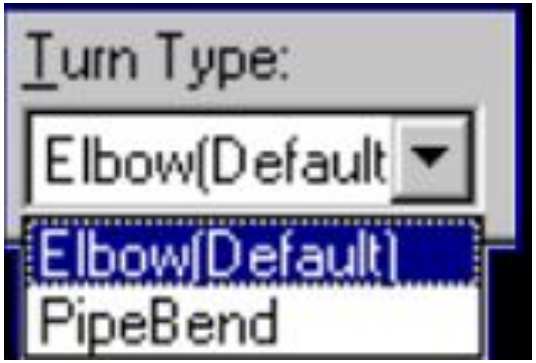
Piping offset option

Angle control

Route Pipe: Turn Type Option

Displays the type of turn (Default, Elbow, Pipe Bend, or Miter).

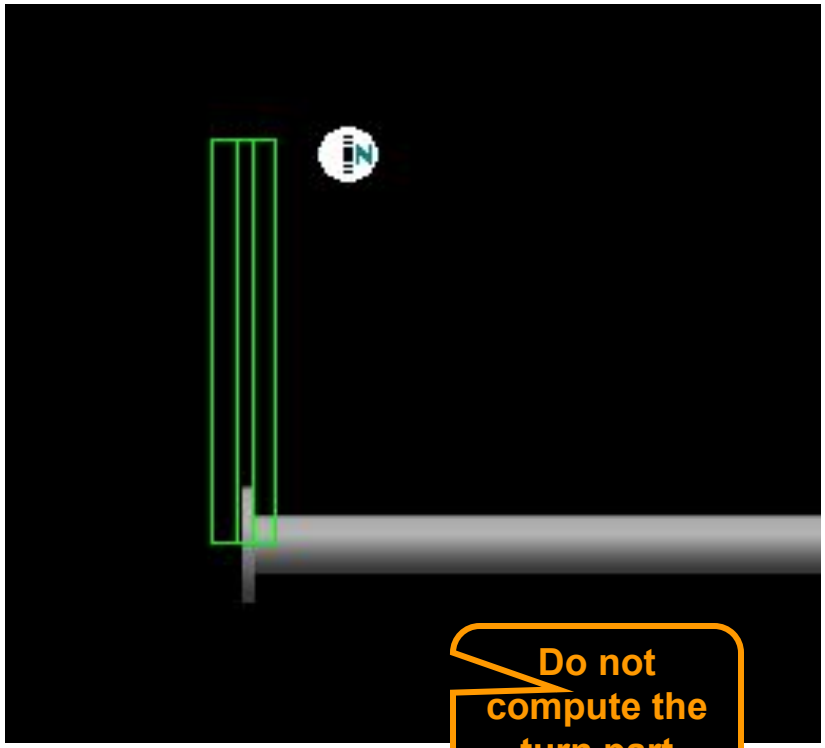
Default turn type: the system selects the type of turn as defined in the Ref Data (Default Change of Direction)

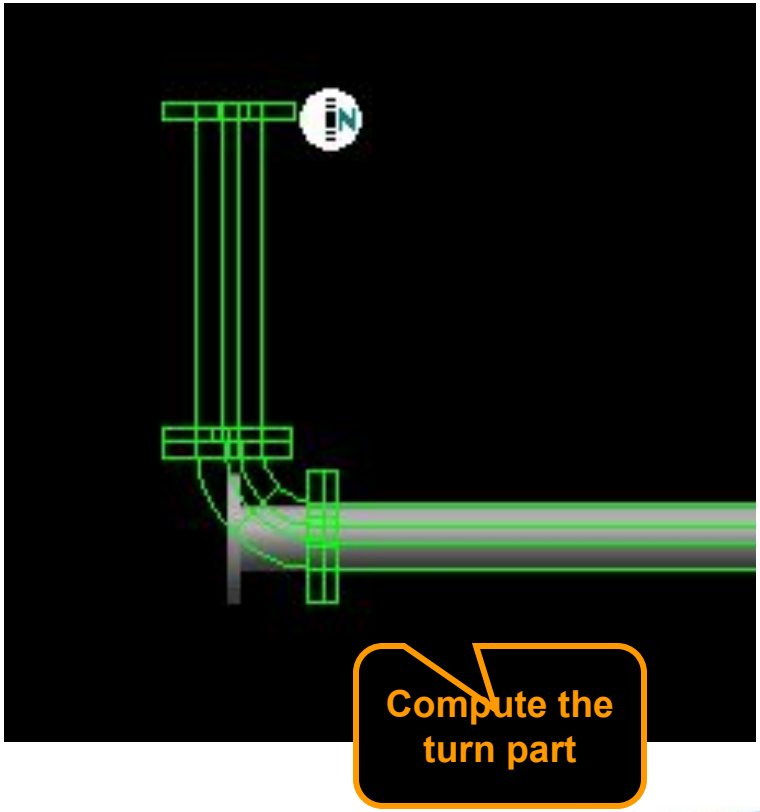


SP3D Piping can check pipe bends as they are modeled to ensure that they have adequate lengths for fabrication on an allocated bending machine.

Route Pipe: Graphics Toggle

- Route command should only compute the turn part on commit or (on-going)
- Use Shift + F keys to toggle the compute modes

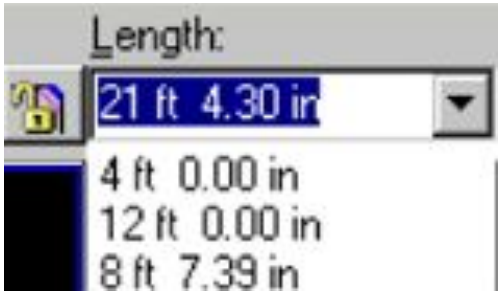


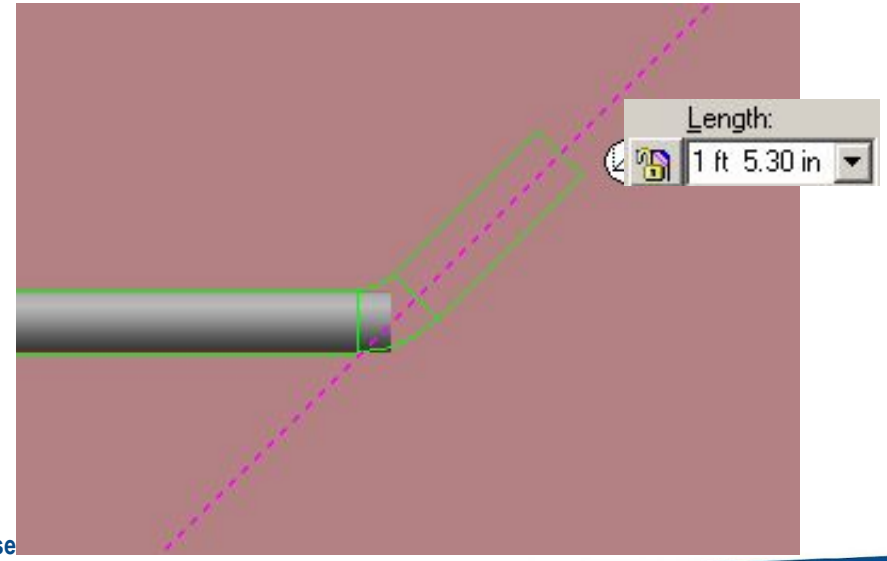


Route Pipe: Length Control Tool

Enter or select a length for the current route path.

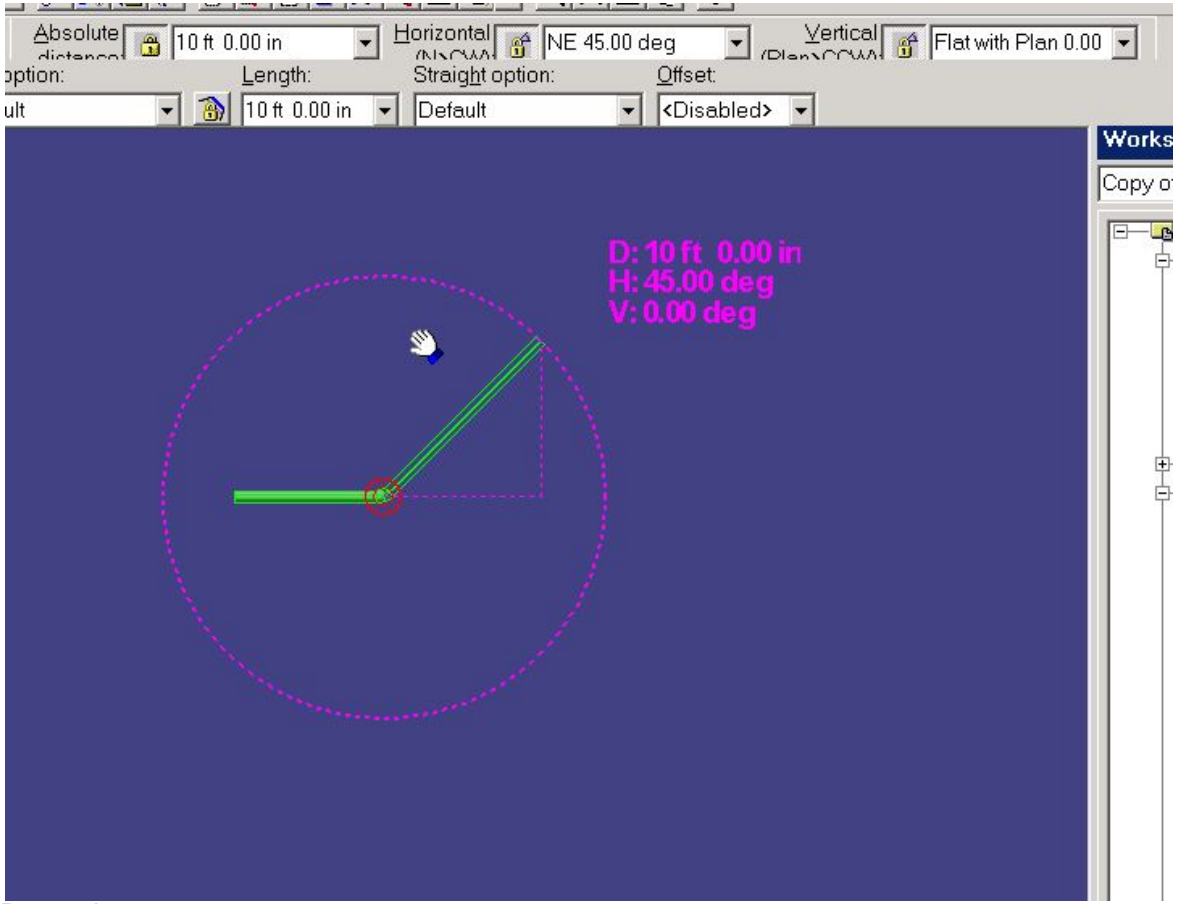
- Length Lock: Lock or unlock the length field.
- By Default: dynamically displays the current length of the pipe run from a turn point or a starting point.
- contains the last 10 values entered by the user.





Route Pipe: Route Using Spherical Coordinates

Relative Tracking Mode

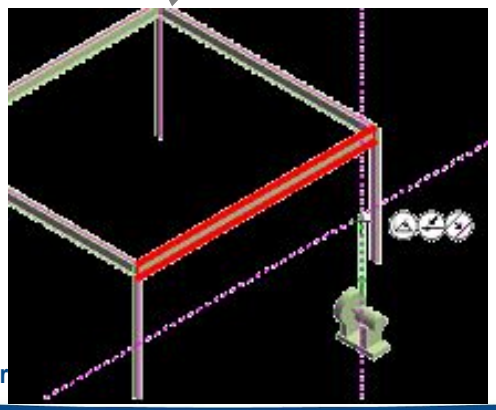


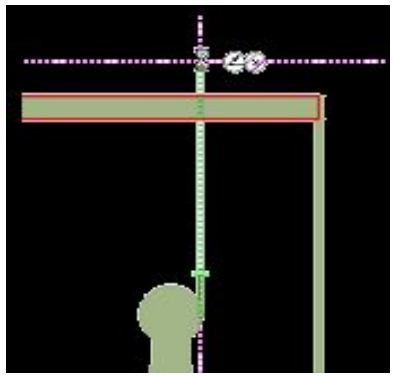
Route Pipe: Offset Value

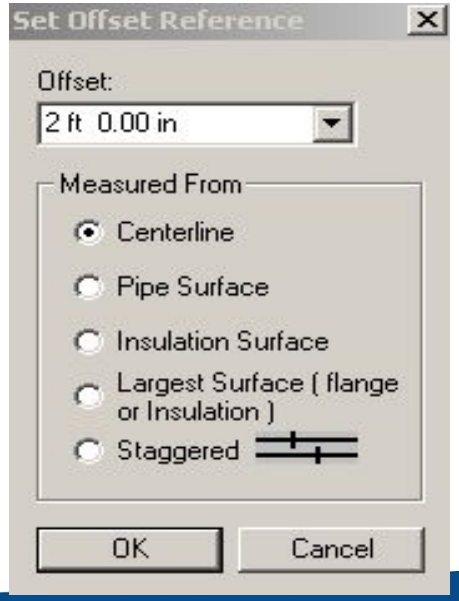
Offset Control Tool

If the reference object is a planar surface or linear element, the offset distance is measured from the surface or line to the indicated reference plane on the pipe being routed. Five offset reference are available.

An offset SmartSketch point is found on either side of the referenced plane or linear element.

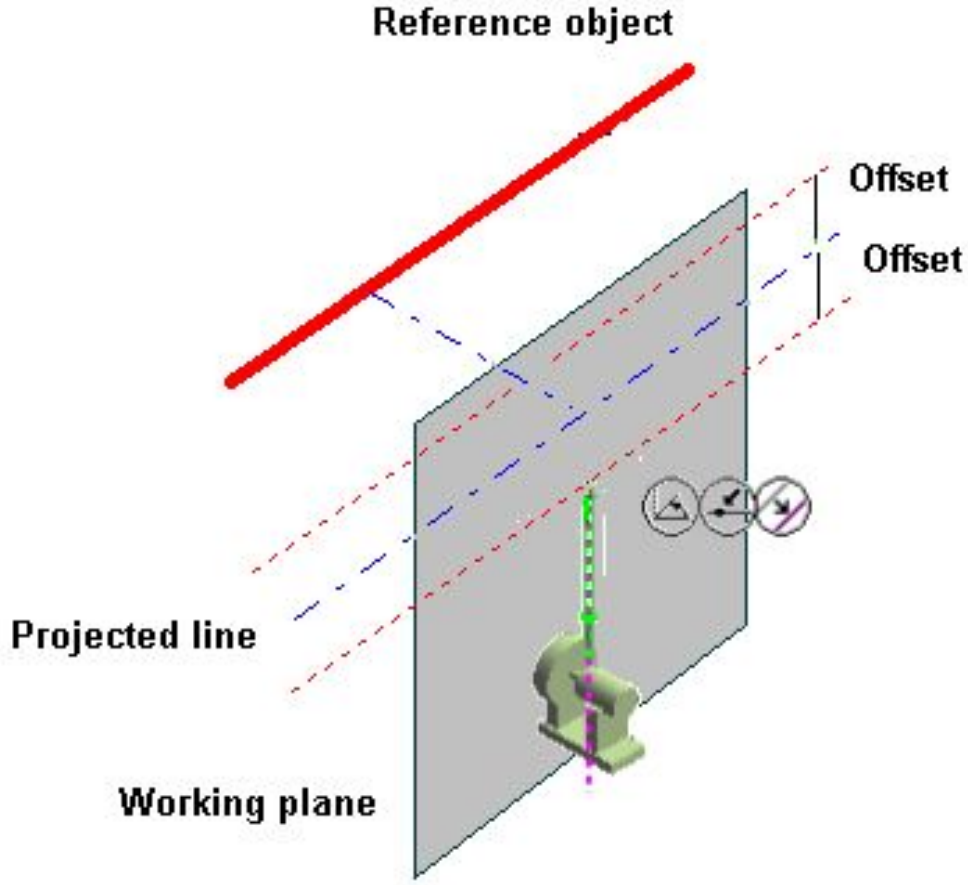






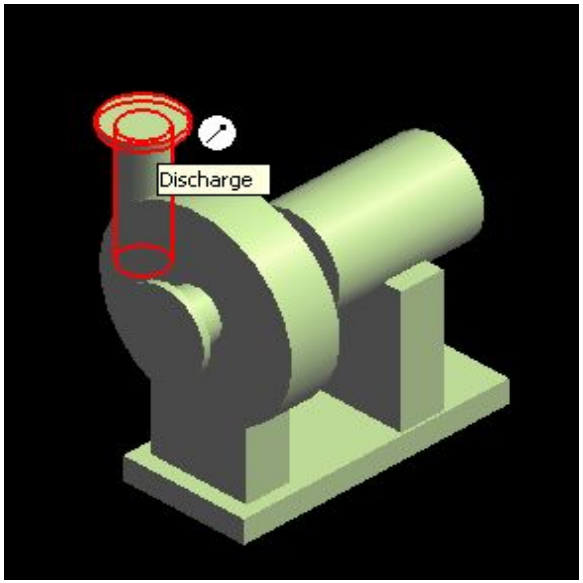
Route Pipe: Offset value

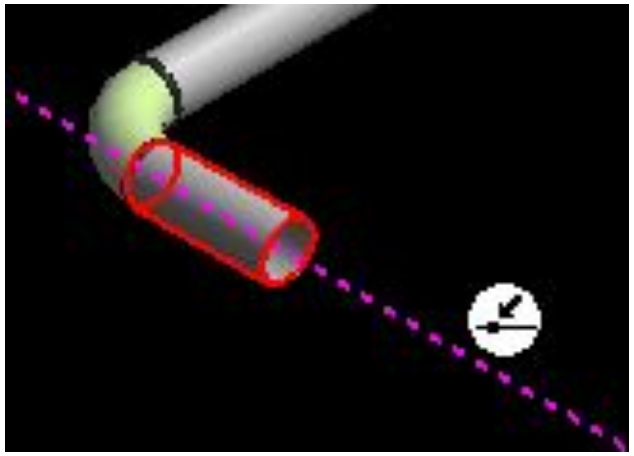
How the Solver finds the offset:



Route Pipe: SmartSketch

- Parallel
- Perpendicular
- Angle
- Reference axis aligned
- Point on plane
- Offset
- Intersection
- Divisor
- Point on element
- Key point
- Add to stack



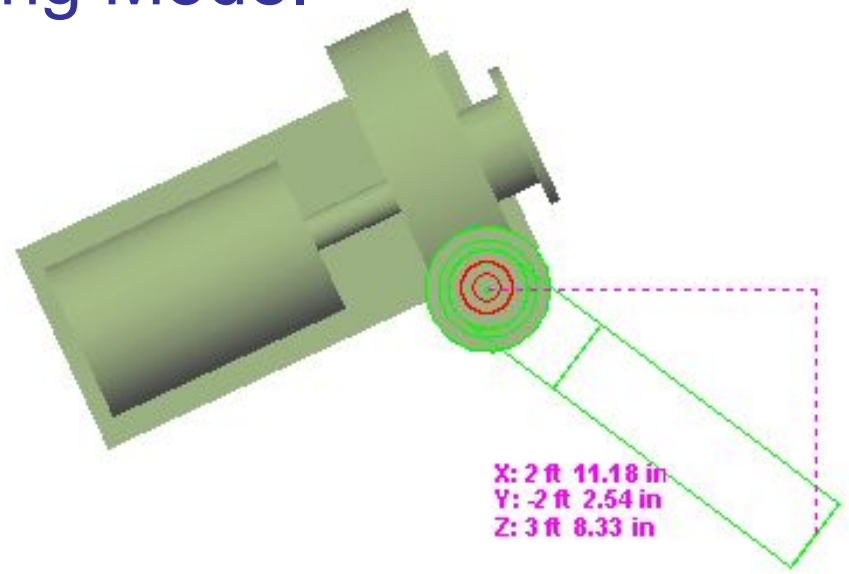


Route Pipe: PinPoint

PinPoint provides coordinate inputs to the route command.

x,y,z coordinates are relative to Target Point.

Relative Tracking Mode.



Route Pipe: Smart Step Ribbon Bar

- **Angle lock** in Route command should remain locked until manually unlocked
- **Working plane** should be set to plan plane when sloped run is created
- **Compute offset** of piping from duct and cableway routes

Working Plane Control

Angle Lock

Offset Control

Route Pipe: Working Plane Control Tool

Constrains the route path to a specific plane.

Ctrl + Keyboard

1 - Plane Plane

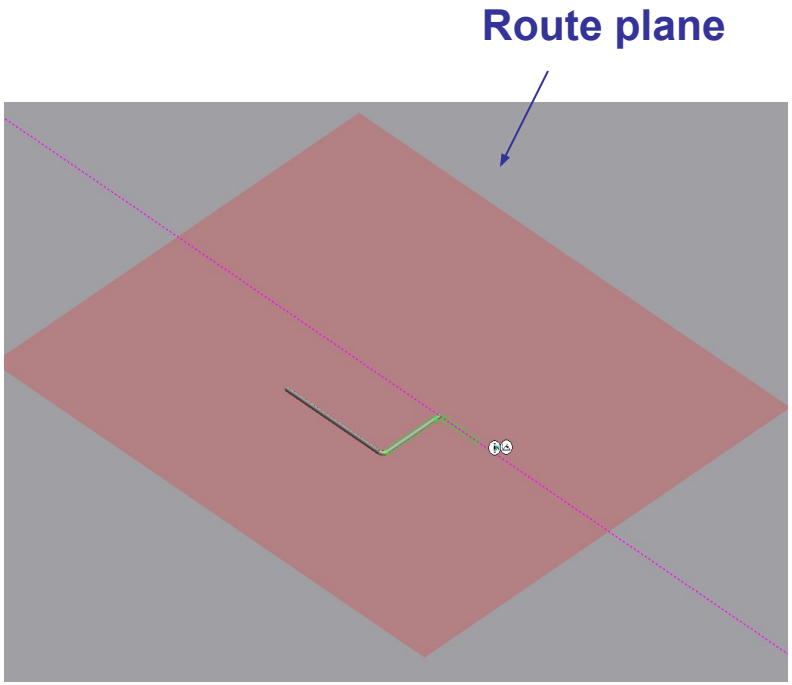
2 - Elevation Plane

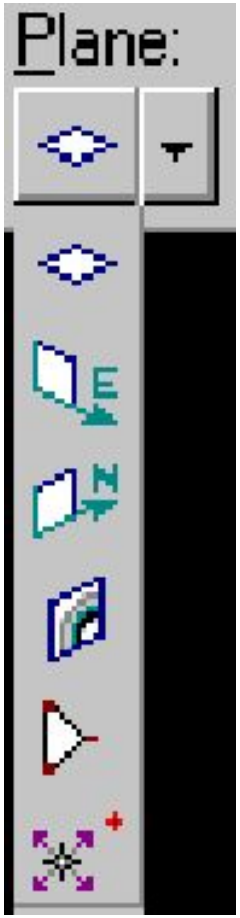
3 - Section Plane

4 - Plane by Turn/Branch

5 - Plane by Three Points

6 - No Plane





Pipe Select Command

Provides specific filters:

Workspace Explorer (set the filter to all and key in the string in the field to find an object).

Tools > Select by Filter

Delete a Pipeline

 Deleting a pipeline deletes all pipe runs, features, and parts associated with that pipeline.

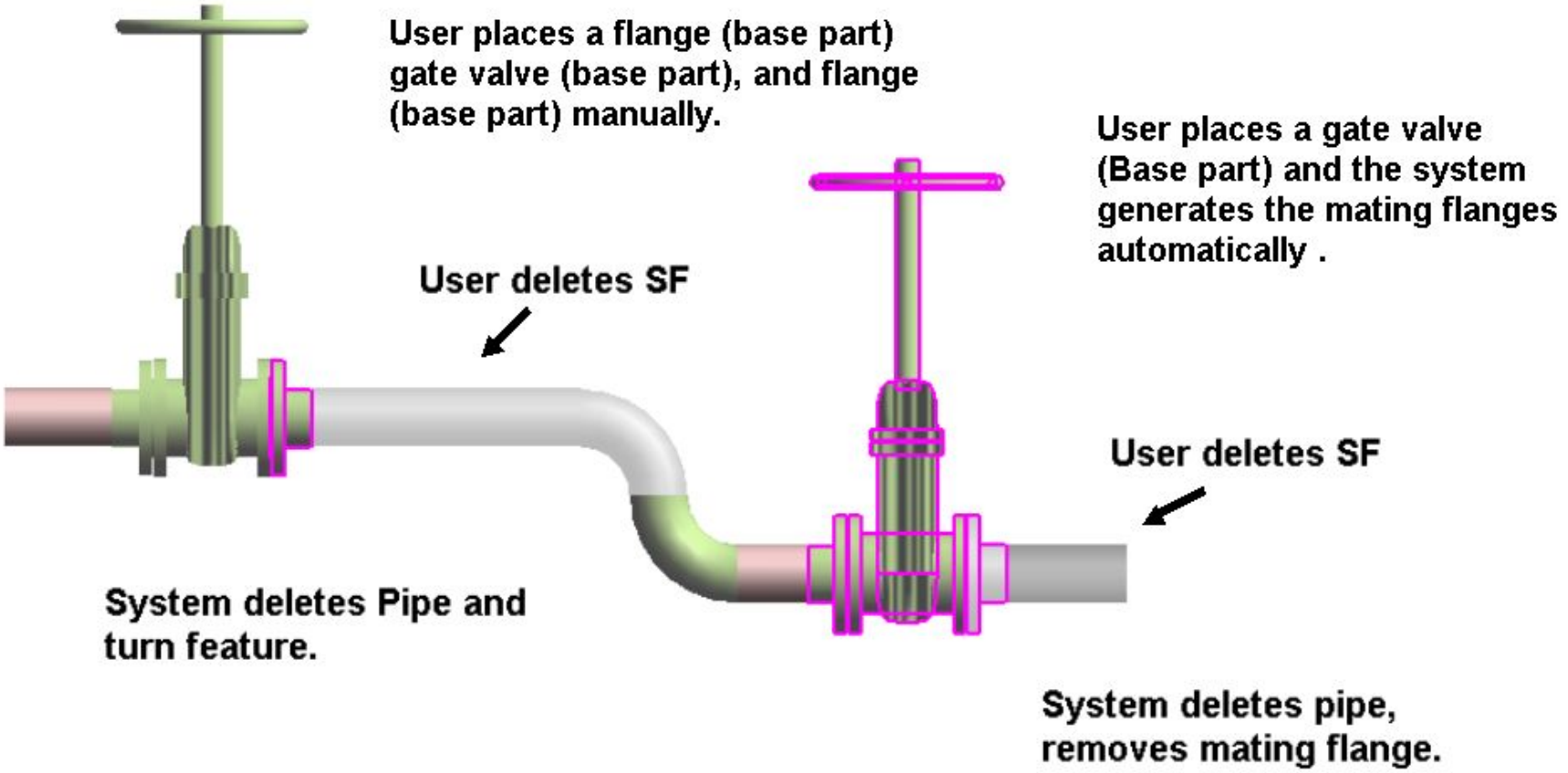
Delete a Pipe Run

 Deleting the run deletes all features (and thereby all parts) belonging to the run.

The software attempts to maintain the design integrity of the model by adjusting all previously connected features.

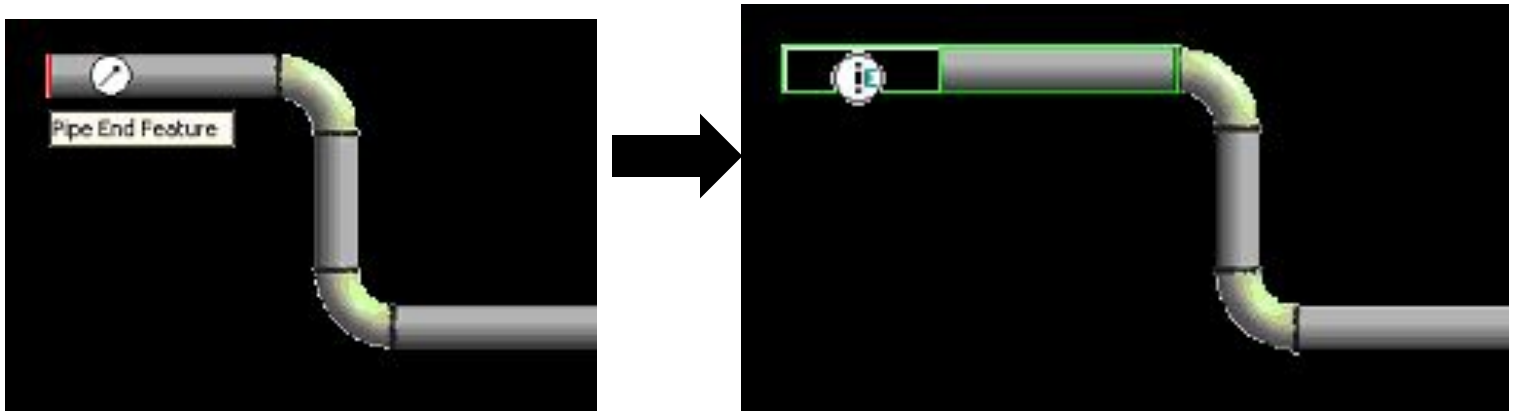
Delete Straight Features

Example:



Run To or From End Features or Nozzle

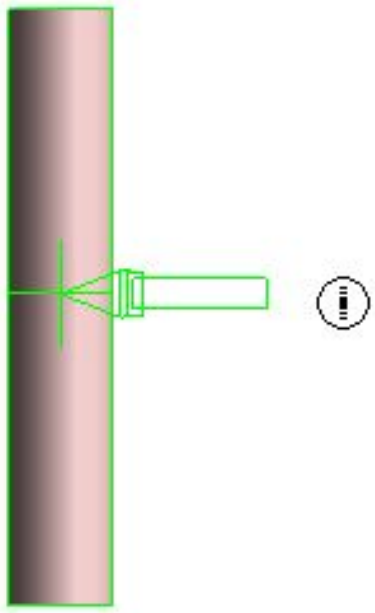
When you select an end feature during the creation of a pipe run, the Route Pipe command joins the run with the end feature and inherits the properties of the run that the end feature belongs to.



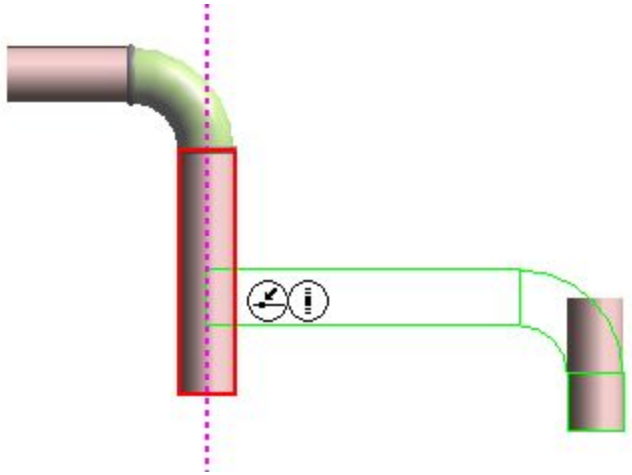
Routing To or From a Straight Feature

Use the Route Pipe command

- Branch on Pipe Run



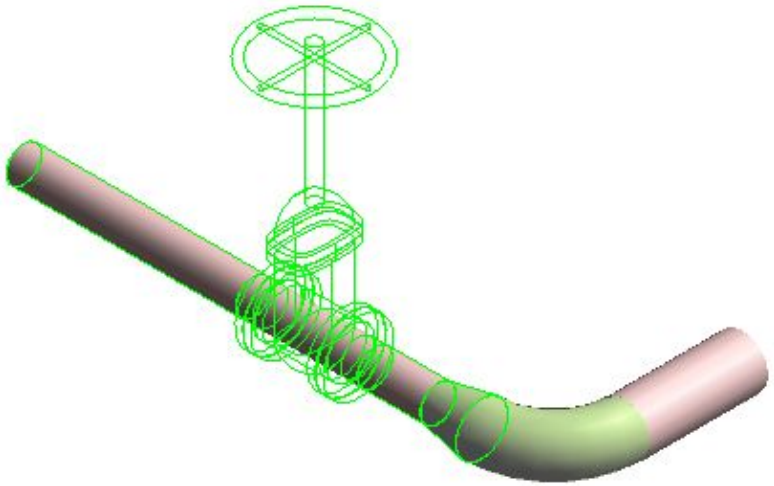
- Intersect to Branch



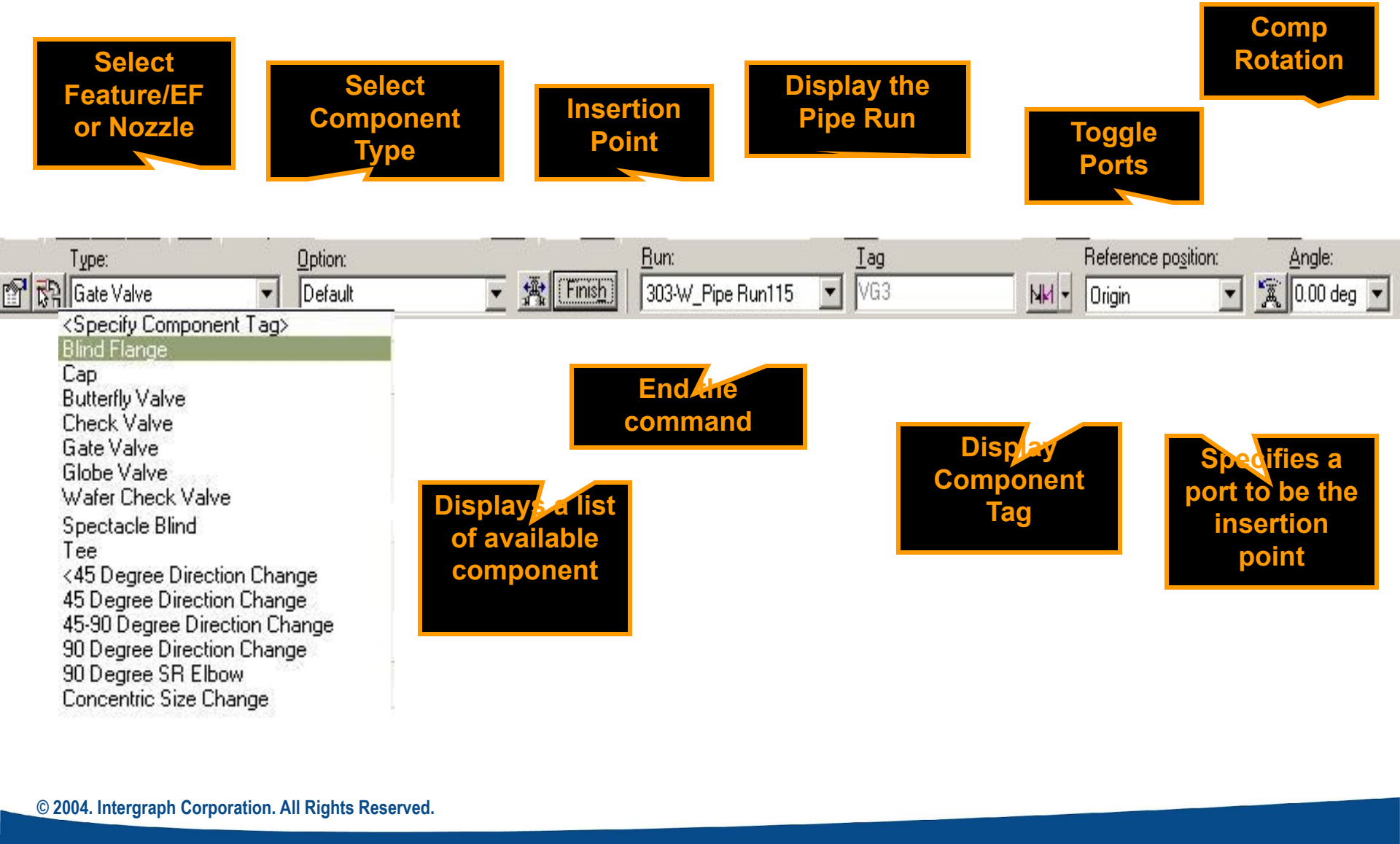
Insert Component

Insert command inserts a component interactively.

In-line components (Valves, Tees, Reducers); Change of direction (Elbows, Miters, Bends); End Components (caps and plugs); Strainers (Y-strainers, Basket Strainers) etc…



Insert Component :Insert Component Ribbon Bar



Insert Component : Graphical Positioning

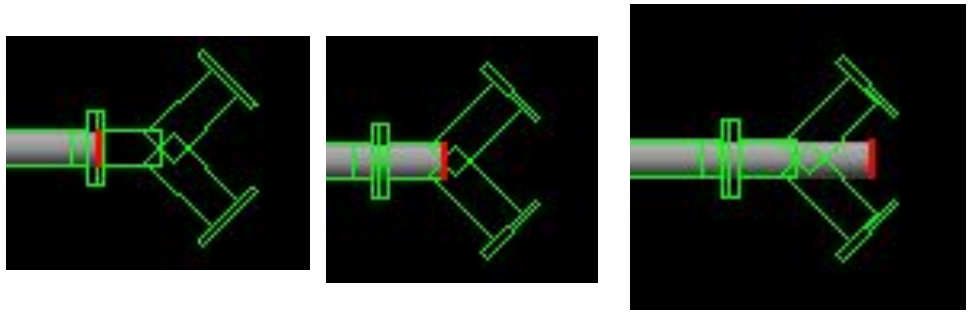
- Reference Position option:
  The system should slide the component along the path so that the select position (example: Origin) is located at the insertion point.

Flip option: port 1

Reference position: port 1

Reference position: origin

Reference position: port 2 or port 3



Insert Component : Graphical Positioning

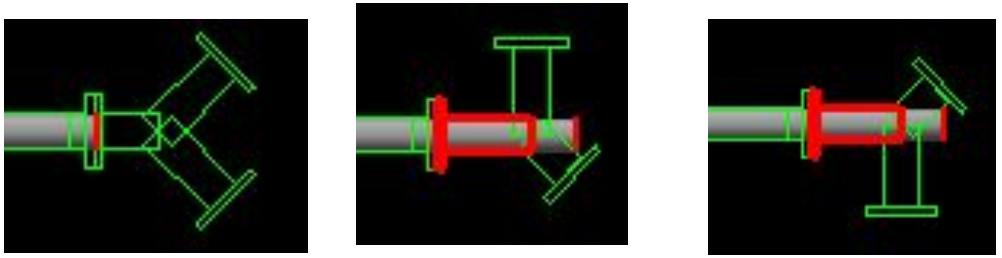
- Flip option:
  Toggles through the ports available for the component being inserted. As each port is toggled, the component is oriented so that the selected port is aligned along the axis of the leg on which it is being inserted.

Reference position: port 1

Flip option: port 1

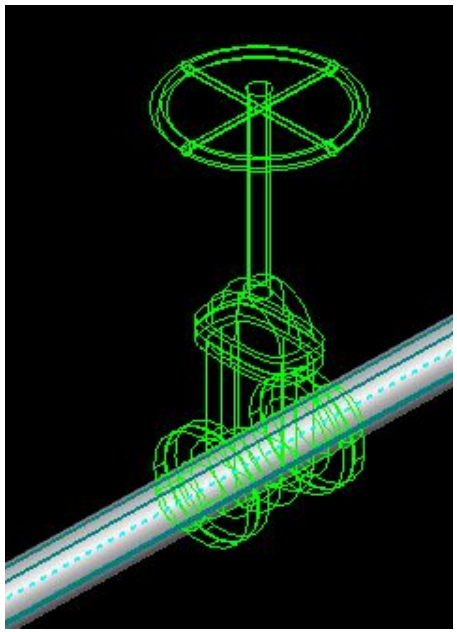
Flip option: port 2

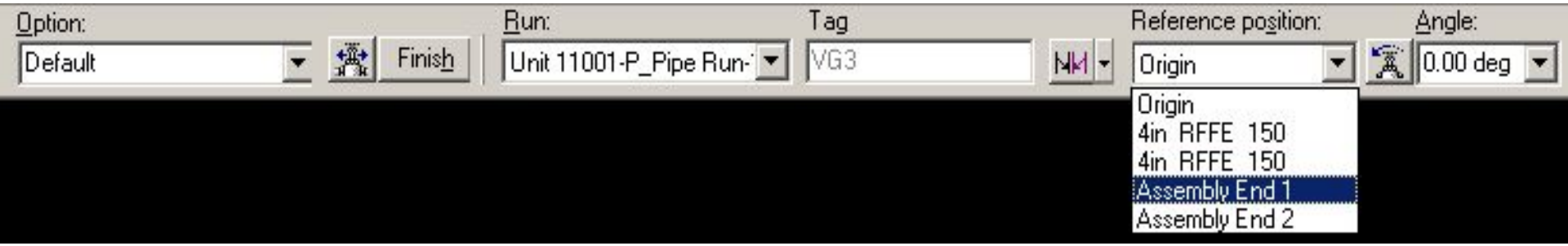
Flip option: port 3



Insert Component : Mating

Mating part ports / end terminus available in the Ref Position list.



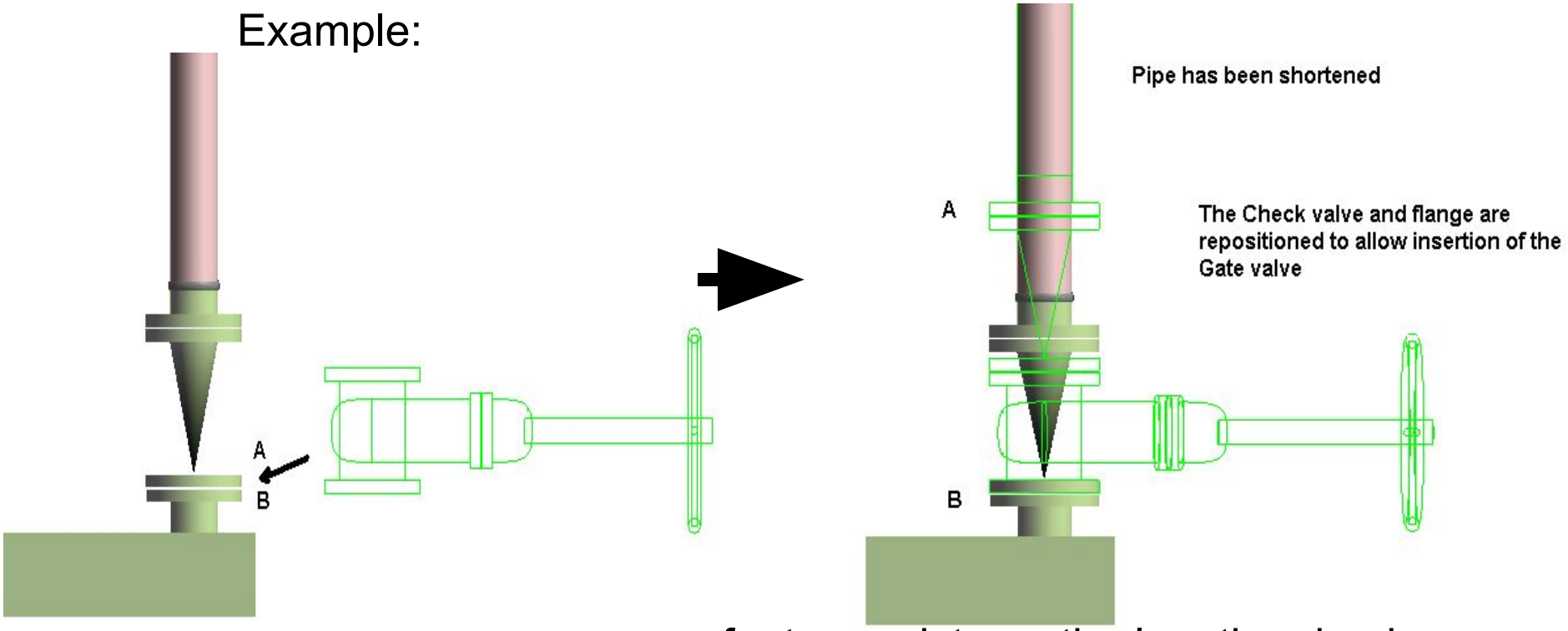


Mating Ports

Insert Component : Positioning & Placement

- Insertion of a new component at an equipment nozzle

Example:



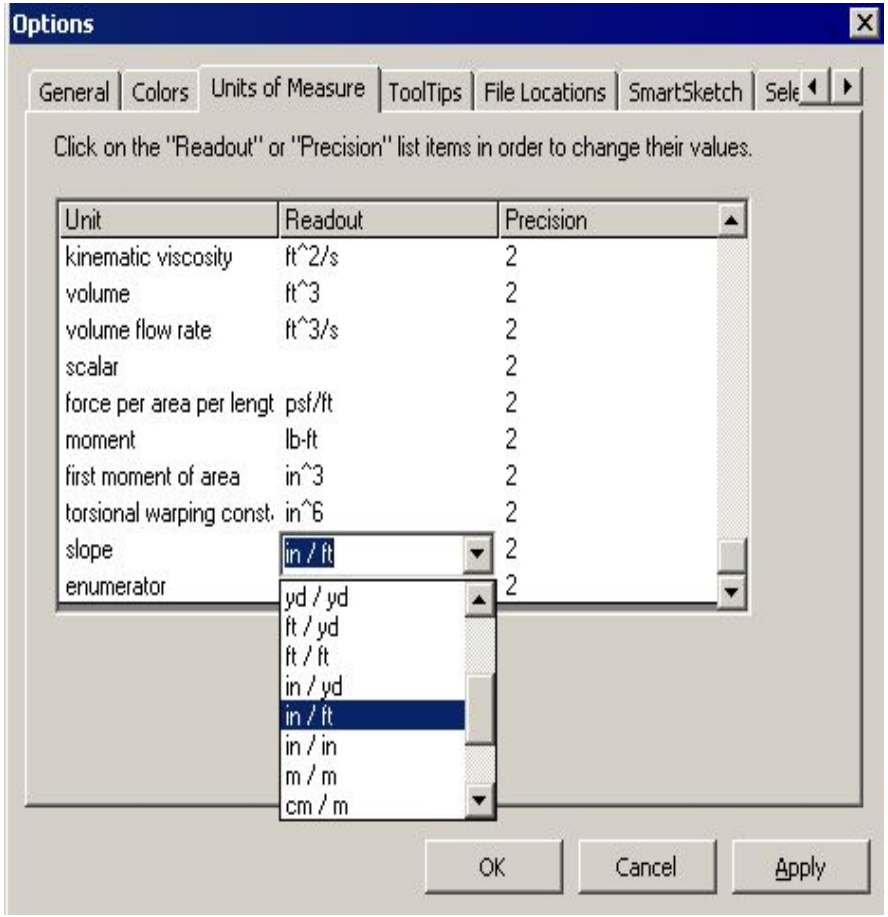
Since a suitable straight feature exists on the leg, the check valve and its connecting flange are repositioned and the gate valve is inserted.

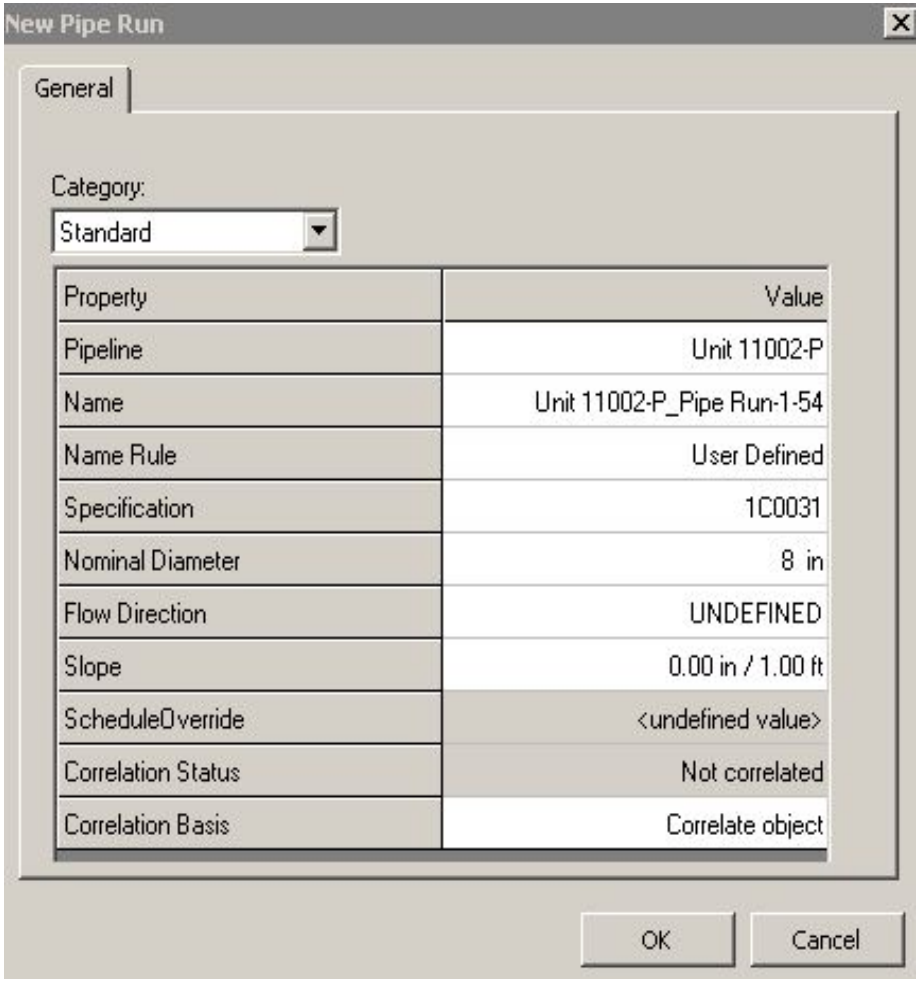
Routing Sloped Pipe

- Underground piping collects drains from funnels or catch basins and transports them to a disposal point. Since there is no pressure in this piping system, the pipe must slope for flow.

Routing Sloped Pipe

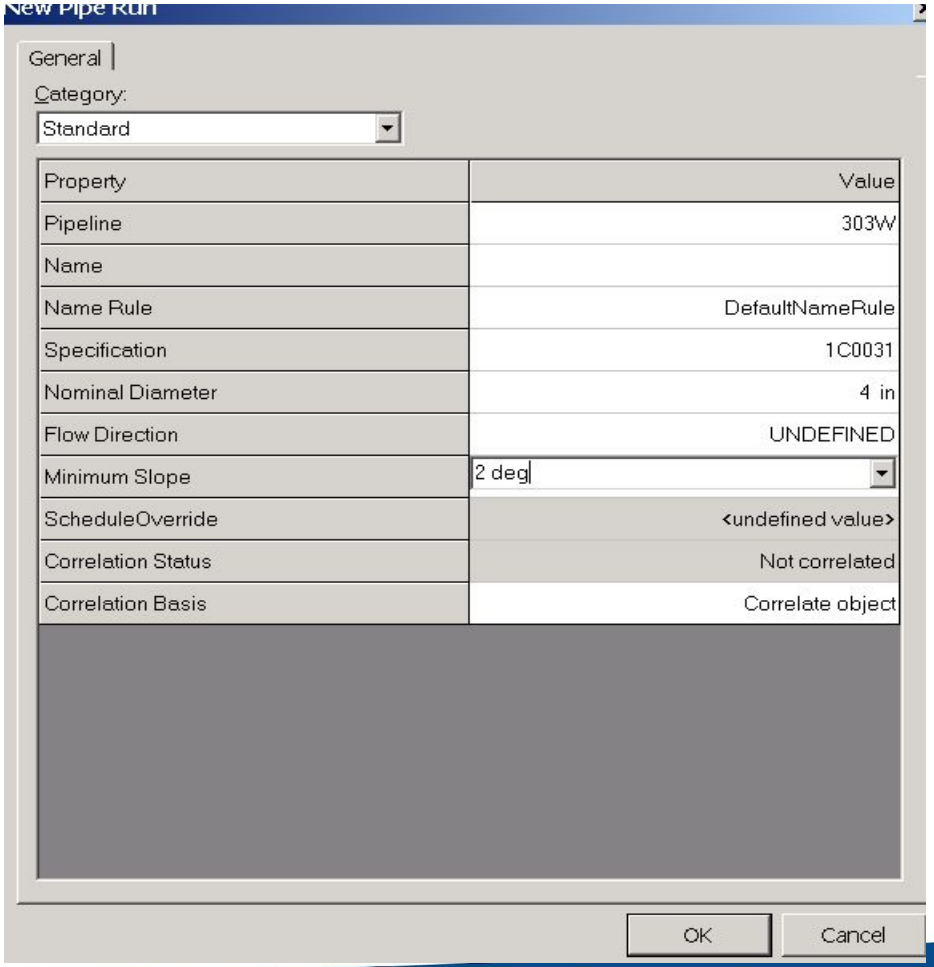
Slope format





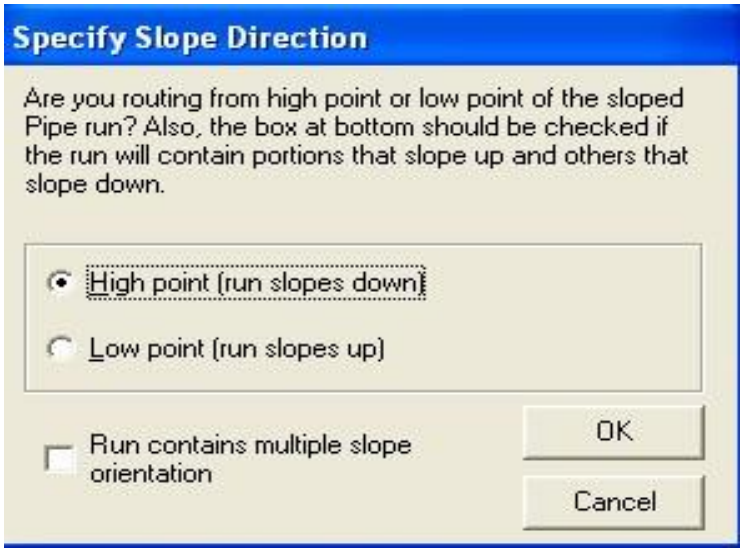
Routing Sloped Pipe

- Specify Slope on New Run Properties page



Routing Sloped Pipe: Slope Direction

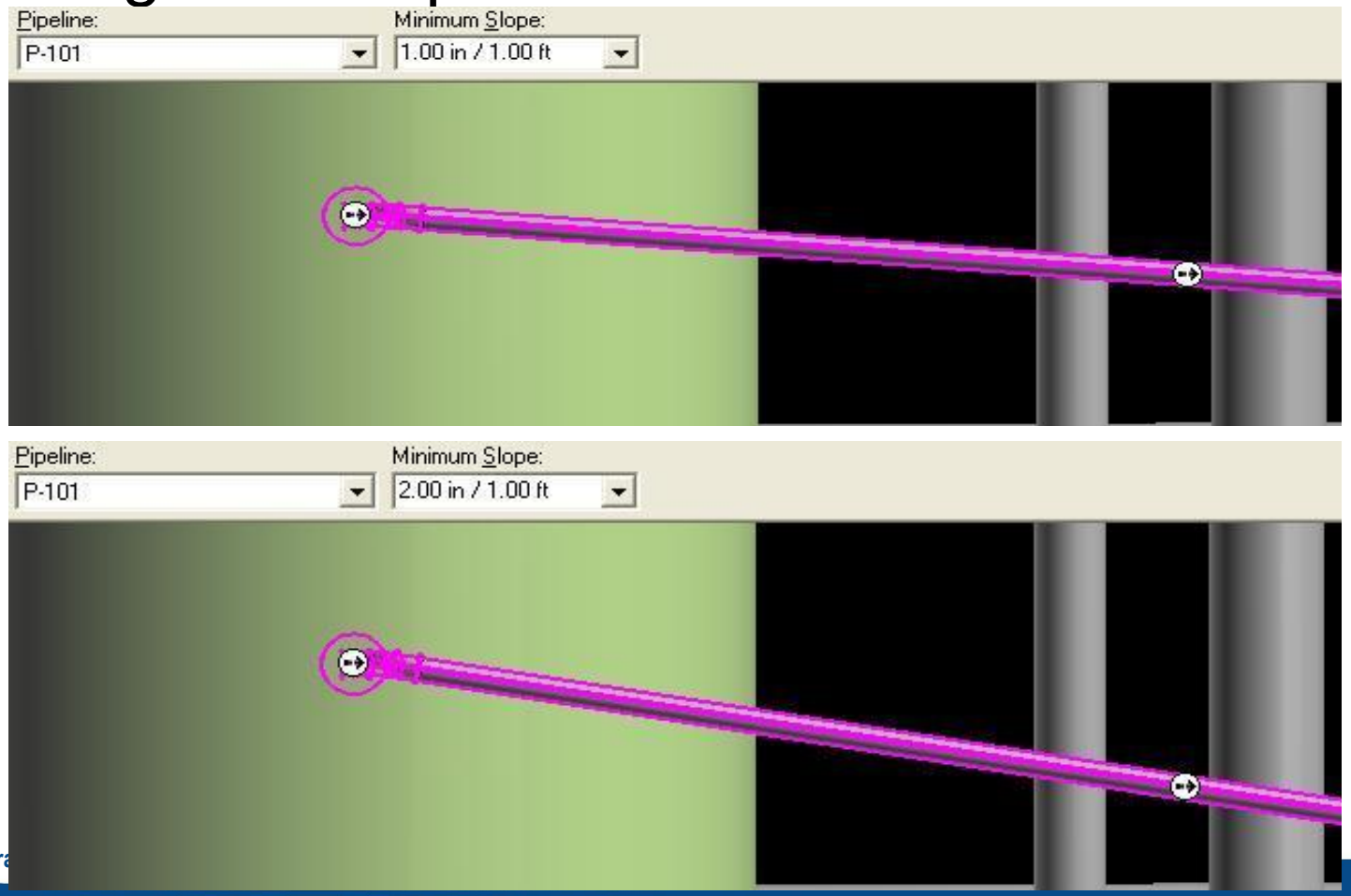
- Specify Slope Direction



- Turn Slope Lock On/Off

Routing Sloped Pipe: Graphical Modifications

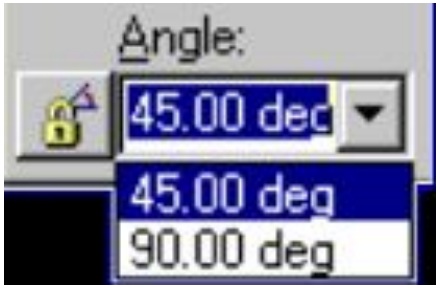
Modification of the "Slope" value will graphically change the slope of a run.

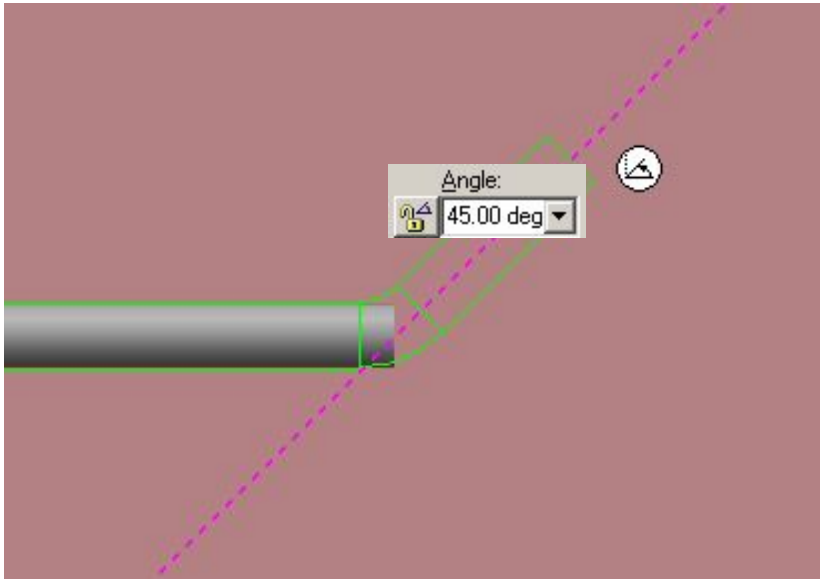


Routing Sloped Pipe :Angle Control Tool

Enter or select an angle for the current route path.

- Angle Lock: Lock or unlock the Angle field.
- By Default: Dynamic readout of the current bend angle as defined by the cursor.
- The angle field can only be 0 or 90 deg if the working plane is set to NO Plane.





Piping Practice Labs

- Route Pipes
- Inserting Components in a Pipe Run
- Routing Sloped Pipe

Integrated Environment

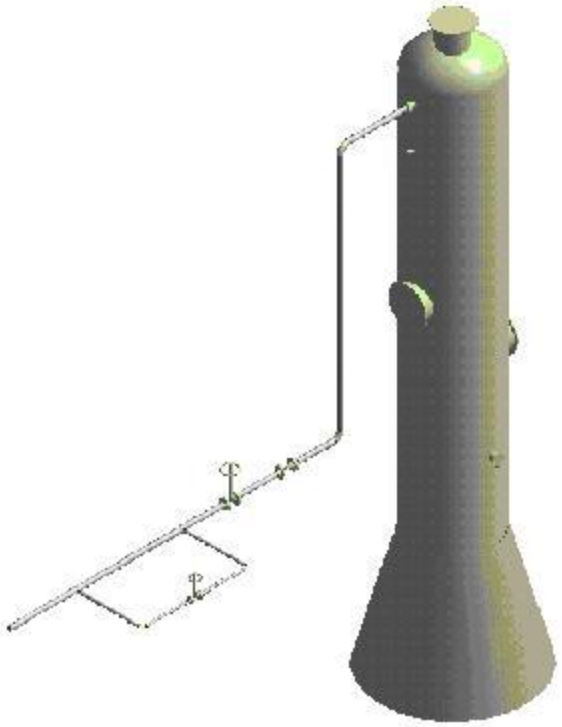
- While designing or creating a plant in SP3D, you can reuse existing data from other design or authoring tools rather than creating a model from scratch. **SmartPlant Foundation** (SPF) supports the **integration** of engineering tools, such as **SmartPlant® P&ID, SP3D, SmartPlant Instrumentation**, and **Aspen Zyqad**. This integration addresses the flow of data as it moves from one engineering application to another through its lifecycle.
- In an integrated environment, you publish and retrieve data from and to SP3D by using a central repository. During a publish operation, data such as **drawings, reports, and 3D models** transfers to a central repository. During a retrieve operation, the system retrieves **P&IDs, Plant Break Down Structure, Project List, Work Breakdown Structure, Electrical Cable Schedules, and Instrumentation Dimensional Data Sheets** from the central repository

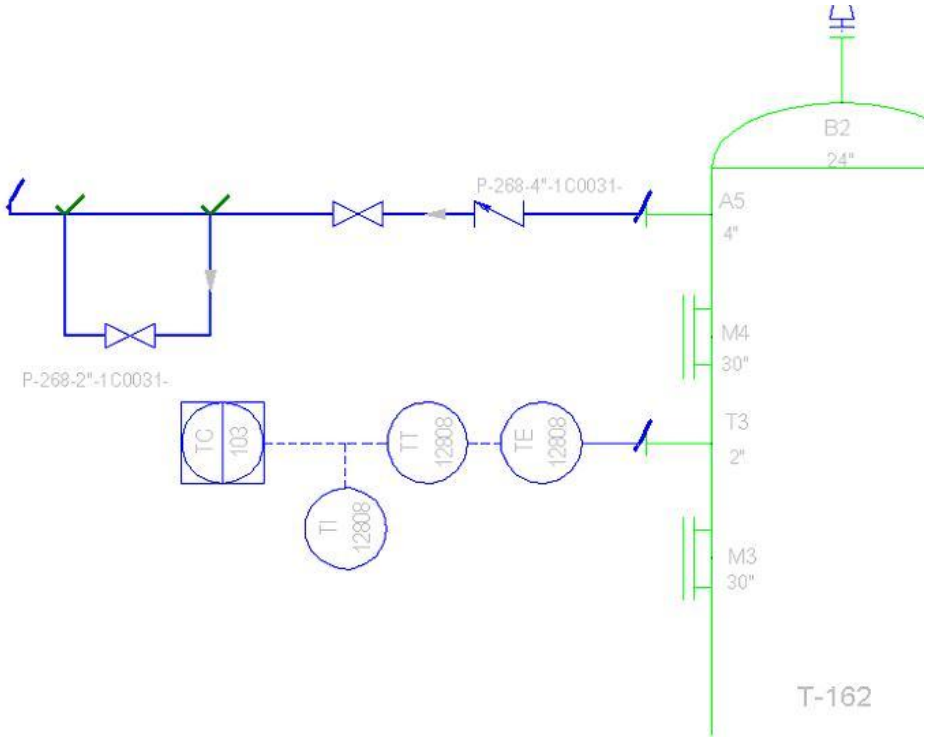
Retrieving Data from a P&ID

- You can retrieve piping, instrumentation, and equipment data from P&ID in the integrated environment. You can use P&ID to access items, such as equipment, piping information, and SmartPlant Instrumentation dimension data, to help create the appropriate 3D design objects. For example, after you retrieve data from P&ID, you can use the P&ID File Viewer window in SP3D for guidance in routing pipes, inserting components and instruments, and placing equipment in the 3D model.

SP3D Routing From P&ID

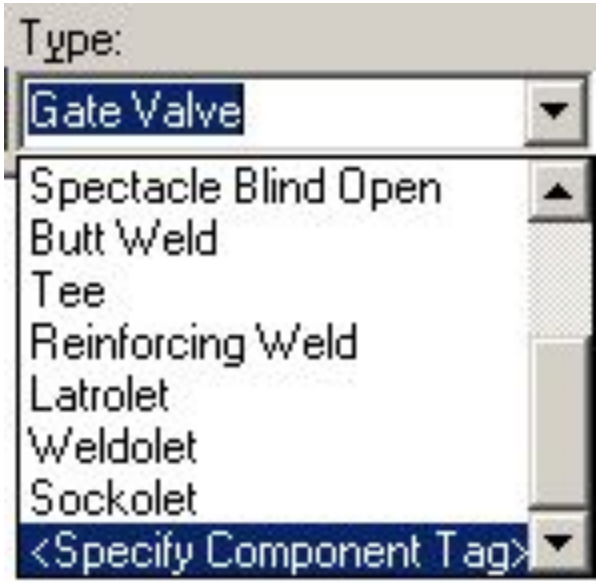
Users can import SmartPlant P&ID pipeline and component data into the 3D active data.

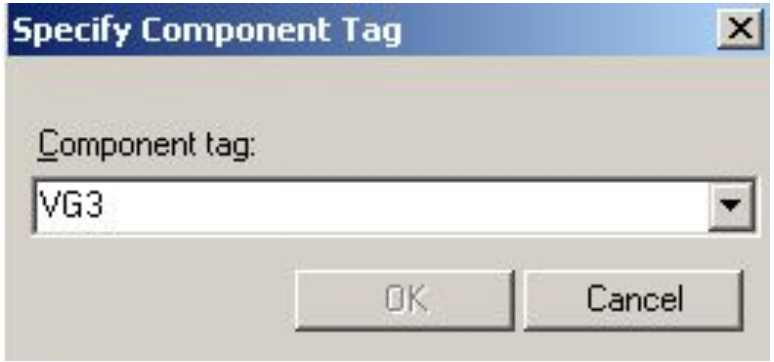


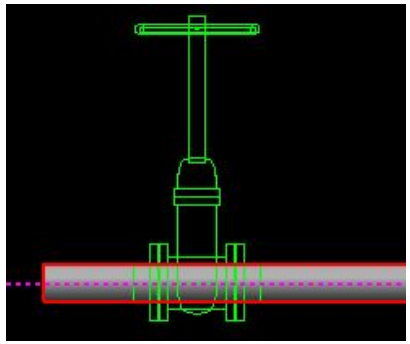


Insert Component by its Engineering Tag

The engineering tag will be available on the P&ID, and may be used to select a piping commodity from the Piping Specification.







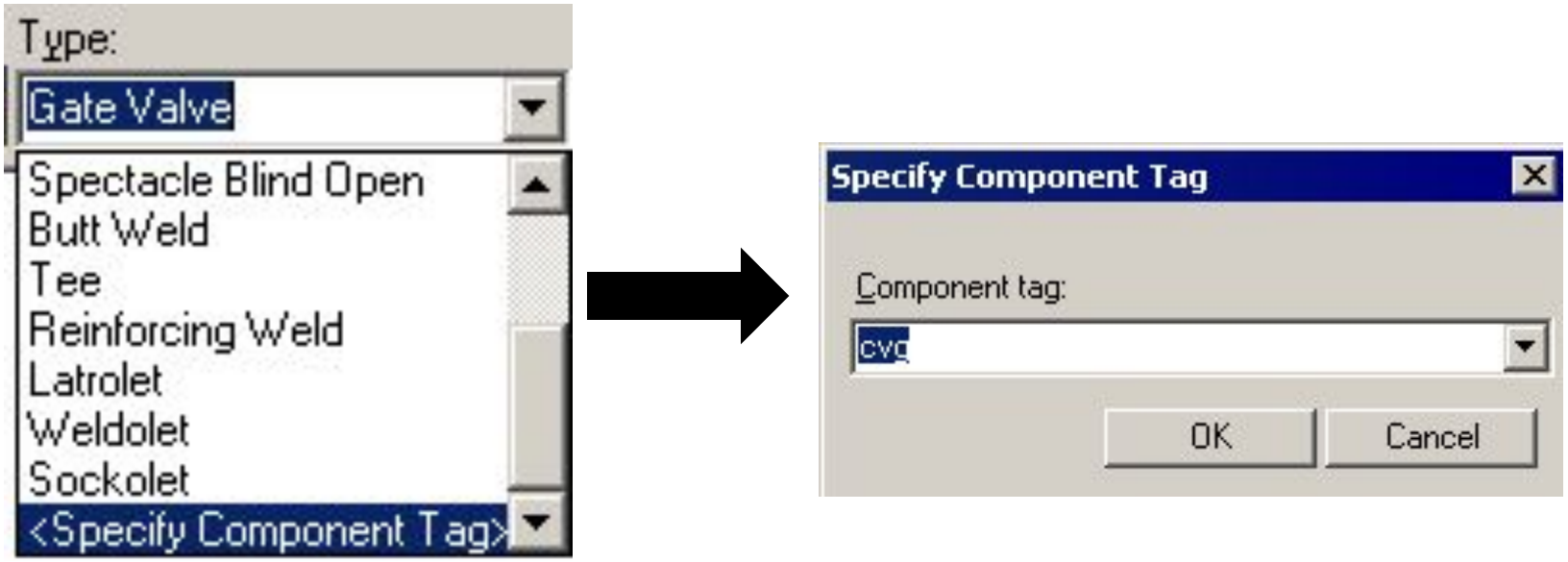
Instrument & Piping Specialty Placement

- We have two types of piping specialty/instrument Parts:

- 1. Stock item: Stock items represent those piping items that are purchased from a manufacturer's catalog, where no real engineering is required other than selecting the correct size, material, etc.
- 2. Custom-engineered item: custom engineered items are built items according to the process.

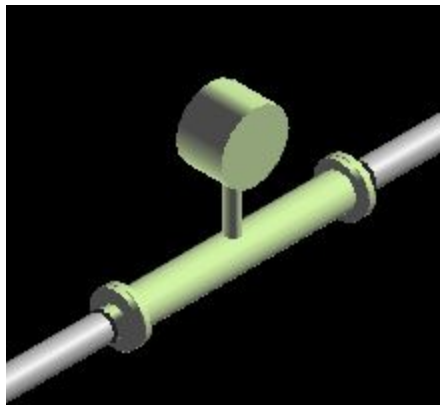
Instrument & Piping Specialty Placement

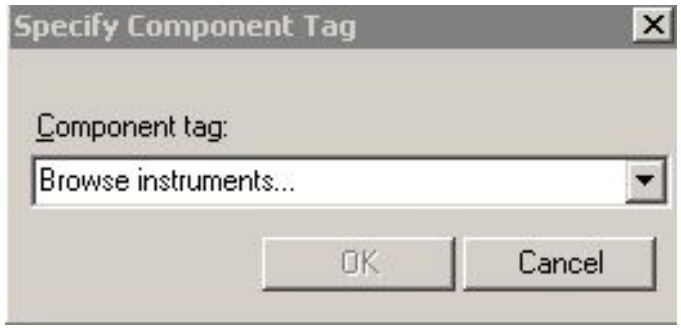
- Placing piping specialty/instruments

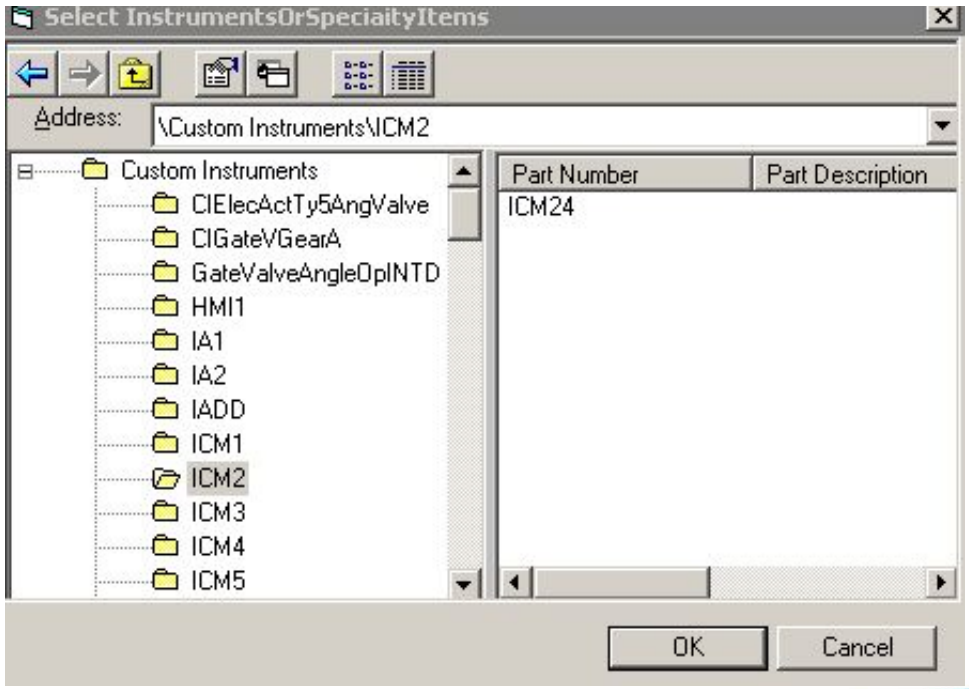


Instruments

Placement of Instrument Items On the Fly

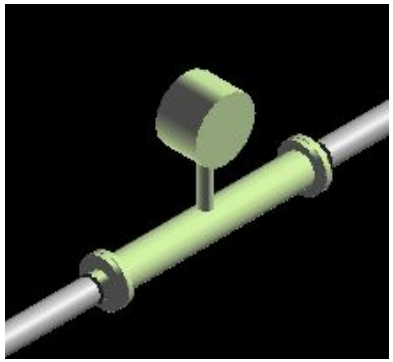


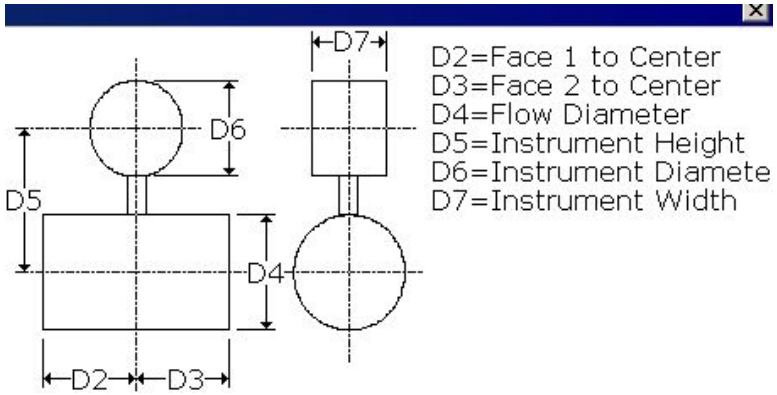


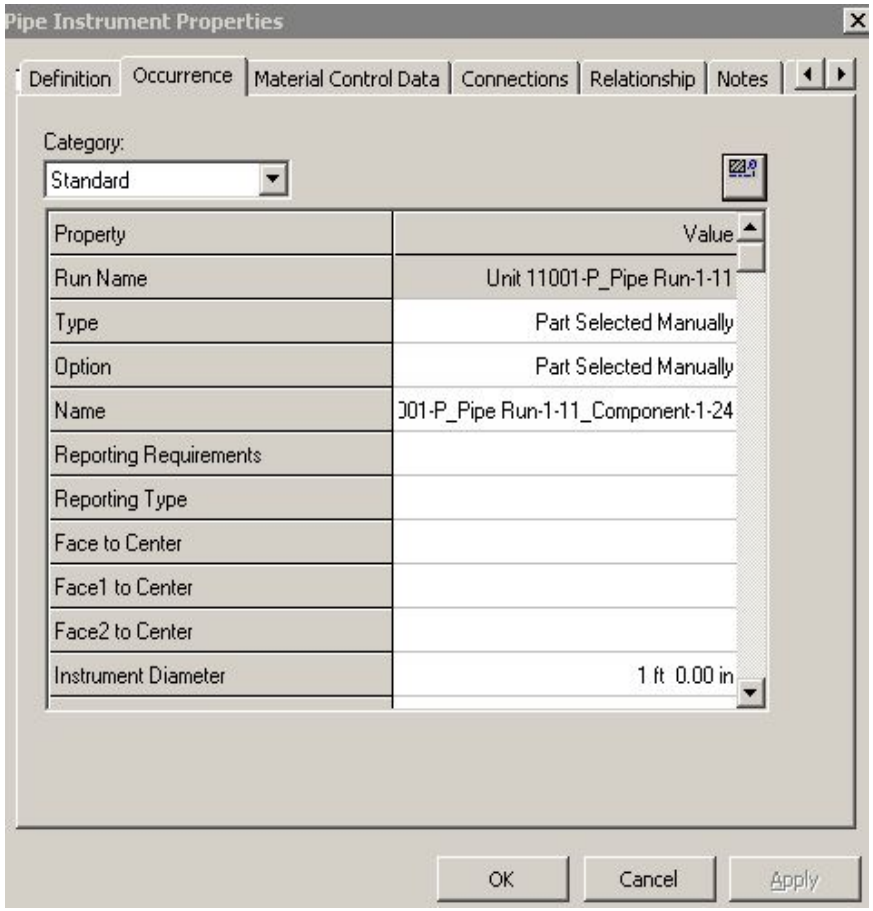


Instruments

Placement of Instrument Items On the Fly: User is able to provide item dims.



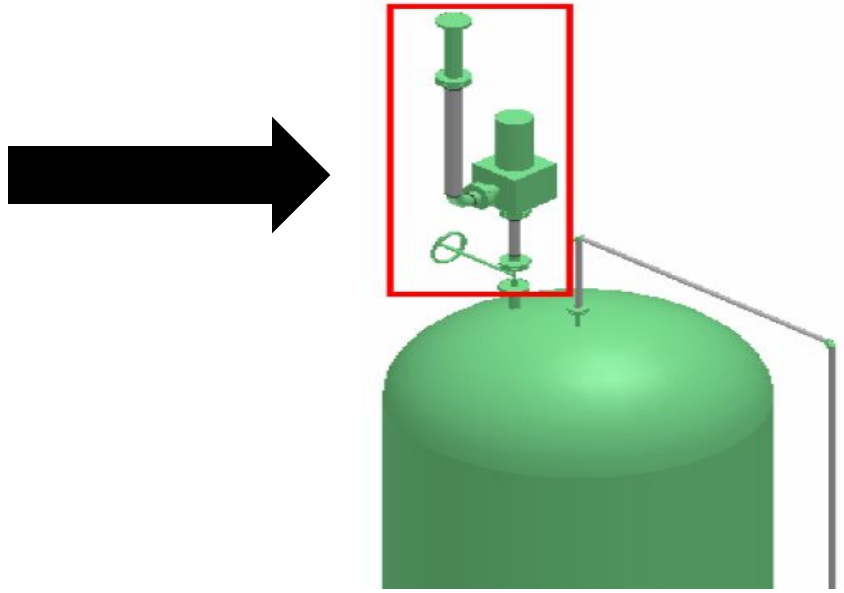




Placing Piping Specialty Items

- Specialty items are piping components that are not defined as a part of piping specification. Just like instruments, you can place specialty items in a pipeline to perform a specific task.

Isolating Gate Valve



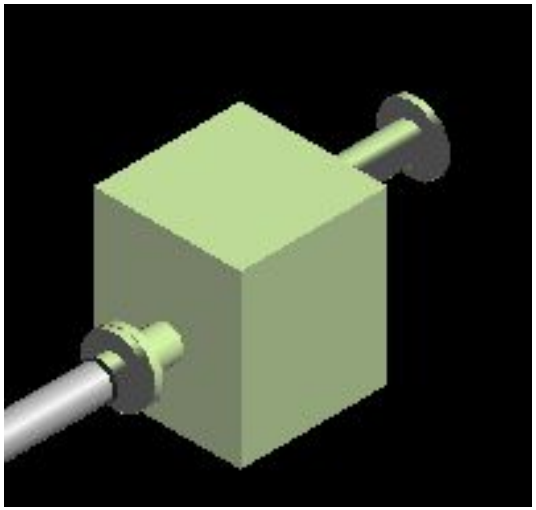
Piping Specialty Items Types

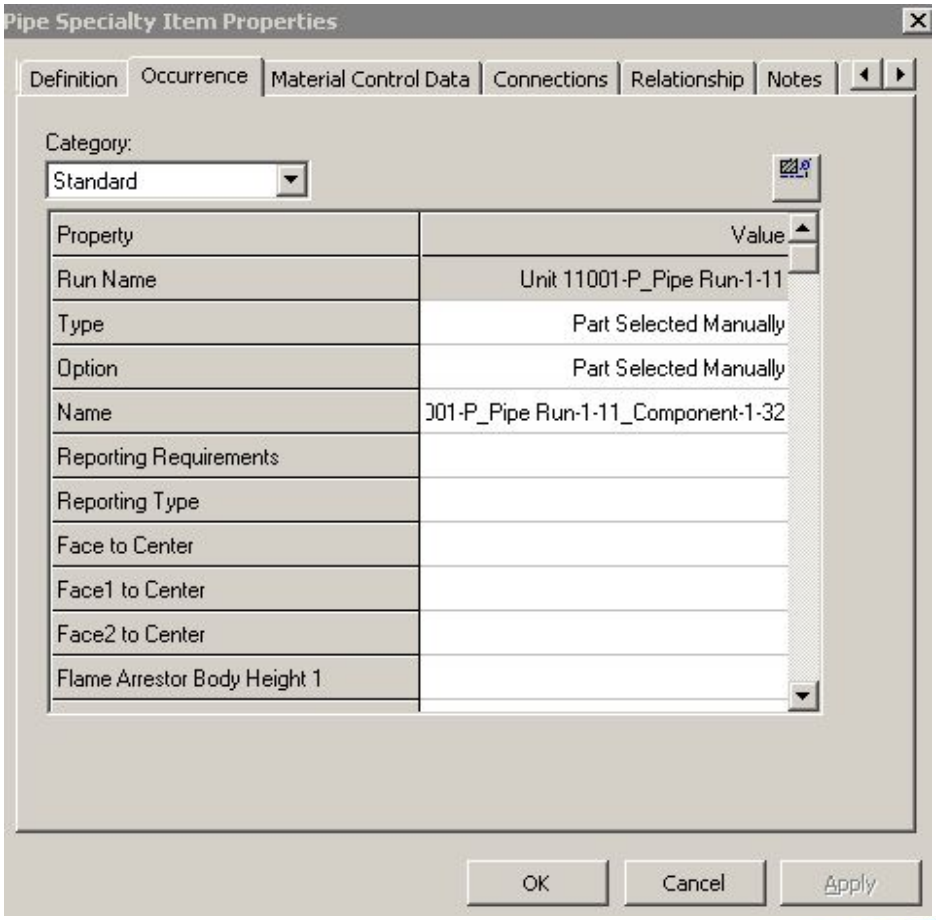
- **Stock specialty items:** These items represents the piping items purchased from a manufacturer's catalog, where no real engineering is required other than selecting the correct size and material.

- **Custom specialty items:** These items are typically driven by parameters. Therefore, you can change their size and shape after placing them in the model.

Placing Piping Specialty Items: Properties

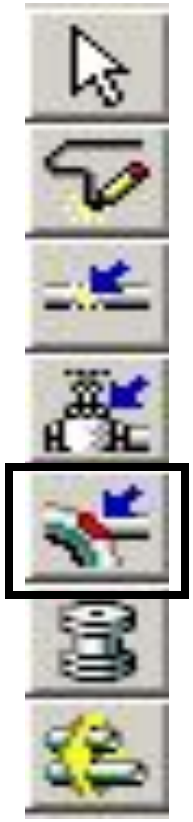
Placement of Specialty Items On the Fly

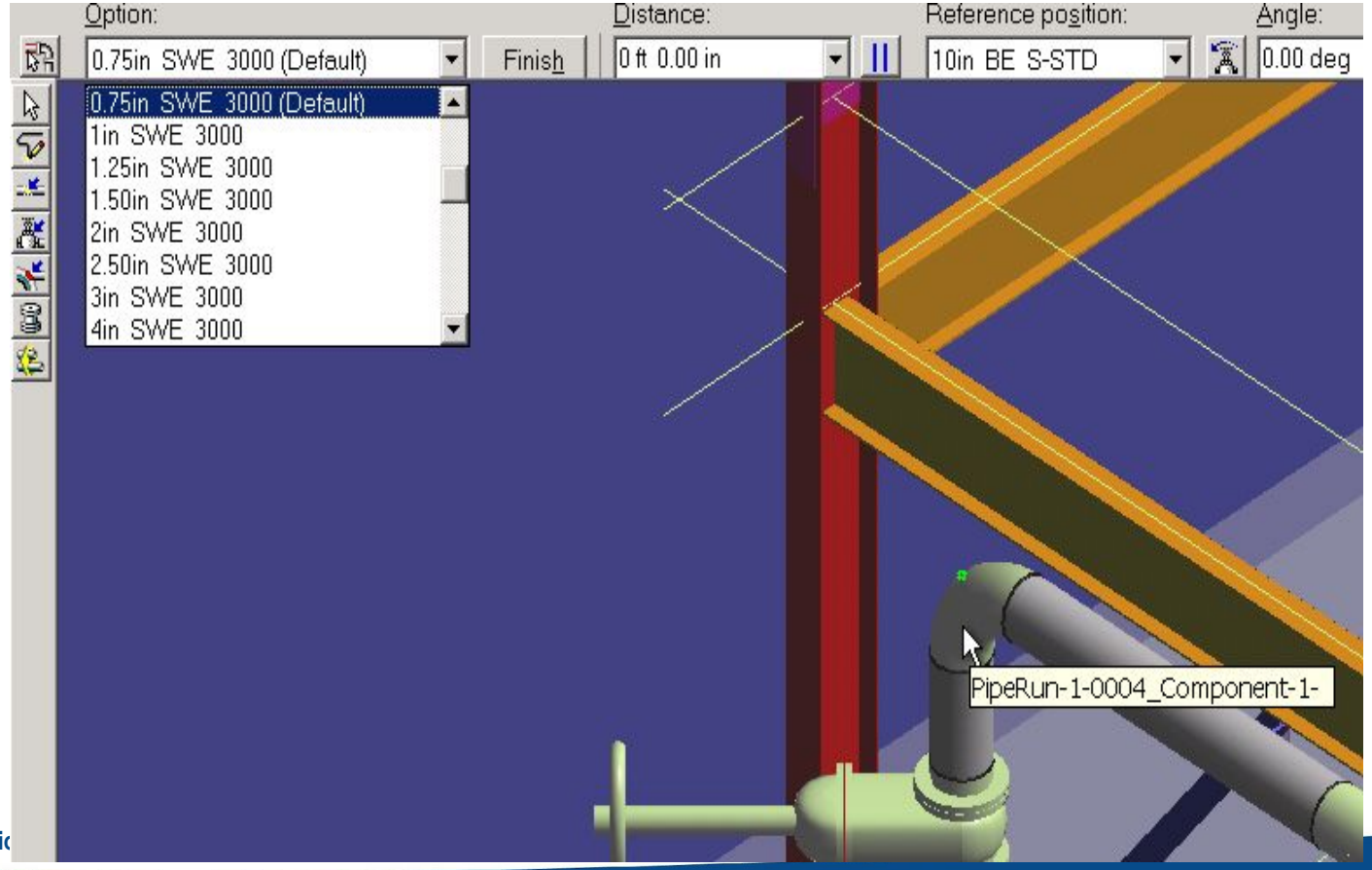




Insert Tap

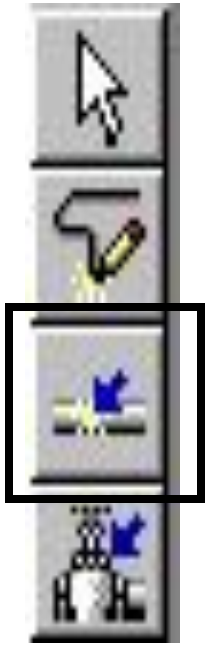
Use this command when in need to tap a drain, vent, or instrument connection. Used to place taps on all piping components; elbows, tees, caps, valves, pipes, and so forth; except for mating parts.

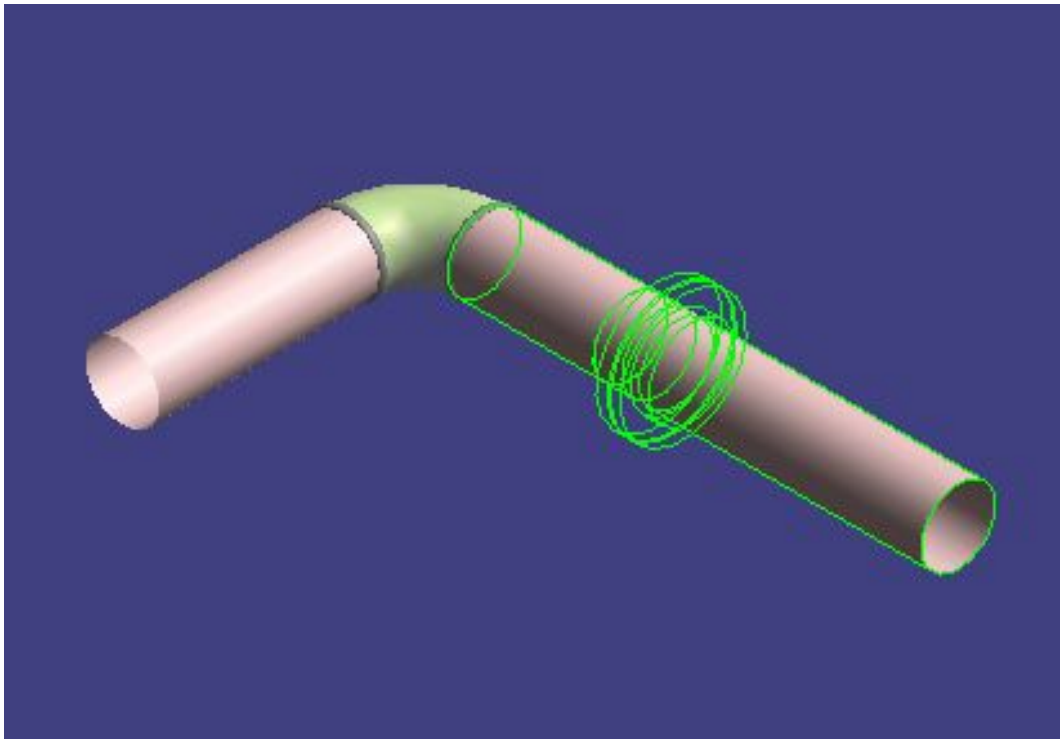




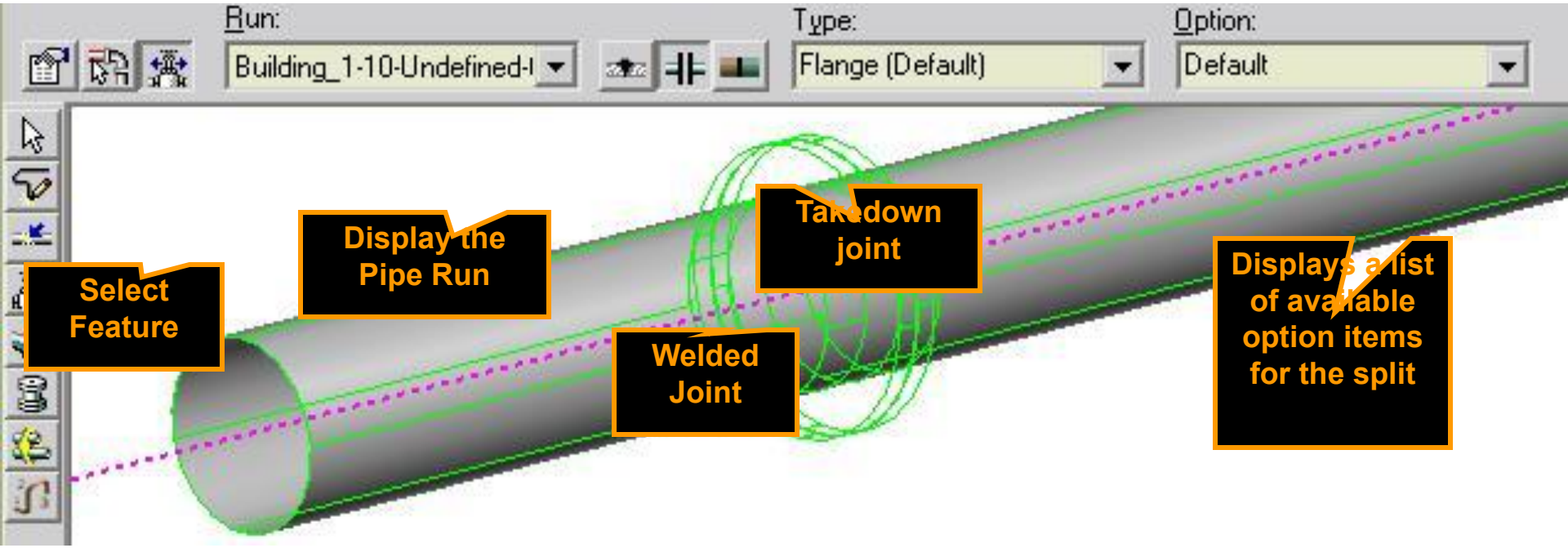
Inserting Splits : Insert Split Command Bar

The Insert Split command cuts a straight pipe and connects the parts by a weld joint or a takedown joint.



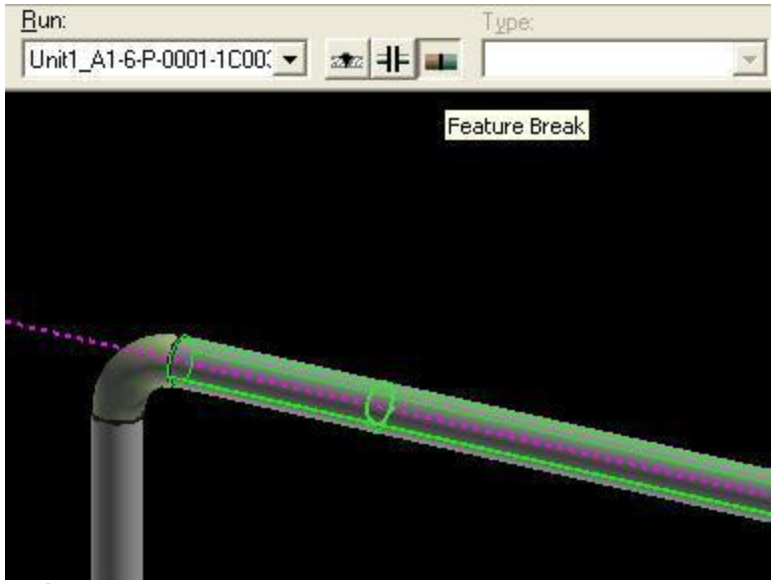


Inserting Splits : Insert Split Ribbon Bar



Inserting Splits : Attribute Break

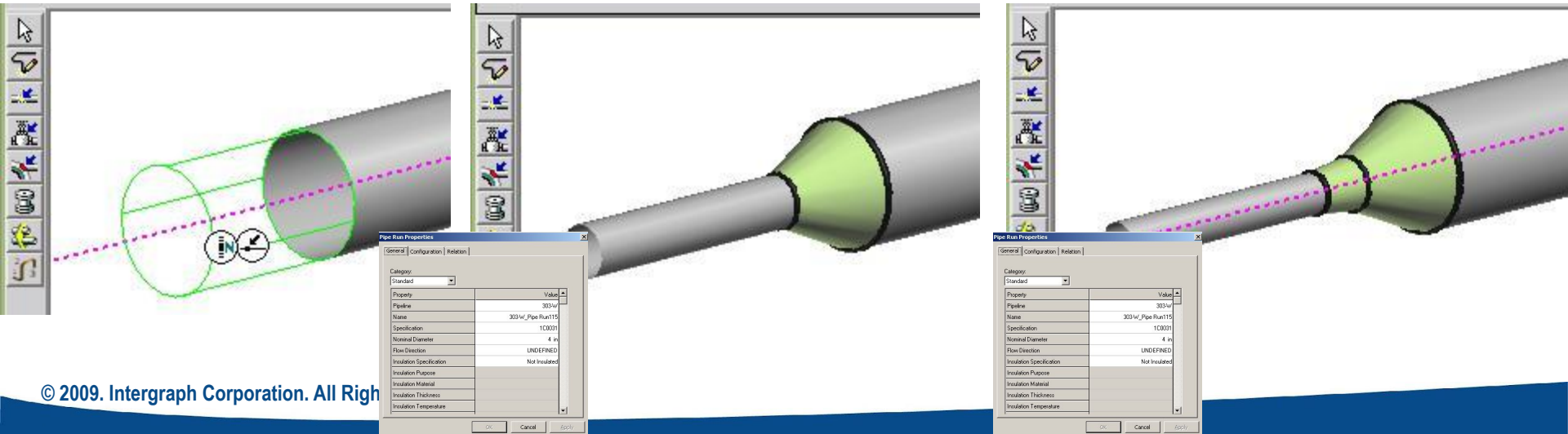
The **Insert Split** command can also be used to create a feature break. This makes it possible to stop heat-tracing, insulation, or a surface coating at an arbitrary location along the pipe instead of at a weld or other break in the line.



Inserting Splits : Attribute Break

Edit Pipe Run properties during modeling to create an attribute break.

- When the run properties are changed, the corresponding feature properties are automatically changed as well.
- When NPD is changed, reducers are selected from the spec to satisfy the NS change.

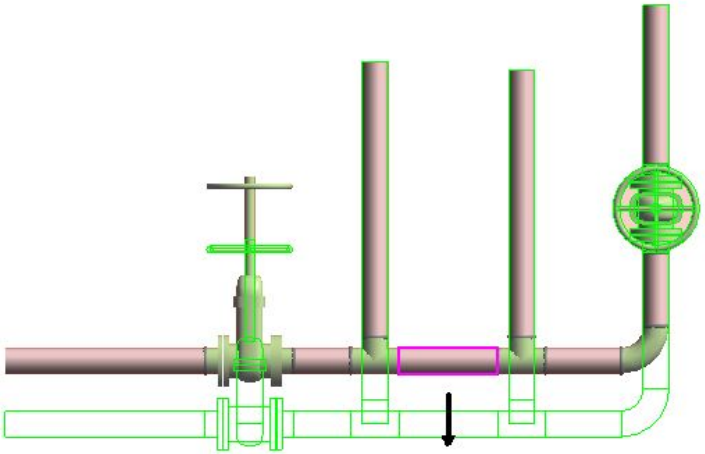


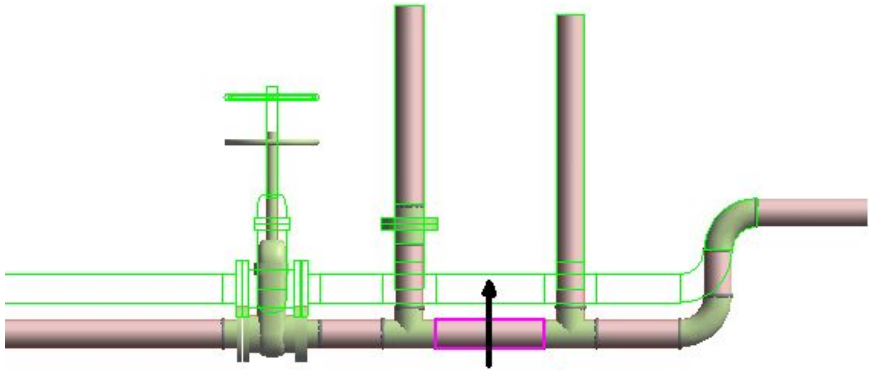
Piping Practice Labs

- Routing Pipes from P&ID
- Placing Piping Instruments
- Placing Piping Specialty Items
- Placing Taps
- Placing Splits

Piping Manipulation : Edit Straight Features

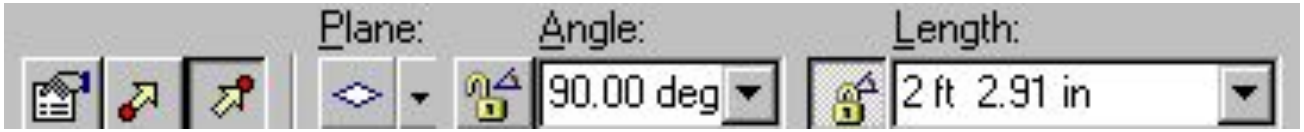
- Moving a SF moves the entire leg to which the feature is connected.
- The move direction is always perpendicular to the axis of the SF.
- A branch feature (BF) connected to the moved leg maintains its original angle.
- Movement stops when parts on the associated leg overlap, or when they overlap with adjacent parts on connected legs.

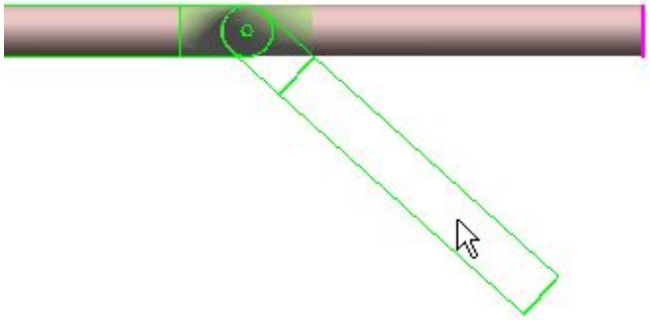




Piping Manipulation : Edit End Features

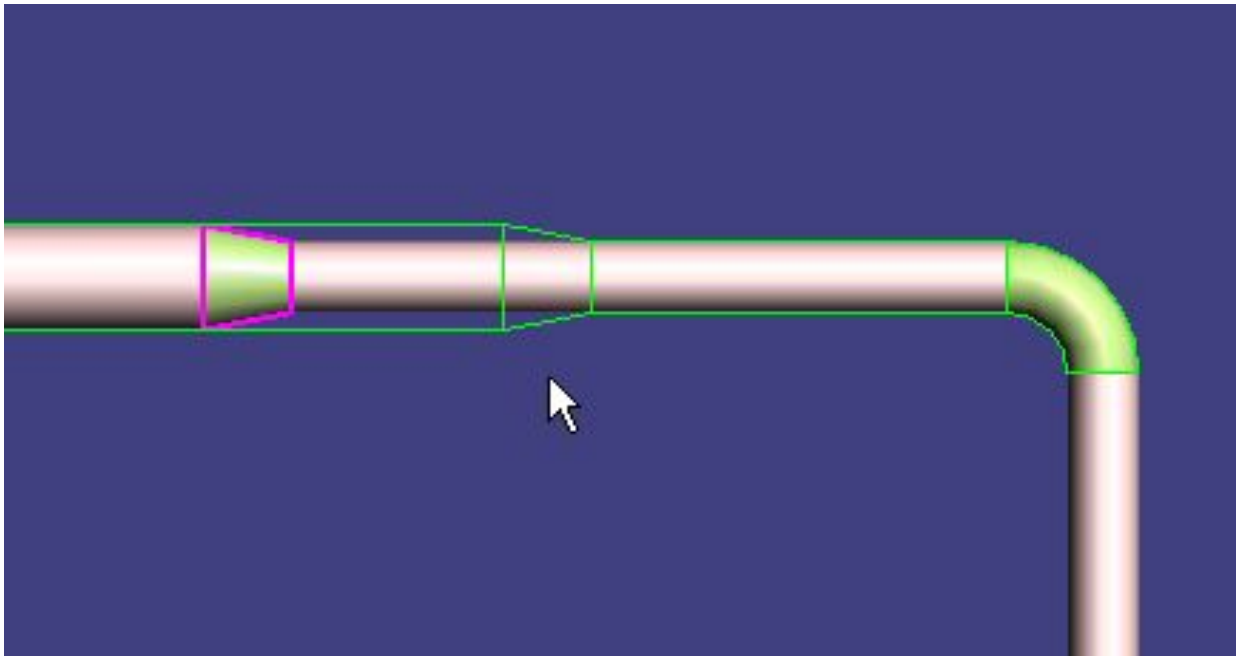
Moving the end feature by key in the length





Piping Manipulation : Edit Run Change Features

You can move the RCF along the associated straight feature. As you move the feature, the RCF appears in dynamic mode.

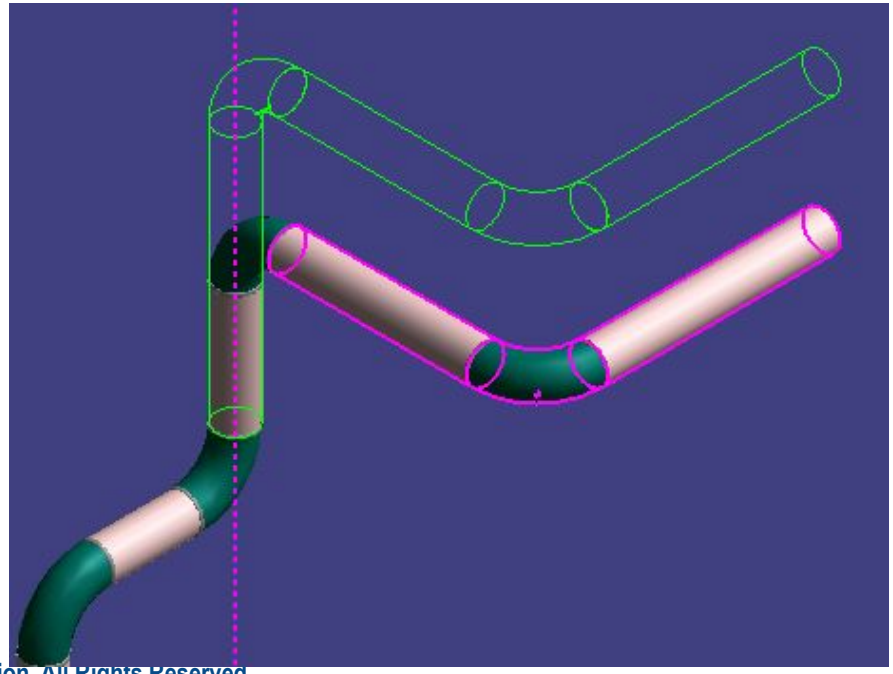


Piping Manipulation : Editing Features

Shift – Select Command

Move selected legs

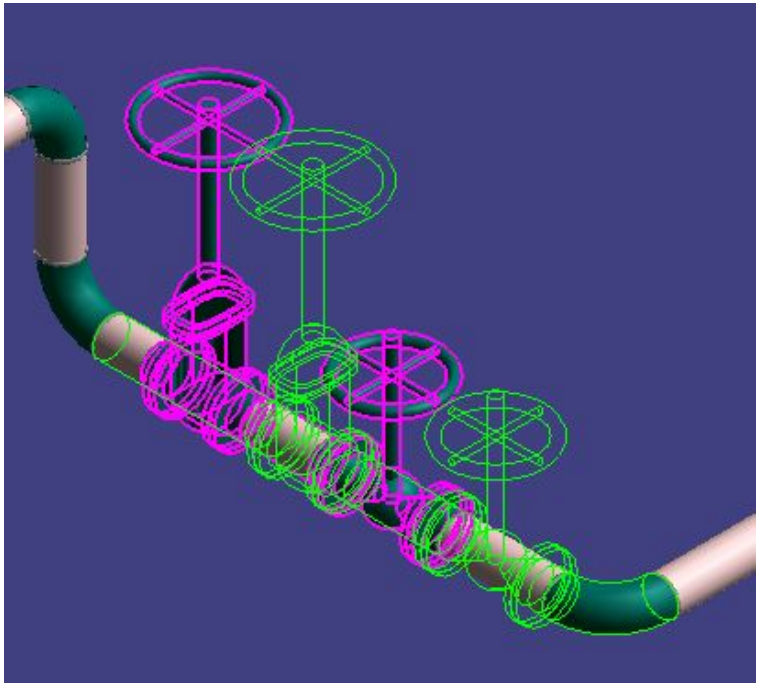
- Point along tool



Piping Manipulation : Editing Features

Shift – Select Command

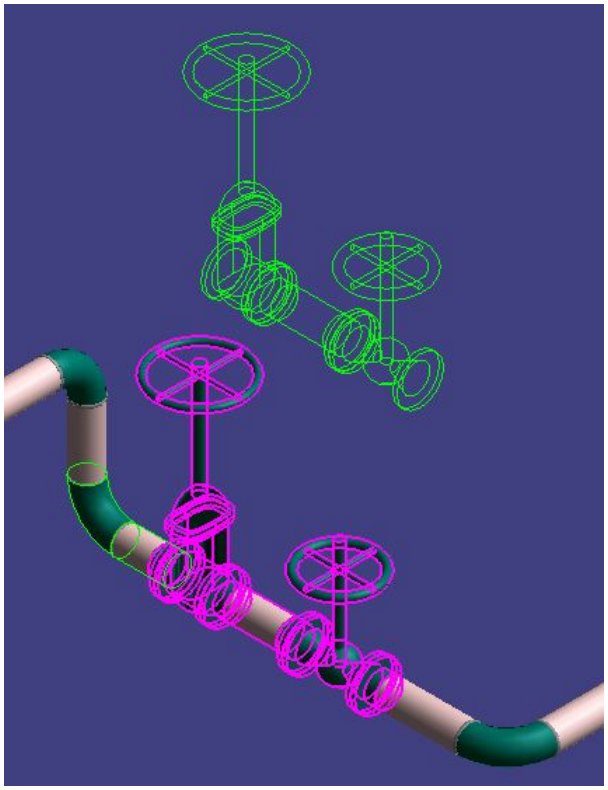
Move along the leg the selected items

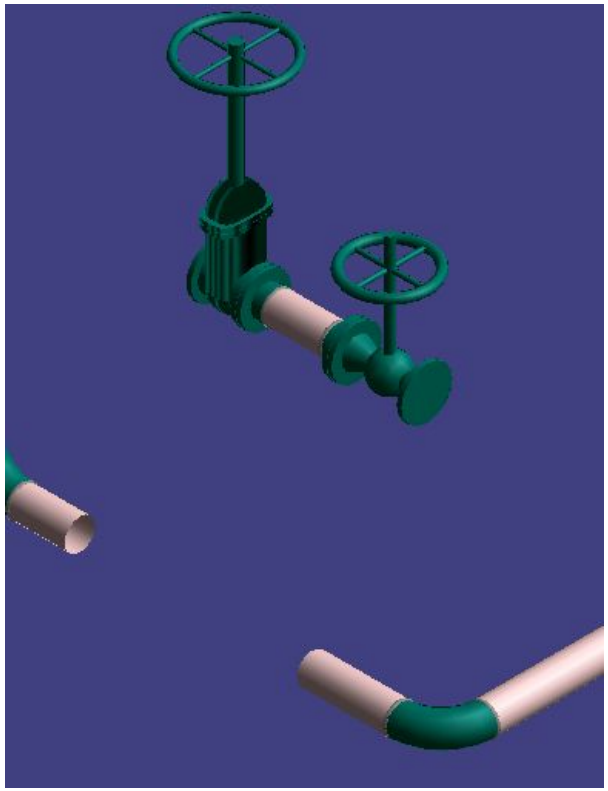


Piping Manipulation : Editing Features

Shift – Select Command

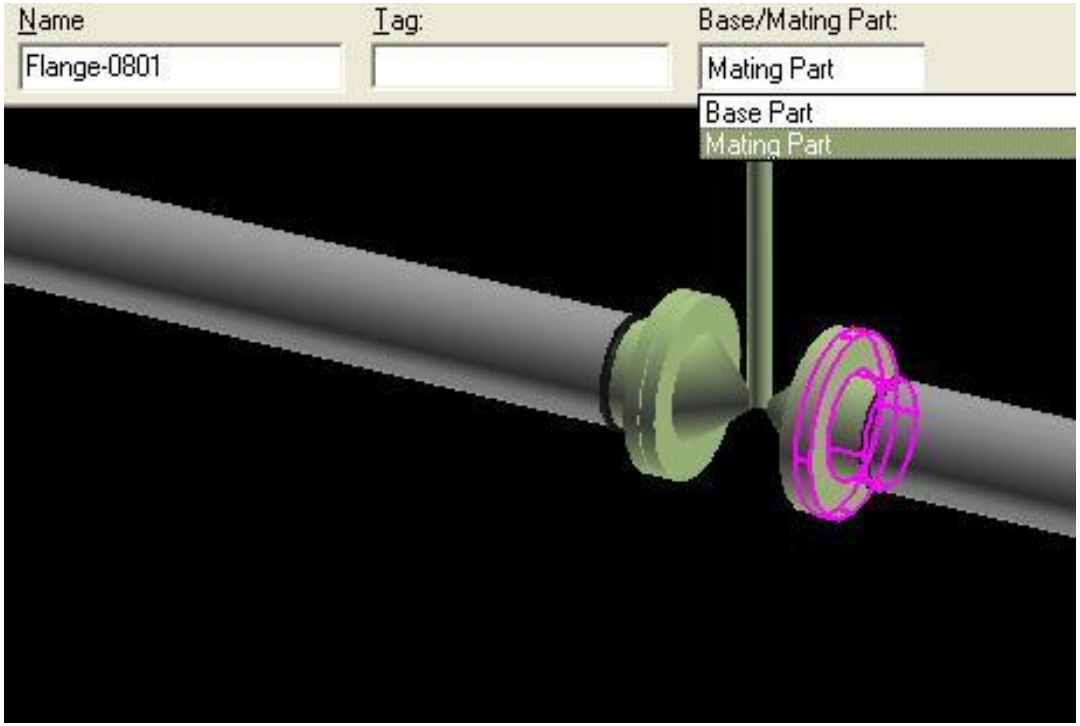
Turn off the moving along the leg





Piping Manipulation : Part Modification

Mating parts can be changed to base parts using either the ribbon or the property page.



Mating Parts: Depend of a parent component for placement, i.e. if parent valve is deleted, mating flange is also removed.

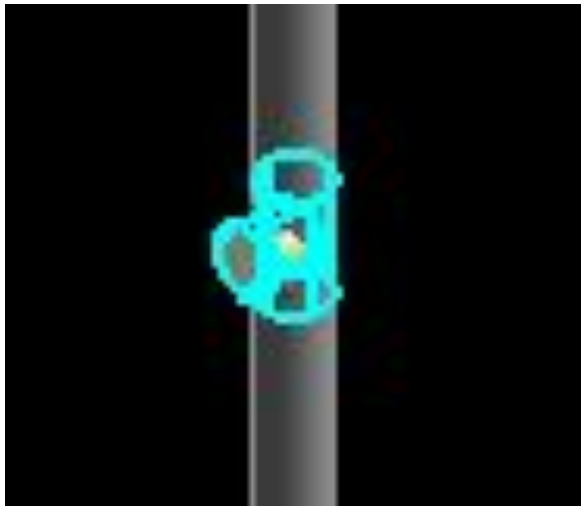
Base Parts: Independent from mating component, i.e. if connecting valve is deleted, flange remains.

Piping Manipulation : Item Replacement

- Operator may replace item with another of same type
- Presentation of only one short code for a particular item.
- If a component has been generated automatically by the solver, the user sees two entries in the Type list for that object: one with a "Default" suffix signifying that this part is rule generated and one without the suffix.

Piping Manipulation : Modification

Ability to rotate components after insertion



Dynamic

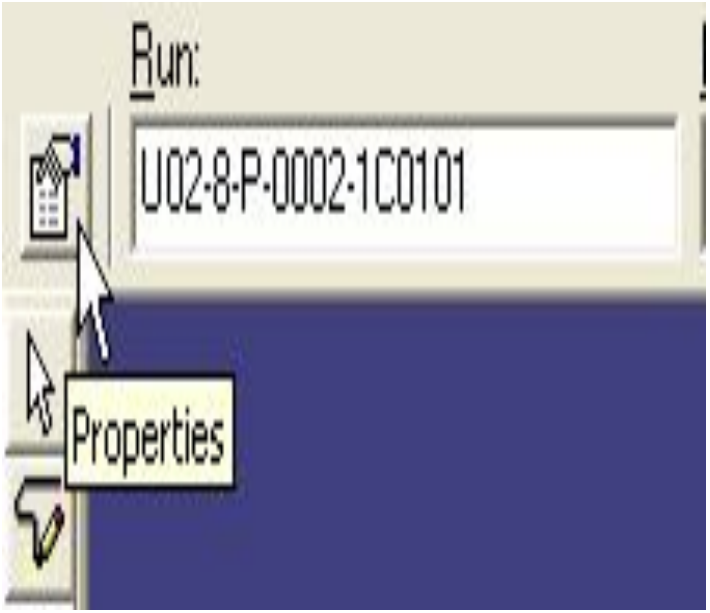
Key-In

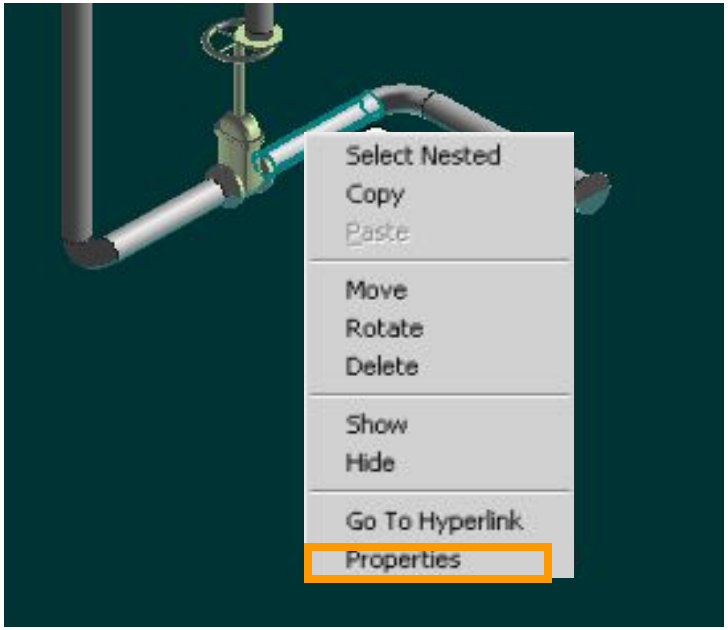
Piping Manipulation : Modification

- Copy/Paste commands are available
- Mirror Copy command is available
- Creation of a connection (geometry permitting) when multiple objects are moved and placed on another object

Piping Properties : Properties

Right clicking on pipe run or Selecting Pipe run and selecting properties on the Route pipe ribbon bar. feature brings up menu when in Route Pipe environment

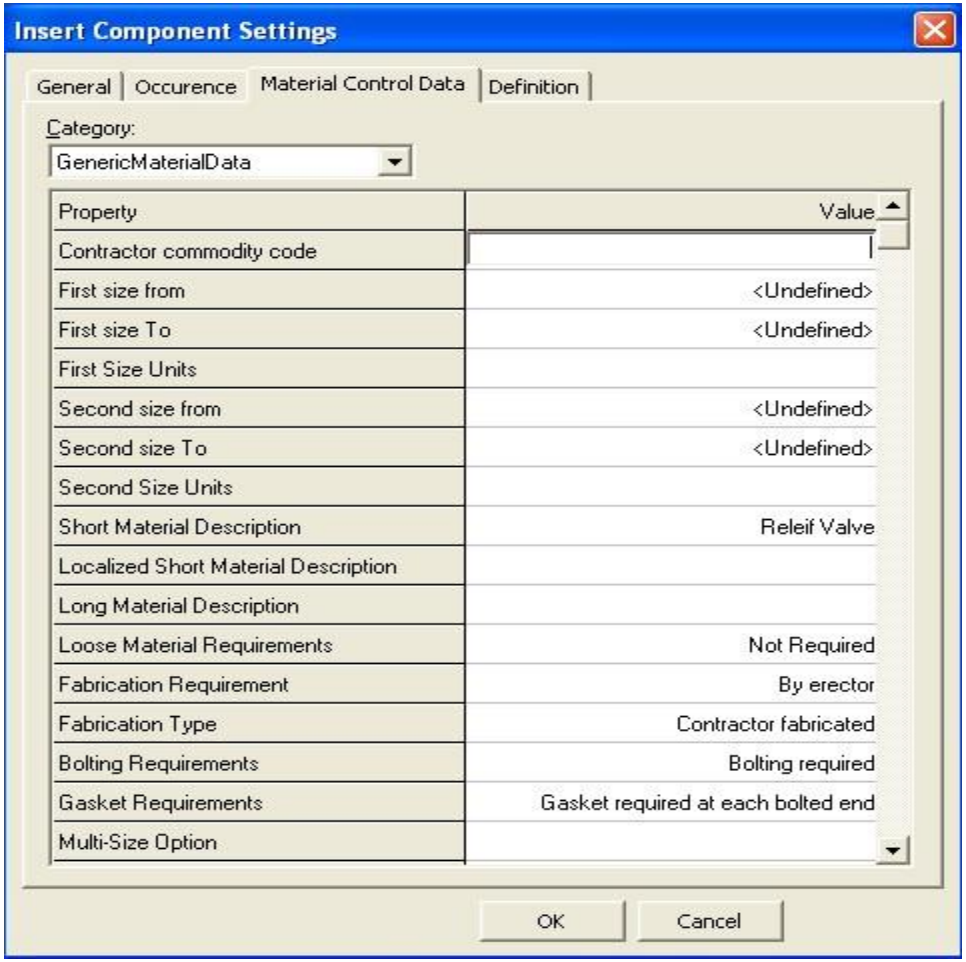




Piping Properties :Edit Properties Command

Edit Pipe Run properties.

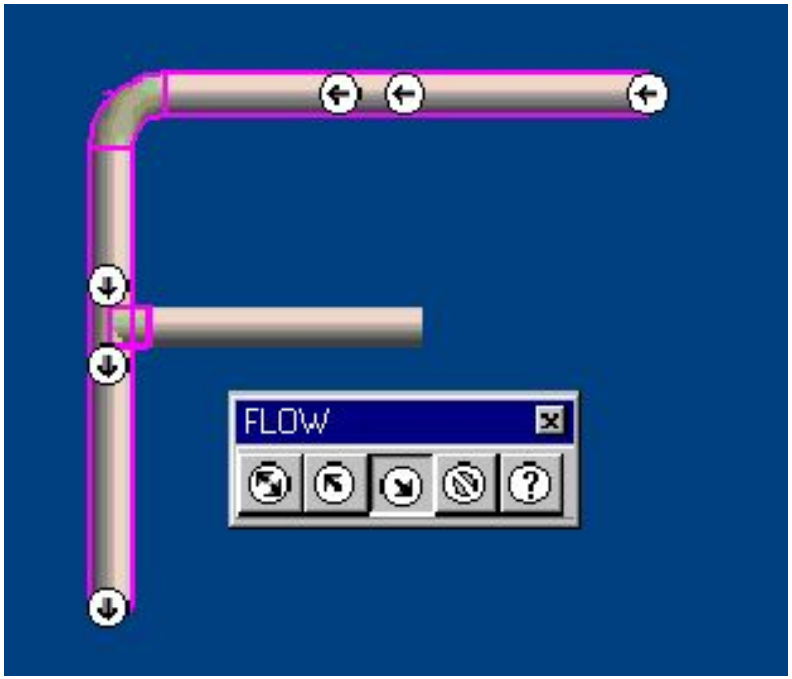
- Features inherit the common properties of the run by default.



Piping Properties : Flow Direction

Flow Direction

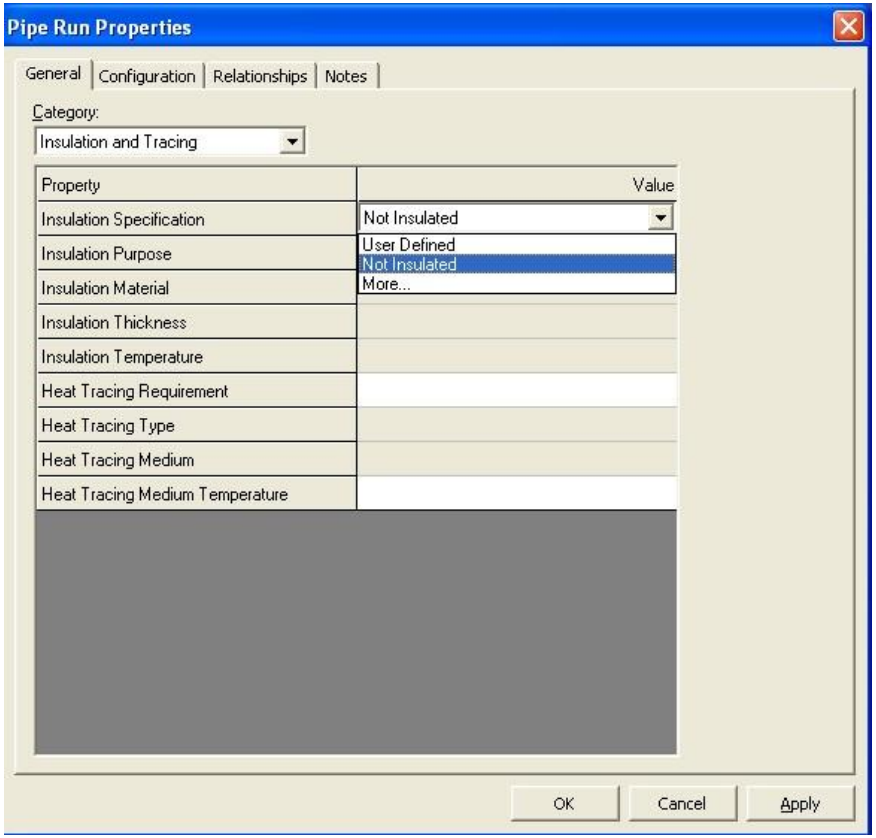
- Downstream is the direction from the start to the end of the run



Bi-directional, Upstream, Downstream, No flow, Undefined

Piping Properties : Edit Properties Dialog Box

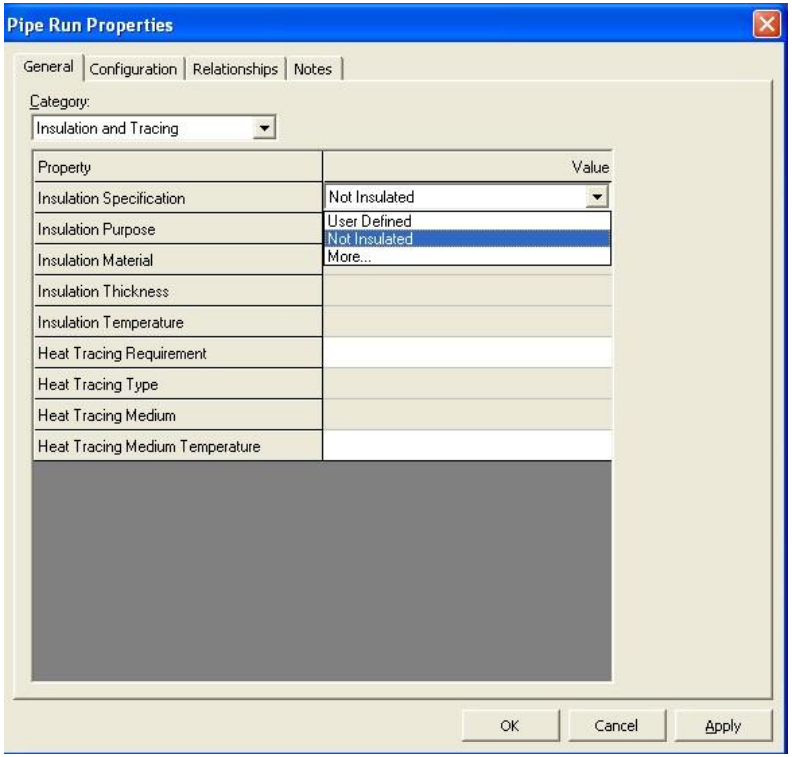
Insulation



Piping Properties : Edit Properties Dialog Box

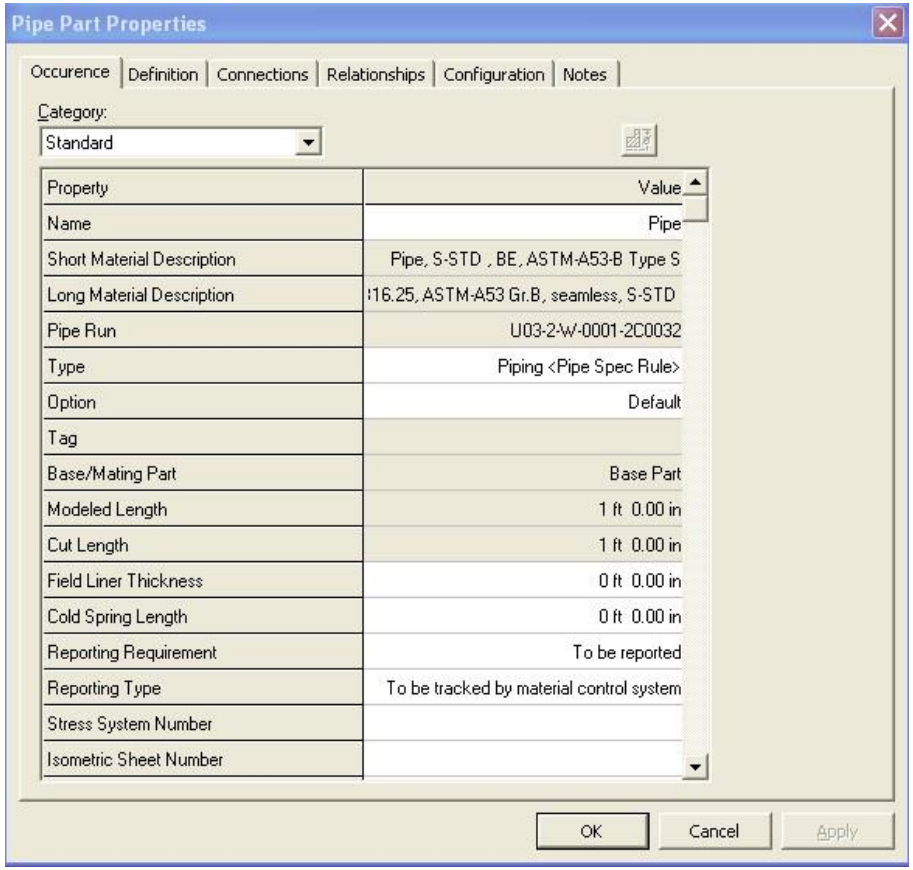
Edit Pipe Run properties

Relation Tab displays all the relationships defined for the selected pipe run.



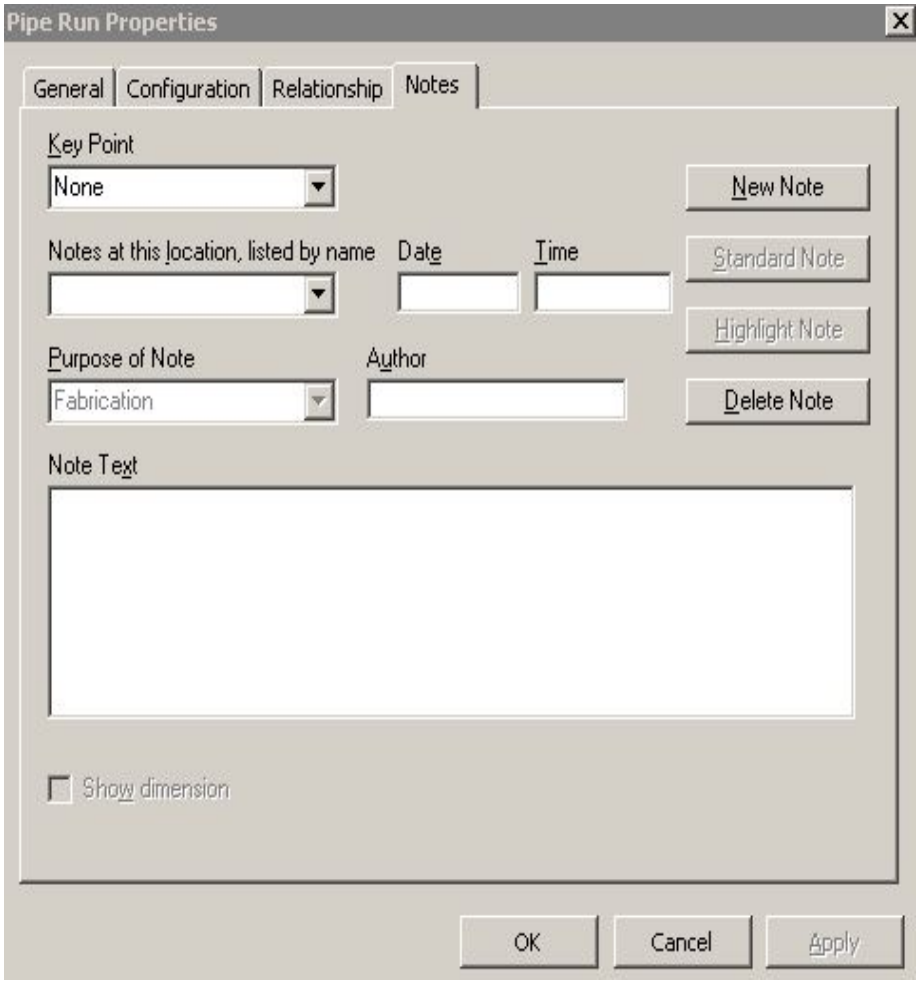
Piping Properties : Edit Properties Dialog Box

- Pipe cut lengths to reflect lining & weld gap



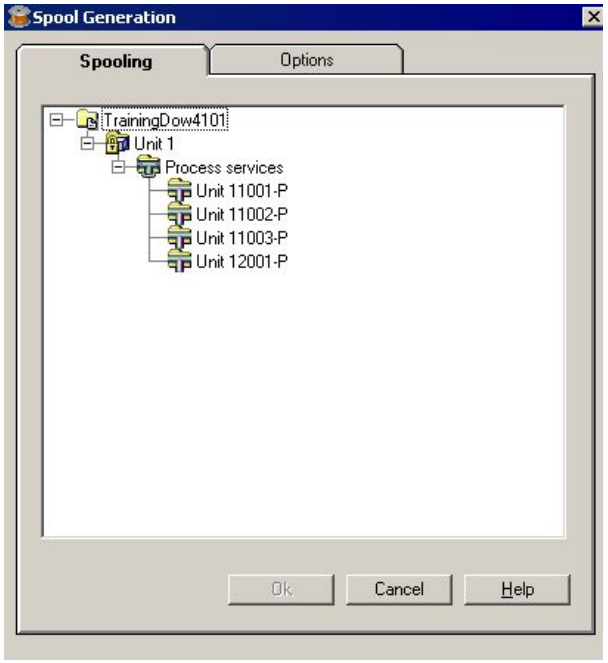
Piping Properties : Inserting notes

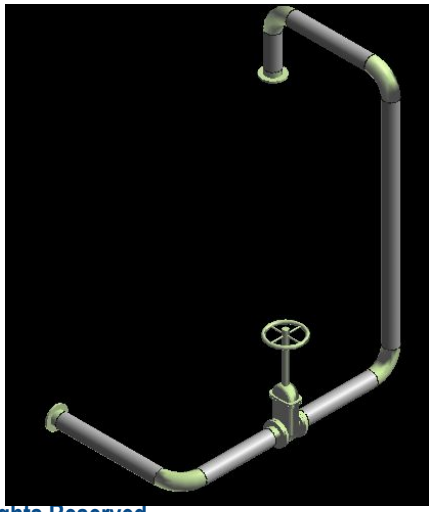
- Ability to insert notes on higher level objects such as pipelines and runs

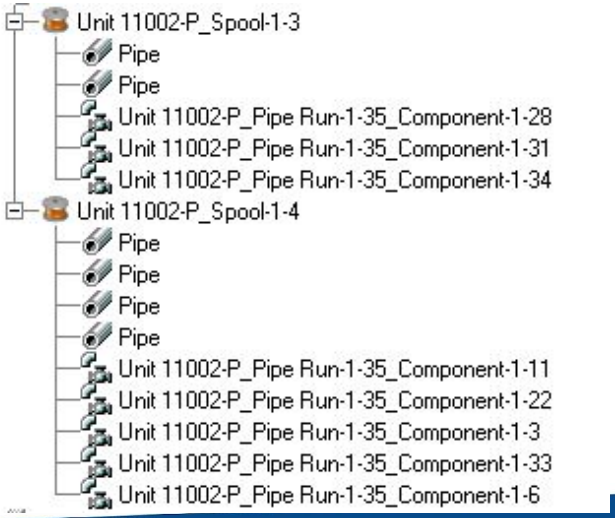


Creating Spools

- Generation of Spools
  - Generate Spools

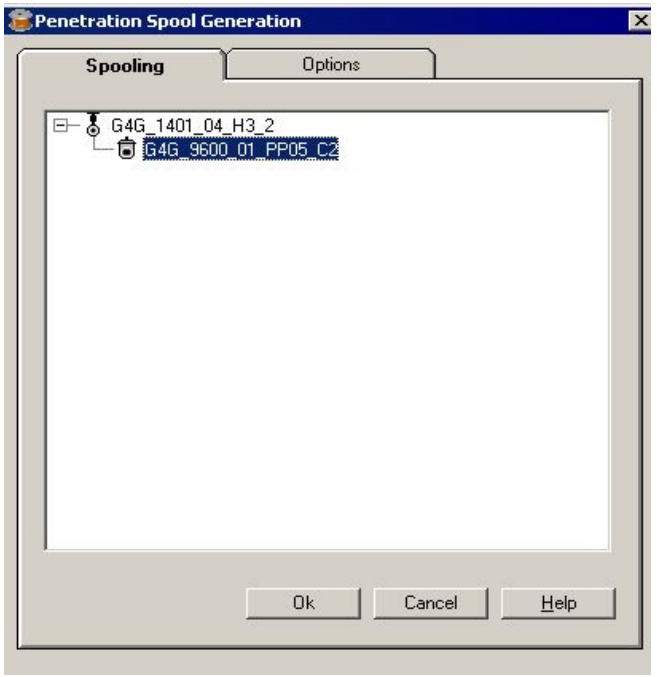


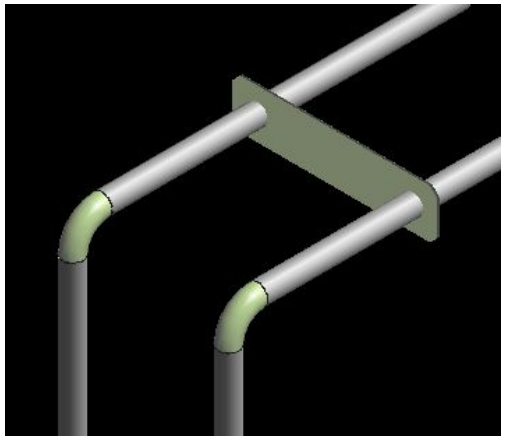


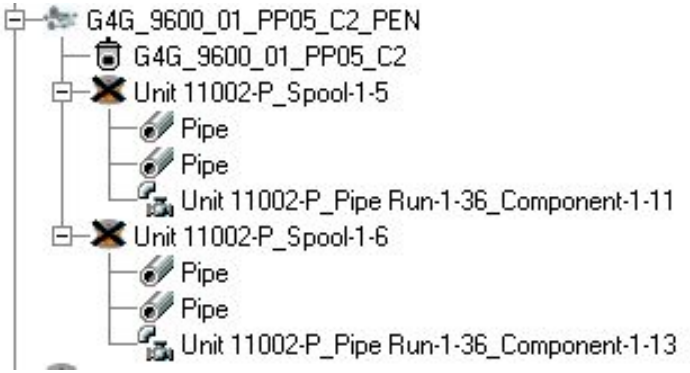


Creating Spools

- Generation of Spools
  - Create Penetration Spools



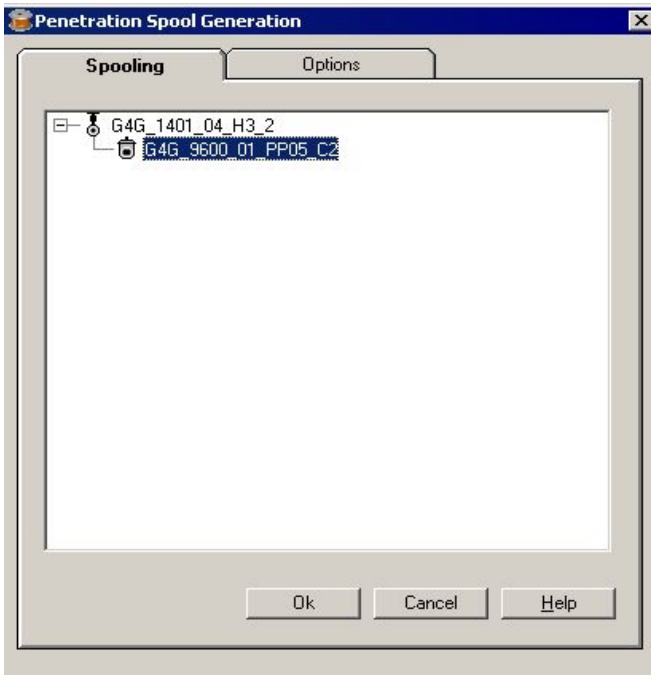


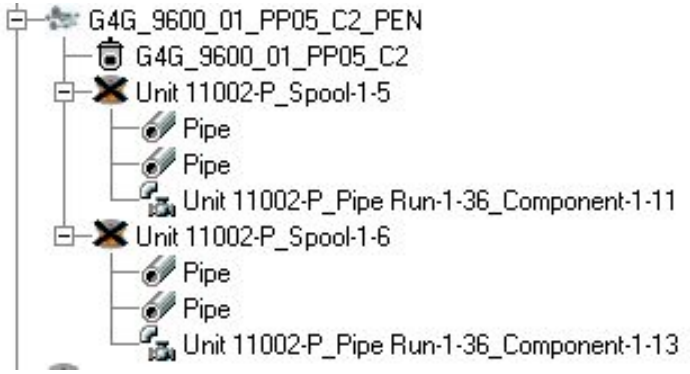


Creating Spools

- Naming of Spools

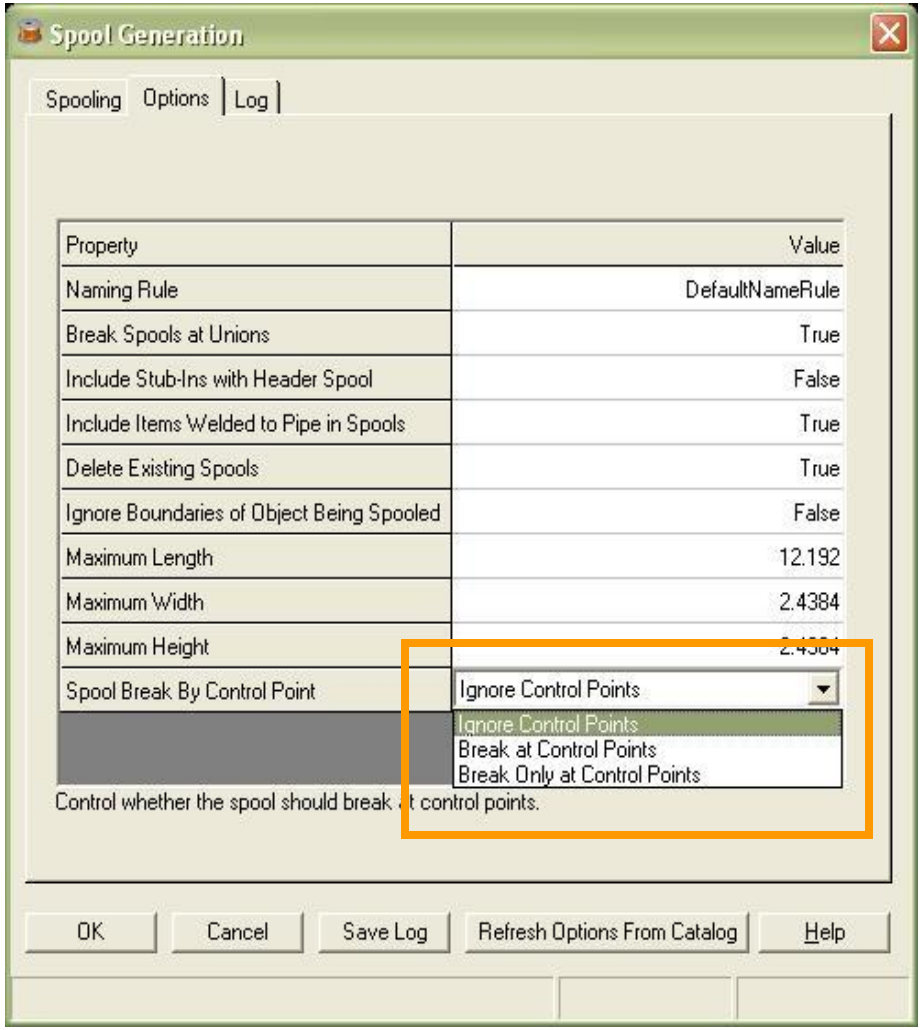
  Spooling options always default to those defined in the Catalog with interactive setting changes persisting for the current session only.





Creating Spools

- Breaks at unions by system
- Breaks at user defined control points

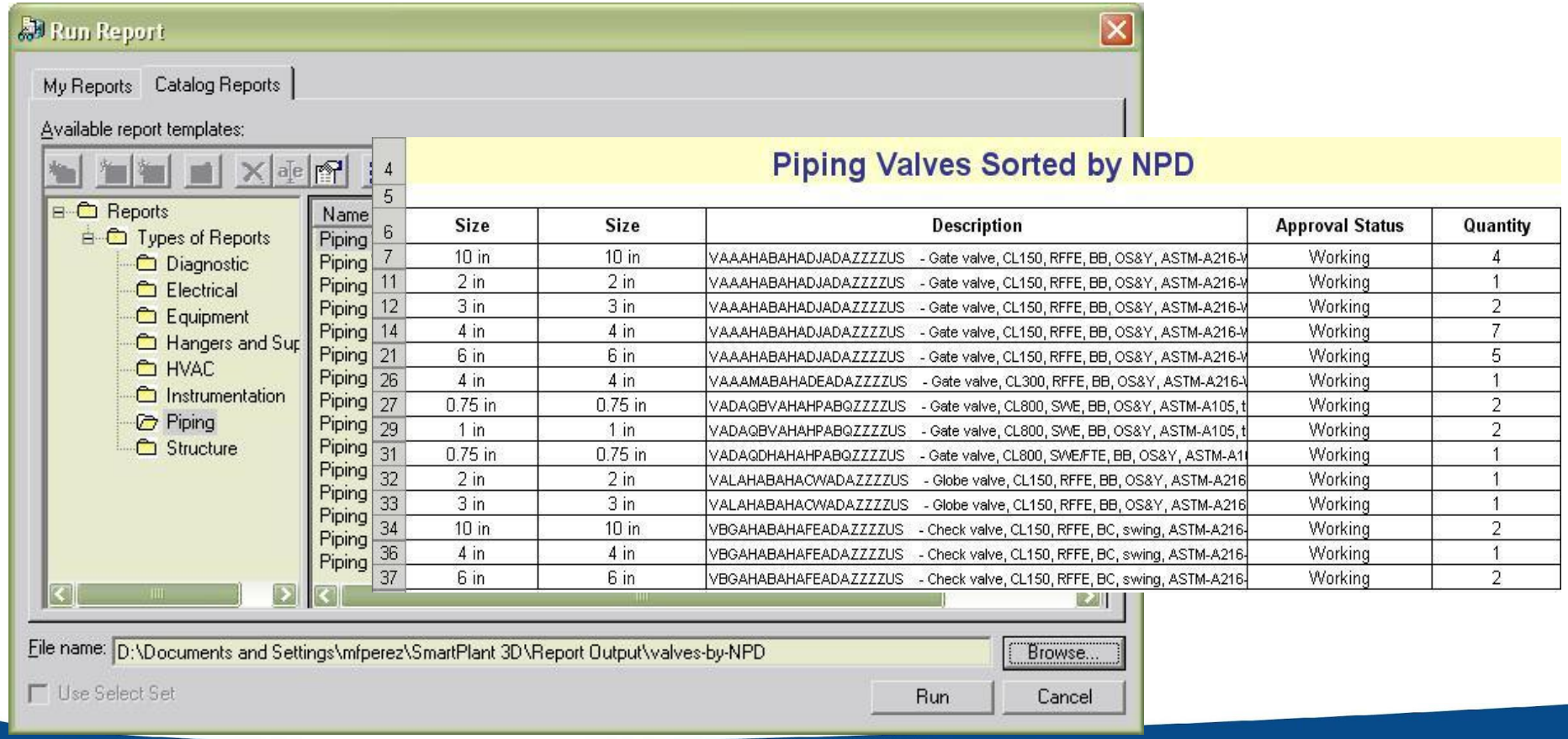


Sequence Objects

Renames objects in the selected pipeline, pipe run, or spool such that the names are in order. You can select to sequence the objects based on flow direction or topology.

Materials Reports

Users can easily extract materials lists for review from their modeled pipelines.



Piping Valves Sorted by NPD

	Size	Size	Description	Approval Status	Quantity
7	10 in	10 in	VAAAHABAHADJADAZZZZUS - Gate valve, CL150, RFFE, BB, OS&Y, ASTM-A216-W	Working	4
11	2 in	2 in	VAAAHABAHADJADAZZZZUS - Gate valve, CL150, RFFE, BB, OS&Y, ASTM-A216-W	Working	1
12	3 in	3 in	VAAAHABAHADJADAZZZZUS - Gate valve, CL150, RFFE, BB, OS&Y, ASTM-A216-W	Working	2
14	4 in	4 in	VAAAHABAHADJADAZZZZUS - Gate valve, CL150, RFFE, BB, OS&Y, ASTM-A216-W	Working	7
21	6 in	6 in	VAAAHABAHADJADAZZZZUS - Gate valve, CL150, RFFE, BB, OS&Y, ASTM-A216-W	Working	5
26	4 in	4 in	VAAAMABAHADEADAZZZZUS - Gate valve, CL300, RFFE, BB, OS&Y, ASTM-A216-W	Working	1
27	0.75 in	0.75 in	VADAQBVAHAHPABQZZZZUS - Gate valve, CL800, SWE, BB, OS&Y, ASTM-A105, t	Working	2
29	1 in	1 in	VADAQBVAHAHPABQZZZZUS - Gate valve, CL800, SWE, BB, OS&Y, ASTM-A105, t	Working	2
31	0.75 in	0.75 in	VADAQDHAHAHPABQZZZZUS - Gate valve, CL800, SWE/FTE, BB, OS&Y, ASTM-A1	Working	1
32	2 in	2 in	VALAHABAHACWADAZZZZUS - Globe valve, CL150, RFFE, BB, OS&Y, ASTM-A216	Working	1
33	3 in	3 in	VALAHABAHACWADAZZZZUS - Globe valve, CL150, RFFE, BB, OS&Y, ASTM-A216	Working	1
34	10 in	10 in	VBGAHABAHAFEADAZZZZUS - Check valve, CL150, RFFE, BC, swing, ASTM-A216-	Working	2
36	4 in	4 in	VBGAHABAHAFEADAZZZZUS - Check valve, CL150, RFFE, BC, swing, ASTM-A216-	Working	1
37	6 in	6 in	VBGAHABAHAFEADAZZZZUS - Check valve, CL150, RFFE, BC, swing, ASTM-A216-	Working	2

Piping Practice Labs

- Manipulating Piping Objects
- Creating Spools
- Sequencing Objects
- Creating Isometric Drawings

Interactive Clash Detection

System can check new piping for interferences with same and other displayed disciplines as user works.