



Fabrication for MEP: Detailing, Costing, and Fabrication Integration

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Class Summary

This class builds on information about design line technology presented in the Go Beyond Design classes. This class will enable you to better understand how this technology, and the technology behind the Autodesk Fabrication products, can help contractors develop holistic knowledge around the portfolio to improve their business practices, increase productivity, and save money.

Learning Objectives

At the end of this class, you will be able to:

- Create and populated various aspects of the main database to fully drive fabrication, estimating and detailing including materials, connectors and specifications/pressure classes.
- Create and populate a fabrication service.
- Adopt Design Line technology for use in detailing and estimating.
- Appreciate Costing implications when detailing.

Main Database

- Single Database shared across all Fabrication products.
- Full control User Access – MapUser
- Access to Materials, Connectors, Airturns, Splitters, Supports, Dampers, Specifications.

User Access

By default the system is multi user, anyone can access the software and database. Control this by activating user logins with permissions.

- Rename the USER folder to off the Database folder to USERS, or create new.
- Default Account “administrator” “admin”
- Use “Configure Users” to set administrator password, and set up users with permissions.

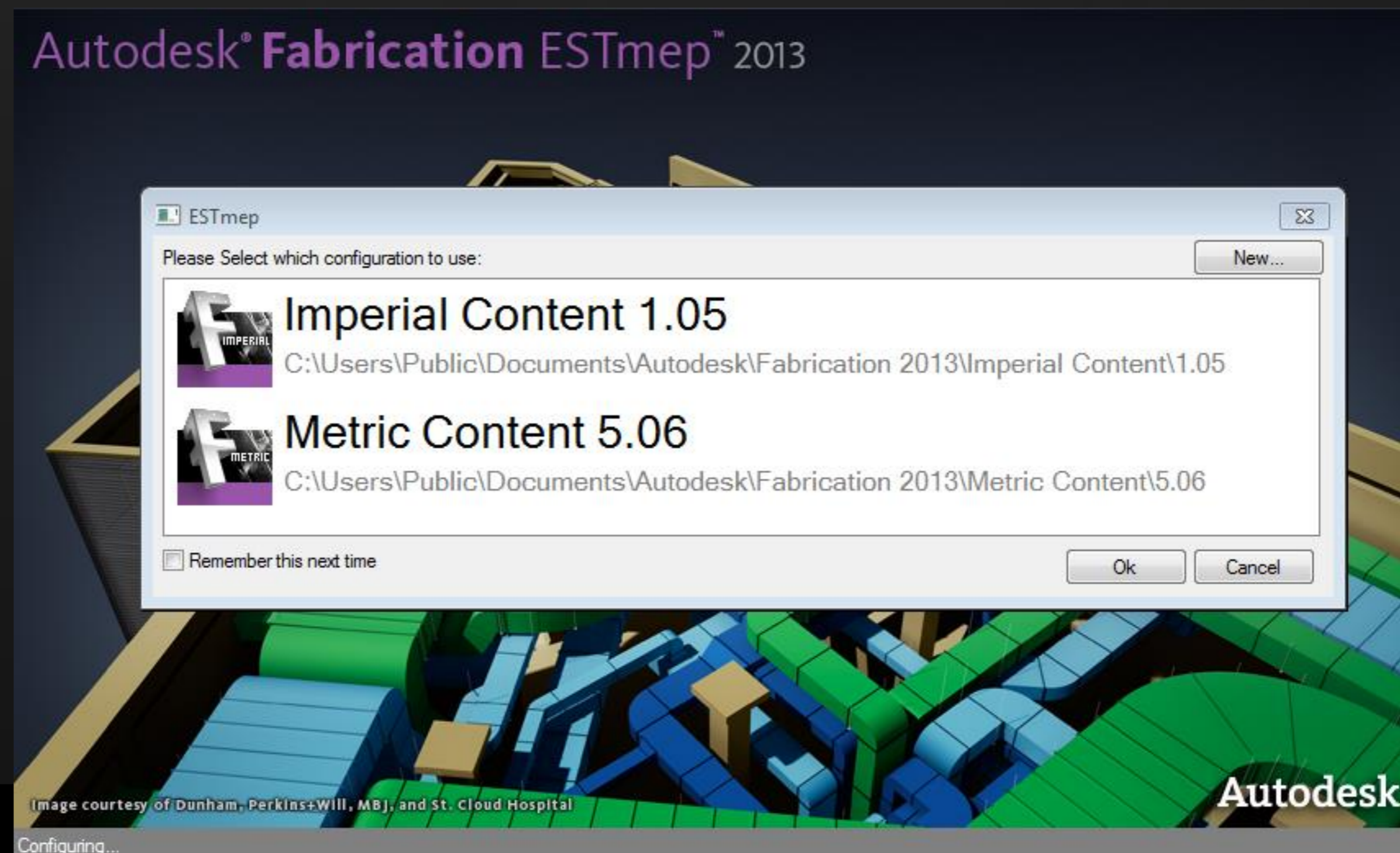
Single Fabrication Database.

The database should be considered in 2 parts, the Content and the data that drives the content.

Default root Install location is

“C:\Users\Public\Documents\Autodesk\Fabrication 2013”

Both Imperial and Metric Content and Database available.



Database - Materials

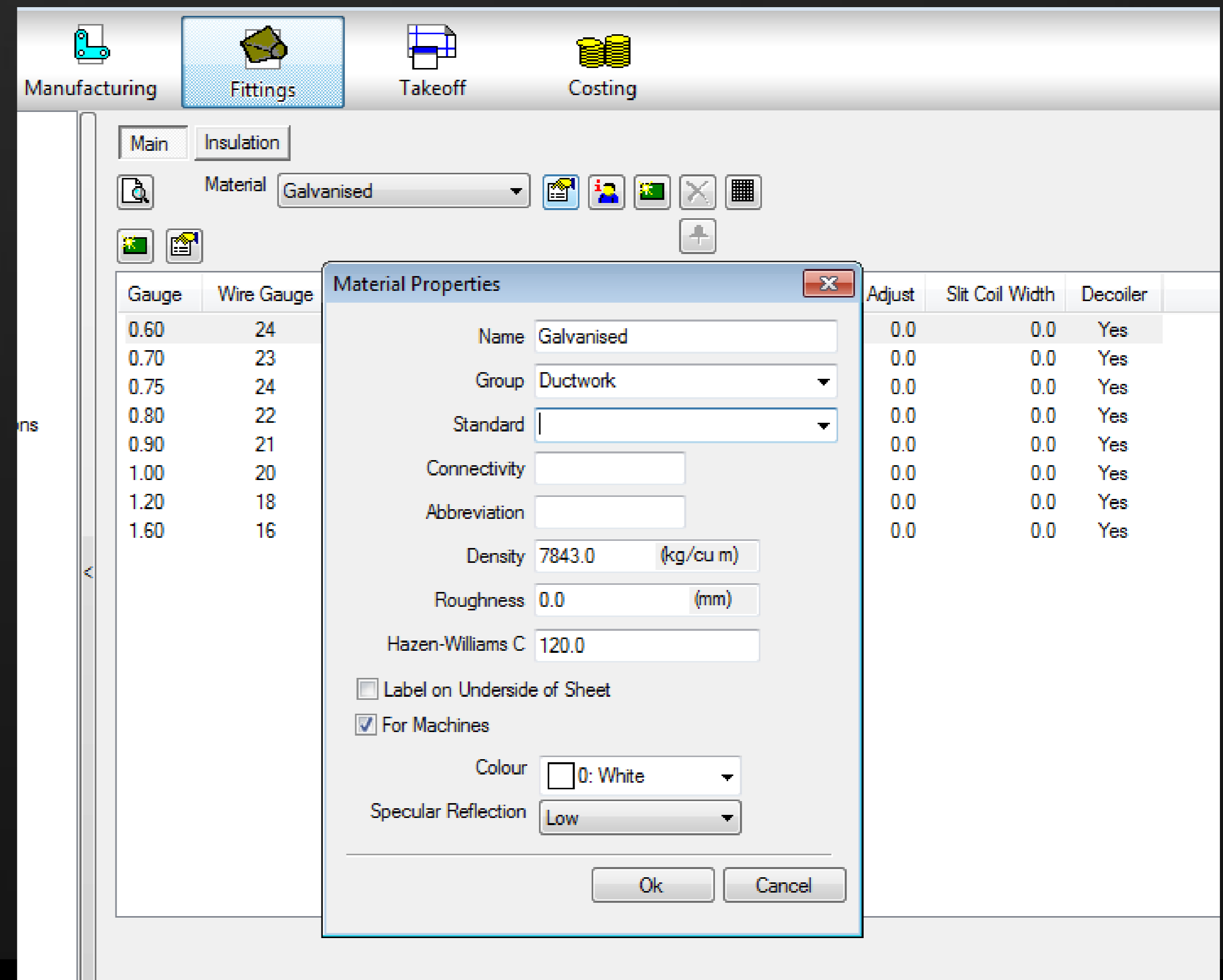
Set up Material names, Gauges, Costs, Sizes and other parameters.

Must Enter

- Name
- Sheet Size
- Gauge
- Density

Can Enter

- Group
- Cost
- Colour



Database - Connectors

3 Connector Types, Rectangular, Round and Oval. Pipework uses Round, Electrical uses Rectangular/Round

Connector setup split into 3 distinct areas.

- Manufacturing
- Estimating
- Drawing

NOTE Service Pack required to access all areas in all programs.

Database – Connectors - Manufacturing

Manufacturing selected from the Icon on the toolbar.

Should Enter

- Name
- Type
- Profile
- Turnover - Straight
- Adjusts
- Notches

Can Enter

- Everything else

To change Group, right click.

The screenshot displays the 'Library' window in Autodesk software, showing a list of connectors under the 'Rectangular' category. The 'Slide On Flange' group is expanded, listing various models like DM-20, DM-25, DM-30 J3, etc. A configuration dialog for 'Slide On Flange: DM-25 {v2}' is open, showing a table of parameters and their values.

Data	Value
Name	DM-25
Turnover	0.00
Straight	0.00
Roller Allowance	0.00
Straight Notch	None
Sloping Notch	Remove FEMALE s...
Type	Whole
Adjust Long/Slide	-34.00
Adjust Short/Drive	-34.00
Profile	Yes
Slit	No
Hole Length	Default
Hole Width	Default
Hole Inset	Default

Database – Connectors - Estimating

Estimating data selected from the Icon on the toolbar.

Name Enter

- Name
- F-Rate
- E-Rate
- Ancillaries, Corners, Bolts, Qty.

Can Enter

- Everything else

The screenshot shows a software interface with a toolbar at the top containing icons for a calculator, a ruler, a list, and a grid. A dropdown menu is set to 'Rectangular'. Below the toolbar is a table listing various connectors. The 'Slide On Flange' category is expanded, showing a list of items including DM-20, DM-25, DM-30 J3, DM-30 J4, DM-35 J3, DM-35 J4, DM-45, DWF-20, DWF-30, DWF-40, MEZ-20E, MEZ-30E, MEZ-40, and Slip Jointed. An estimation dialog box is open for the 'Slide On Flange: DM-25 {v2}' connector. The dialog box contains a table of data and values, with 'DM-25' entered in the Name field. The dialog box also has 'Breakpoints' and 'Close' buttons.

Name	Owner	Material (Slip)	Drive Material	F-Rate	E-Rate	Con
+	No Group					
+	Actionair					
+	Ductboard					
+	Electrical					
+	Generic					
+	Raw Edge					
+	Rolled Steel Angle					
+	Rolled Steel Flange					
+	Sheet Metal Flange					
-	Slide On Flange					
	DM-20	v2	DM Flange			
	DM-25	v2	DM Flange			
	DM-30 J3	v2	DM Flange			
	DM-30 J4		DM Flange			
	DM-35 J3	v2	DM Flange			
	DM-35 J4	v2	DM Flange			
	DM-45	v2	DM Flange			
	DWF-20	v1	None			
	DWF-30	v1	None			
	DWF-40	v1	None			
	MEZ-20E		MEZ 120L			
	MEZ-30E		MEZ 130L			
	MEZ-40		MEZ 141L			
+	Slip Jointed					

Data	Value
Name	DM-25
Material (Slip)	DM Flange 25mm
Drive Material	None
F-Rate	Skilled*
E-Rate	Skilled*
Corners	DM Comer 25C
Bolts	M8x20 Set Screws
Qty	4
+ per (m)	0.00
Clips	DM Metal Cleat 65mm
Qty	2
+ per (m)	2.00
Gasket	DM Gasket Tape 14x...
Shared Gasket	Yes

Database – Connectors - Drawing

Drawing data selected from the Icon on the toolbar.

Should Enter

- Name
- Colours (Plotting)
- Linetype
- Connectivity
- End Type

Can Enter

- CAD Block
- End Draw Type
- Breakpoints – usually for Round - Pipework

The screenshot shows the Autodesk software interface. On the left, a 'Library' window displays a list of connectors. The 'Slide On Flange' category is expanded, showing a table of connector data. The 'DM-25' connector is selected. On the right, a configuration dialog for the 'Slide On Flange: DM-25 {v2}' connector is open, showing various data fields and their values.

Name	Owner	Line 1 C...	Line 2 C...	Line Type	Connectivity	End Type	Tu
+	No Group						
+	Actionair						
+	Ductboard						
+	Electrical						
+	Generic						
+	Raw Edge						
+	Rolled Steel Angle						
+	Rolled Steel Flange						
+	Sheet Metal Flange						
-	Slide On Flange						
	DM-20	v2		1			
	DM-25	v2		8			
	DM-30 J3	v2		1			
	DM-30 J4			1			
	DM-35 J3	v2		8			
	DM-35 J4	v2		8			
	DM-45	v2		1			
	DWF-20	v1		127			
	DWF-30	v1		127			
	DWF-40	v1		127			
	MEZ-20E			2			
	MEZ-30E			2			
	MEZ-40			2			
+	Slip Jointed						

Data	Value
Name	DM-25
Line 1 Colour	8
Line 2 Colour	8
Line Type	BYLAYER
Connectivity	DM-25
End Type	None
Turnover	0.00
Straight	0.00
CAD Block	
End Draw Type	Standard

Database – Connectors – Make Up

A full connector definition includes additional items that contribute to the Connector “make up” These items are necessary for accurate costing.

5 sub categories for Connector make up.

- Notches
- Ancillary Materials
- Clips
- Gasket
- Corners

Additionally Fixings may be required for setup of Flanges for example bolt type and quantity.

Database – Connectors – Make Up – Notches.

Notches are used in the Fabrication process to allow the connector to be 'connected' to the duct. A notch can either add or subtract material from the flat sheet development.

Within the notch database, various notches can be established by using a combination of X and Y line moves at the corner of the connector/seam junction of the flat panel for both the Male and Female seam positions.

Database – Connectors – Make Up – Notches.

- Use Seam – First cut is the seam allowance
- Display Seam – see the affect of the seam
- Male-Female angles, control first cut angle.
- Notch Out, automatically removes Seam x Turnover
- Remove Taper Extn, removes metal on taper/transition developments to aid forming



- X-Y values, control length and angle of cut outs

Database – Connectors – Make Up – Ancillary Materials.

- The Ancillary Material is the material used in the makeup of the connector, in the case of a Slide On connector, this is bought out material and a cost can be associated.
- The cost can be specified based on a price list via a lookup code, or can be allocated per base quantity plus an additional cost per M/Ft
- Can Enter
 - Description
 - ID
 - Cost (price list or value)
 - Weight
 - Times, Fabrication and Installation.

Ancillary Materials: DM Flange 25mm

Data	Value
Description	DM Flange 25mm
Product Id	LIN-DF25
Cost	Price List
Price List	Lindab UK Products
Weight (kg)/Qty	0.00
Weight (kg)/(m)	0.50
F time	Value
F time (mins)/Qty	5.00
F time (mins)/(m)	2.00
E time	Value
E time (mins)/Qty	0.00
E time (mins)/(m)	0.00

Product Ids Close

Database – Connectors – Make Up – Clips.

- The Ancillary Clips are additional components for connecting the Connector Material to the duct component.
- Again cost can be specified based on a price list via a lookup code, or can be allocated cost per quantity
- Can Enter
 - Description
 - ID
 - Cost (price list or value)
 - Weight
 - Times, Fabrication and Installation.

Clips: DM Metal Cleat 65mm

Data	Value
Description	DM Metal Cleat 65mm
Product Id	LIN-DMC65
Cost	Price List
Price List	Lindab UK Products
Weight (kg)/Qty	0.00
F time	Value
F time (mins)/Qty	0.00
E time	Value
E time (mins)/Qty	0.00

Product Ids Close

Database – Connectors – Make Up – Gasket.

- The Ancillary Gasket is the material used between mating connectors, as a air seal, or can be used to wrap around the joint to seal.
- Similar to Ancillary Material, the cost can be specified based on a price list via a lookup code, or can be allocated per base quantity plus an additional cost per M/Ft
- Can Enter
 - Description
 - ID
 - Cost (price list or value)
 - Weight
 - Times, Fabrication and Installation.

Gasket: DM Gasket Tape 14x6x12m

Data	Value
Description	DM Gasket Tape 14x...
Product Id	LIN-NGT146
Cost	Price List
Price List	Lindab UK Products
Weight (kg)/Qty	0.00
Weight (kg)/(m)	0.00
F time	Value
F time (mins)/Qty	0.00
F time (mins)/(m)	0.00
E time	Value
E time (mins)/Qty	0.00
E time (mins)/(m)	0.00

Product Ids Close

Database – Connectors – Make Up – Corners.

- Some Connector types use Corners in their construction
- Cost can be based on a price list or per Quantity.

- Can Enter
 - Description
 - ID
 - Cost (price list or value)
 - Weight
 - Times, Fabrication and Installation.

Corners: DM Corner 25C

Data	Value
Description	DM Comer 25C
Product Id	LIN-DC25C
Cost	Price List
Price List	Lindab UK Products
Weight (kg)/Qty	0.00
F time	Value
F time (mins)/Qty	0.00
E time	Value
E time (mins)/Qty	0.00

Product Ids Close

Database – Price Lists

The previous items talked about Price Lists for costing.

These Price Lists appear in many areas of the Database, but all follow the same format.

- ID Driven.
 - Each price list will have a list of ID's that are used by database objects (and content) to locate the price.
- Import from Excel.
 - Prices can be read from Excel when saved as CSV.
- Multiple fields can be imported.
 - Id
 - Cost
 - Discount
 - Units

Database – Additional objects that make up a Specification.

In addition to Materials and Connectors, there are other database objects that you would consider when building up a Fabrication Specification, these all contribute to the overall experience for Fabrication, Costing and Detailing.

- Seam
 - Fabrication material to joint panels
- Stiffener
 - Stiffening material, Tie rods or Frame
- Support
 - Hangers
- Sealant
 - Air tight seals
- Splitter
 - Aid air deflection
- Airturn
 - Aid air deflection

Database – Putting it all together

Once all the database entries are available, we can build of a Pressure Class/Specification to drive Fabrication. This can be configured for any of the many standards in existence.

- Create a New Specification.
 - Must Enter
 - Name
 - Breakpoint Type
 - Stiffen By
 - Can Enter
 - Group
 - Abbreviation
 - Default Material
 - Alt Connectors and Seams.

Create New Specification

Name AU 2012

Group HVAC

Abrv AU

Breakpoint Type Single Dimension

Stiffen By Spacing

Default Material Galvanised

Alt Connectors

Alt Seams

Ok Cancel

Database – Putting it all together

Once created, we populate the entries by selecting objects we have configured for the appropriate columns.

The screenshot shows a software interface for managing specifications. The main window has a top toolbar with icons for search, print, and other functions. Below the toolbar are several dropdown menus: 'Specification' (DW144-LV), 'Material' (Galvanised), 'Library' (Rectangular), and 'Valid for' (All Types). The main area contains a table of entries with the following columns: <= Dim, Gauge, STD Straight, Connector (In), Connector (Out), Connector (Lock), Connector (Spigot), and Seam. The table lists 10 entries with varying dimensions and connector types.

A pop-up window titled 'Specification "AU 2012", Entry 2' is open, showing a detailed view of a specific entry. It contains a table with the following data:

Data	Value
<= Dim	300.00
Gauge	0.80
STD Straight	1500.00
Connector (In)	DM-25 v2
Connector (Out)	Not Used
Seam	LAP
Stiffener	RSA 25x25x3
Spacing	0.00
Supports	Rectangular Bearer
Spacing	0.00
Sealant	SILICONE
Splitter	STANDARD
Airtum	Single Skin

Below the table in the pop-up window are two buttons: 'Preview...' and 'Close'.

Create and populate a fabrication service.

- Services can be considered as the main interface for Detailing, Estimating and Fabrication.
- A Service is a collection of fittings and equipment that would be logically grouped together for use in a system
 - Supply Air
 - Return Air
 - Domestic Hot Water
 - Etc.

Each Service can contain any number of fitting and equipment items.

The Service can drive the Pressure Class/Specification, Insulation, design criteria and Design Line Take-off.

The Service also controls your detailing standards for layers and colours.

Create and populate a fabrication service.

- The Service can be considered as being made up of 2 parts, the actual components, and the data.
- Configuring the Components.
 - Create a new Service
 - Create a new Service Template
 - Create Tabs for 'like' items
 - Create Conditions
 - Drag and Drop content onto the conditions in Tabs from either the Folder interface, or from other templates.
- Configuring the Data.
 - Setup Service Types (control layering)
 - Set Button Mappings
 - Set additional 'Design Line' dependencies
 - Set detailing preferences (Rise-Fall symbols)

Create and populate a fabrication service.

Configuring the Components.

- New Service – select “New Service” enter name.
- New template – select the “New Template” icon and copy existing or create an empty template, to name the template, type in the “Use Service Template” field.
- Tabs - right click to manipulate Tabs, New, Rename Delete.
- Conditions – right click in condition area to create new.
 - A condition will allow auto selection of content based on size criteria.
 - Multiple items can be placed on a single button if there are multiple conditions.
 - Assign the Hanger requirements per condition.
- Populate with content, Drag and Drop, Copy / Paste, right click to Set Caption (tooltip), Set Icon and manage conditions via Button Properties.

Create and populate a fabrication service.

- Configuring the Data.
 - Setup Service Types (control layering)
 - Use the built in list of pre-defined Service Types, or add new entries. These are associated with content from the Item Properties, Item Tab.
 - Add the required Service types into the service, New Entry button or right click New.
 - Enter Layering data for the service types.

Data	Value
Service Type	1: Rectangular Duc
Layer Tag 1	M570
Layer Tag 2	GEN_RET
Layer Colour	150
Level Block	
Size Block	
Level Text Includes I...	<input type="checkbox"/>
Layer Line Weight	Default

Create and populate a fabrication service.

- Configuring the Data.
 - Set Button Mappings
 - Button codes and Mappings are used extensively by “Design Line” and related commands.
 - There are 19 built in Button codes, other can be created and mapped to the built in types.
 - Most common types are Bend, RedInLine, RedILTee, RebEOLTee ShapeChange and Terminal.
 - The easiest way to set up button codes, is to draw with Design Line and look at the results.
 - Another method is to Copy and Paste from one service to another.

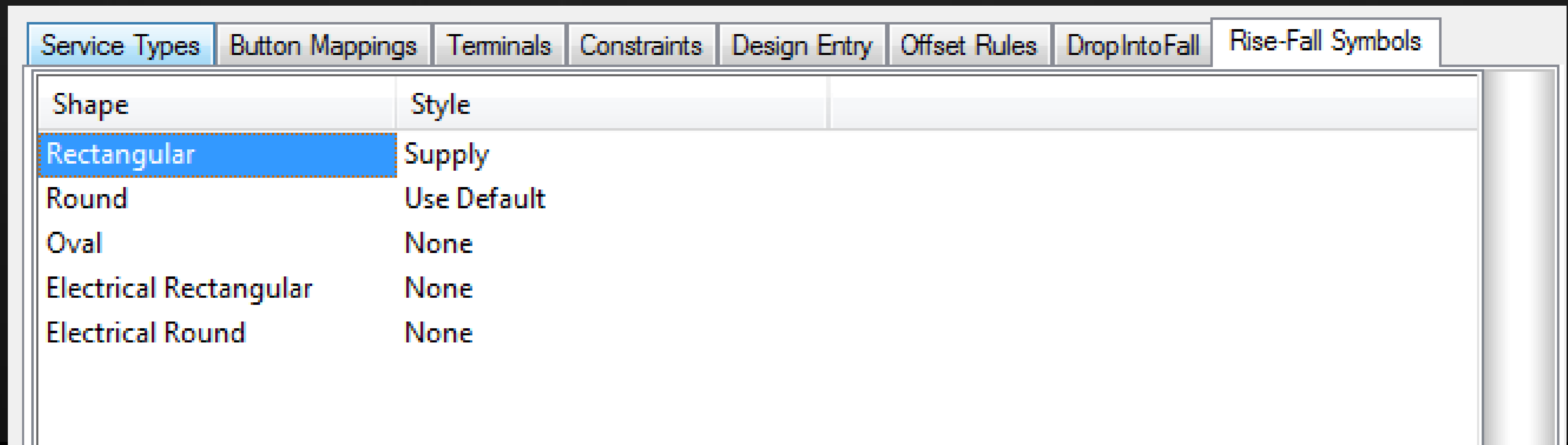
We will do this with worked example.

Create and populate a fabrication service.

- Configuring the Data.
 - Set additional 'Design Line' dependencies
 - Additional dependencies include
 - Terminal Styles – used to control how the branch runs are connected to terminals, hard connections, Flex, use Dampers etc.
 - Constraints – Build up a list of commonly used Sizes or Design constraints used for Trace Estimating or Design.
 - Design Entry – Select what information you want to be prompted for when detailing with Design Line.
 - Offset Rules – control what objects are used when offsets are introduced into the system.
 - DropIntoFall – control what fitting combinations are used on sloped systems when connecting into the main run with the branch run.

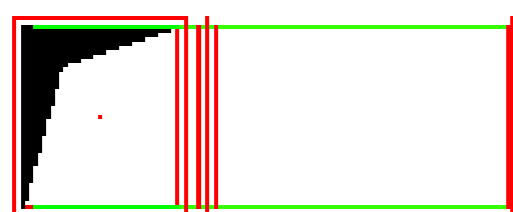
Create and populate a fabrication service.

- Configuring the Data.
 - Set detailing preferences (Rise-Fall symbols)
 - There are various styles of Rise Fall symbols available in the software, each service can control which symbols are used, or use the database defaults.
 - Select from the Drop down list the required style.

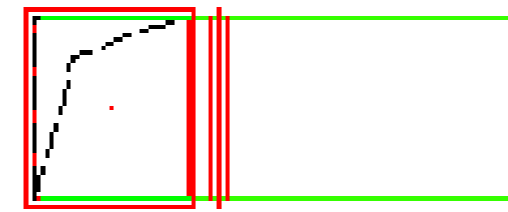


Create and populate a fabrication service – Rise Fall Symbols

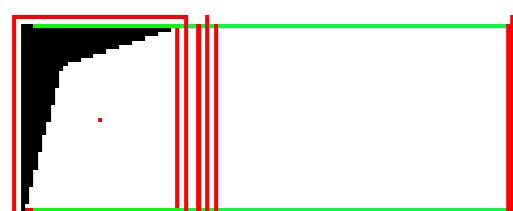
Rectangular Styles



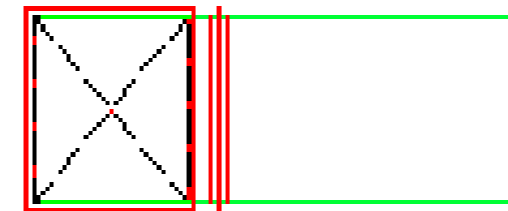
Rise Detail - Style 1
Rectangular Section



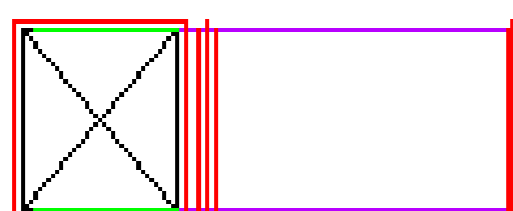
Fall Detail - Style 1
Rectangular Section



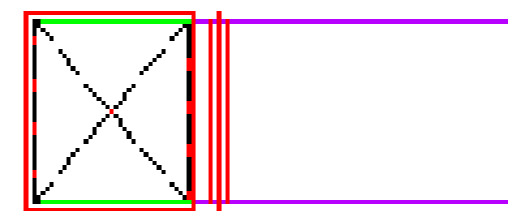
Rise Detail - Style 2
Rectangular Section



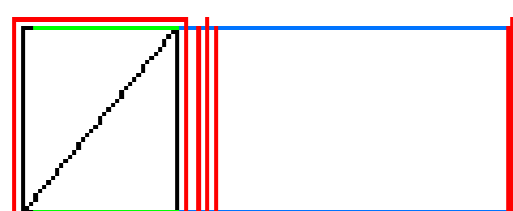
Fall Detail - Style 2
Rectangular Section



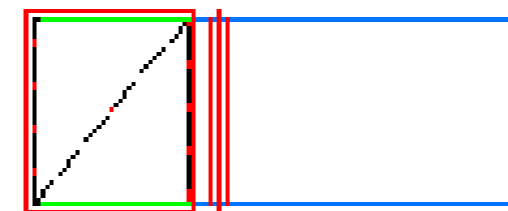
Rise Detail - Style 3
Rectangular Section



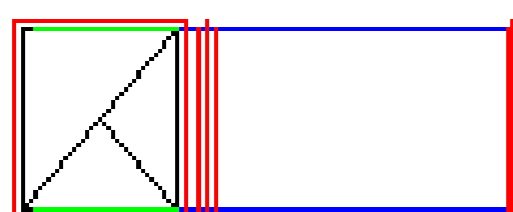
Fall Detail - Style 3
Rectangular Section



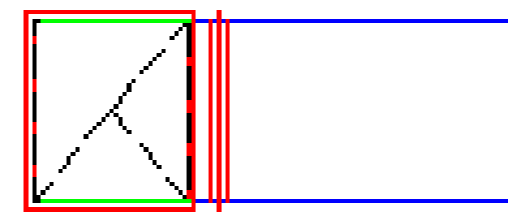
Rise Detail - Extract
Rectangular Section



Fall Detail - Extract
Rectangular Section



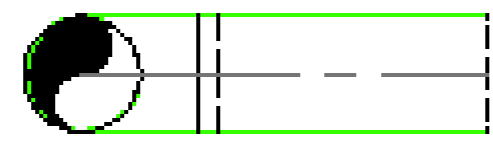
Rise Detail - Exhaust
Rectangular Section



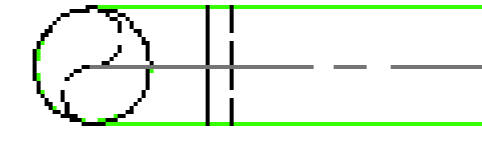
Fall Detail - Exhaust
Rectangular Section

Create and populate a fabrication service.

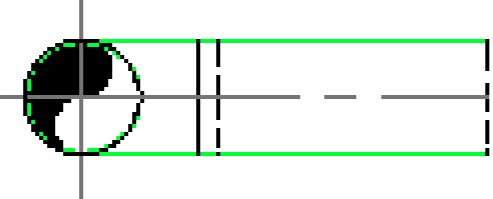
Round Styles



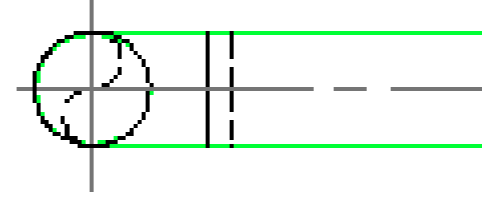
Rise Detail - Style 1
Round Section



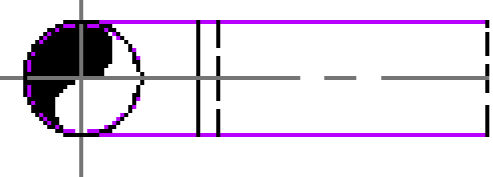
Fall Detail - Style 1
Round Section



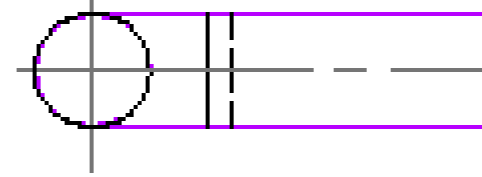
Rise Detail - Style 2
Round Section



Fall Detail - Style 2
Round Section

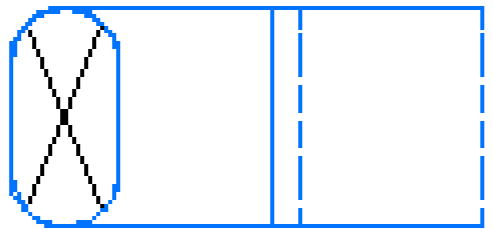


Rise Detail - Style 3
Round Section

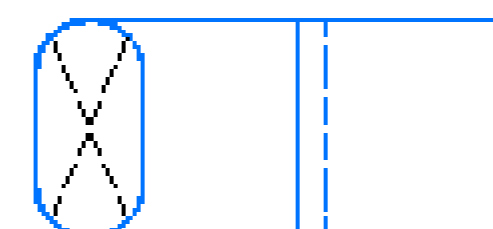


Fall Detail - Style 3
Round Section

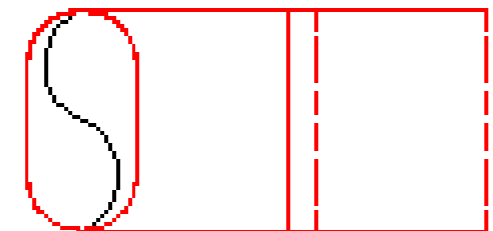
Oval Styles



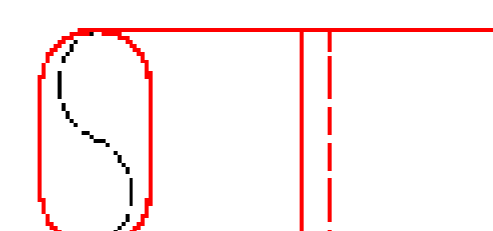
Rise Detail - Supply
Oval Section



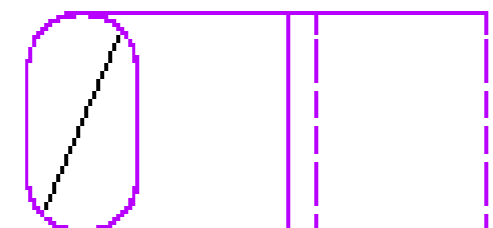
Fall Detail - Supply
Oval Section



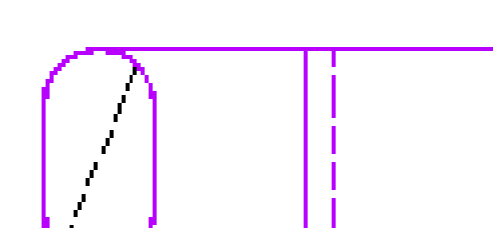
Rise Detail - Style 1
Oval Section



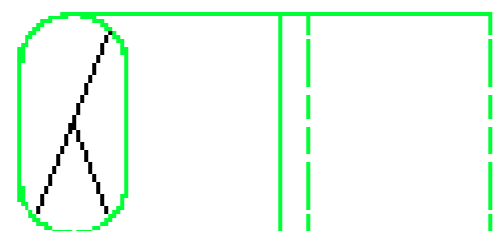
Fall Detail - Style 1
Oval Section



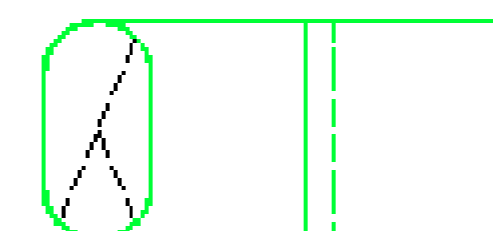
Rise Detail - Extract
Oval Section



Fall Detail - Extract
Oval Section



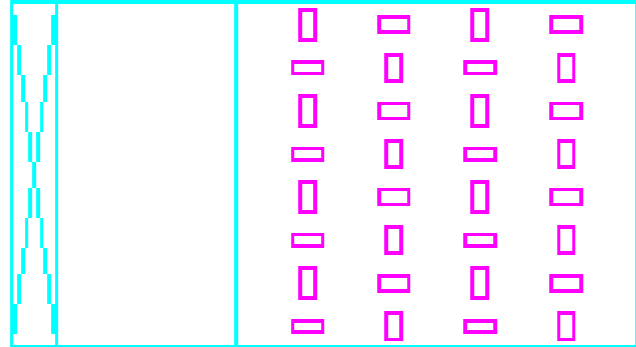
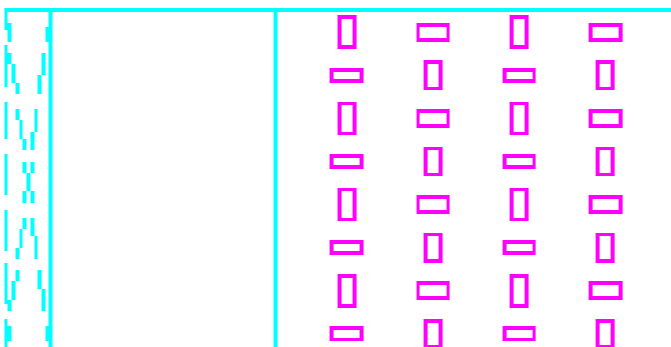
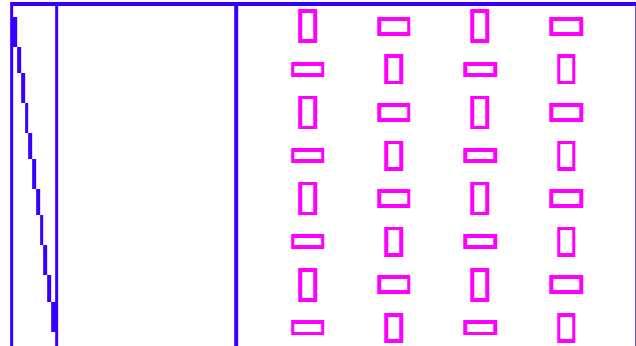
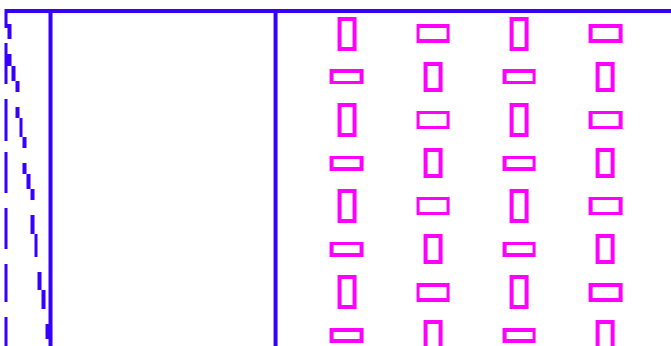
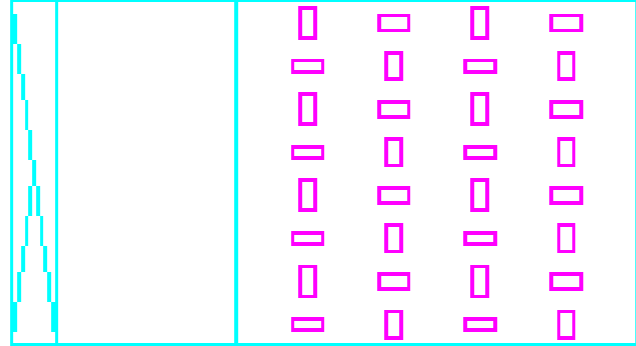
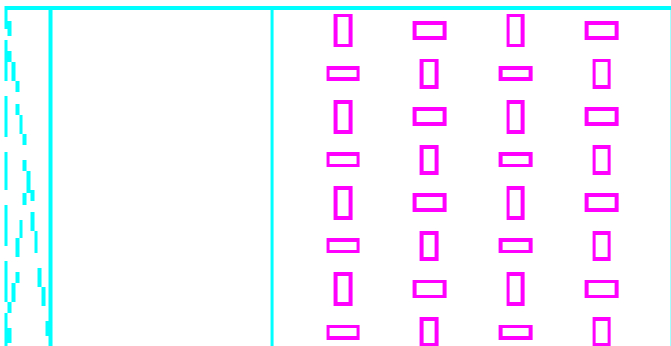
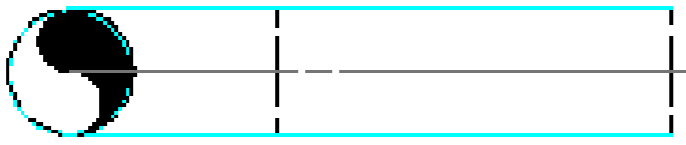
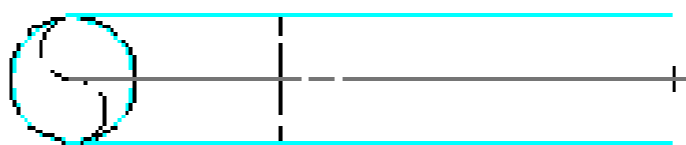

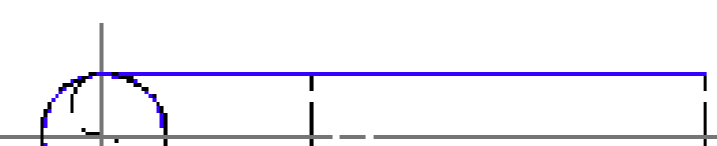
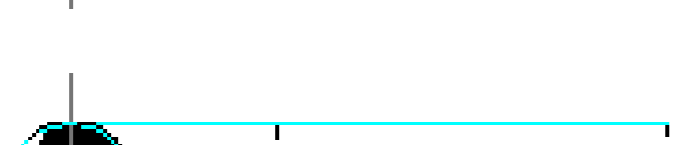

Rise Detail - Exhaust
Oval Section



Fall Detail - Exhaust
Oval Section

Create and populate a fabrication service.

Electrical Styles

	Rise Detail - Style 1 Electrical		Fall Detail - Style 1 Electrical
	Rise Detail - Style 2 Electrical		Fall Detail - Style 2 Electrical
	Rise Detail - Style 3 Electrical		Fall Detail - Style 3 Electrical
	Rise Detail - Style 1 Electrical Round		Fall Detail - Style 1 Electrical Round
	Rise Detail - Style 2 Electrical Round		Fall Detail - Style 2 Electrical Round
	Rise Detail - Style 3 Electrical Round		Fall Detail - Style 3 Electrical Round

Create and populate a fabrication service.

- Configuring the Data.
 - Finally configure any Service Level data – Assign override Specification, Insulation and design defaults for Fluid and flow direction.

Adopt Design Line technology for use in detailing and estimating.

Design Line can be used in 2 ways, by entering sizes or by entering design criteria data.

Size entry is usually adopted by Estimators but is equally suitable for Detailers. In size mode, you specify the exact size required for each section of the system as you are detailing.

Design Entry would be used if you wanted the software to calculate the size of the system

In this mode you would specify 2 of the 4 design parameters

- Flow at Terminals, and either
- Velocity or
- Pressure Drop, with Size being calculated.

Appreciate Costing implications when detailing.

CAD tools are available that allow you to see ESTmep information, this enables you to make decisions for detailing around component and labour costs.

Tools include Cost Breakdown, CostDB command, this displays information about the selected objects down to component level.

Another useful tool is the Fill2Ends command, this will report out additional details about fabrication parameters for a variety of solutions to a routing problem.



Fabrication for MEP: Detailing, Costing, and Fabrication Integration

Questions?

