



AVEVA

MARINE

# HVAC Administrator Guide

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# HVAC Administrator Guide

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# 1 Read This First

## 1.1 Scope of this Guide

The guide covers the range of administrative functions required to support the HVAC application. A tutorial style exercise is provided to demonstrate the creation of the catalogue and specifications for user defined fittings.

### 1.1.1 Intended Audience

The guide has been written for administrators who are responsible for creating user defined HVAC fittings, setting the defaults, and producing drawing templates and tables for HVAC sketches.

### 1.1.2 Assumptions

It is assumed that the administrator has the following:

- competence in using Catalogue and Specifications, and the ability to create and edit macros to create the necessary database elements.
- a basic understanding of PML
- familiarity with HVAC Designer

## 1.2 How the Guide is Organised

This guide is divided into 14 Chapters, as follows:

*Read This First* introduces this guide and summaries its scope.

*Application Files* provides the storage location of the application files and identifies the control file for changing the defaults.

*Sample Catalogue* shows the key element names in the sample catalogue.

*User Defined Components* demonstrates the creation of a user defined catalogue and specifications for HVAC fittings by means of a tutorial style exercise.

*Detail Specifications* explains Detail Specification for defining duct ranges with different joints, standard length, material thickness or stiffening.

*Insulation Specifications* shows the database structure for insulation and the creation of insulation specifications.

*User Definable Joints Set* explains how joints can be user defined and shows the catalogue database sections that hold the dataset elements for each joint.

*User Definable Stiffeners* explains how stiffeners can be user defined and shows the catalogue database sections that hold the dataset elements for each stiffener.

*Defaults* considers the storage of default values and how they can be changed by creating or editing data elements to give user defaults.

*Weights* gives the database mechanism for HVAC component weights.

*Auto Naming* discusses auto naming options from both the administrator and user perspectives.

*HVAC Spools* shows the HVAC Spool functionalities in a table format.

*OUTFITTING DRAFT Sketches* explains the setting up of templates, backing sheets and tables for HVAC spool sketches. Also covers HVAC Sketches created in batch mode.

*OUTFITTING DRAFT General* gives recommendations for the creation of OUTFITTING DRAFT drawings.



## 2 Application Files

For the HVAC Designer application, files are generally stored in the directory:

`%pdmsui%/des/hvacadv`

The control file 'xmaincontrol' can be edited within a text editor, such as WordPad, to change the defaults.



### 3 Sample Catalogue

HVAC Designer provides a sample catalogue of HVAC fittings.

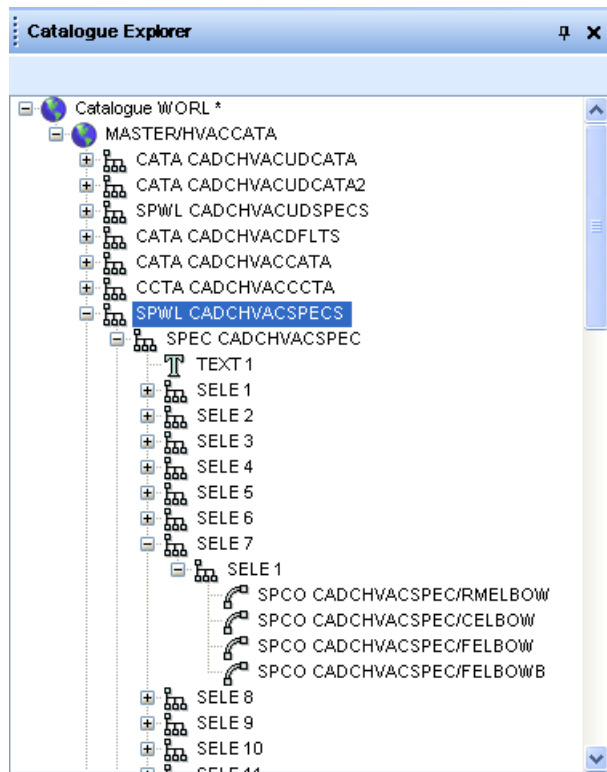
The catalogue is stored in the Master Project (MAS)

Database /MASTER-HVACCATA

The key element names are:

CATA /CADCHVACCATA	- HVAC Designer Standard Catalogue
SECT /RMELBOW-SECT	- Section for Rectangular Mitred Elbow
CATE /RMELBOW-SECT	- Category for Rectangular Mitred Elbow
PTSE /RMELBOW-SECT	- Point set for Rectangular Mitred Elbow
GMSE /RMELBOW-SECT	- Geometry for Rectangular Mitred Elbow
SCOM /RMELBOW	- Rectangular Mitred Elbow Component
SECT /CADCHVACCATA-INFO	- Section for HVAC Datasets
CATE / CADCHVACCATA-DTSE	- Category for HVAC Datasets
DTSE /RMELBOW-DETAIL-DATA	- Data set for Mitred Elbow
DATA /RMELBOW-DETAIL-DATA-PLOT	- Data (Property DATA) - etc for each property
SECT /CADCHVACCATA-DETTEXT	- Section for HVAC Detail Text
CATE / CADCHVACCATA-DETCATE	- Category for HVAC Detail Text
SDTE /RMELBOW-DETAIL	- Detail Text for Mitred Elbow
SPWL /CADCHVACSPECS	HVAC Designer Standard Specifications
SPEC /CADCHVACSPEC	HVAC Designer Standard Specification
SELE	Selector based on TYPE
SELE	Selector based on STYPE
SPCO	Spec component

Example:



## 4 User Defined Components

The HVAC application has an extensive parametric catalogue of components but there will always be the need for Special User Defined HVAC Fittings. It is recommended that the standard elements are used whenever possible, however, the HVAC form has a Category for User Defined Fittings

Element Type	
"STRT"	Straights
"OFST"	Offsets
"BEND"	Stock Bends
"STIF"	Stiffening Guides
"FLEX"	Material Connections

First the HVAC Administrator has to create a User Defined catalogue and specifications to populate this form. A tutorial style exercise follows to describe this process.

### 4.1 Tutorial Style Exercise

An exercise is carried out from start to finish, to create a new User defined HVAC fitting for use in OUTFITTING DESIGN, covering all relevant points to successfully complete this task.

#### 4.1.1 Pre Conditions

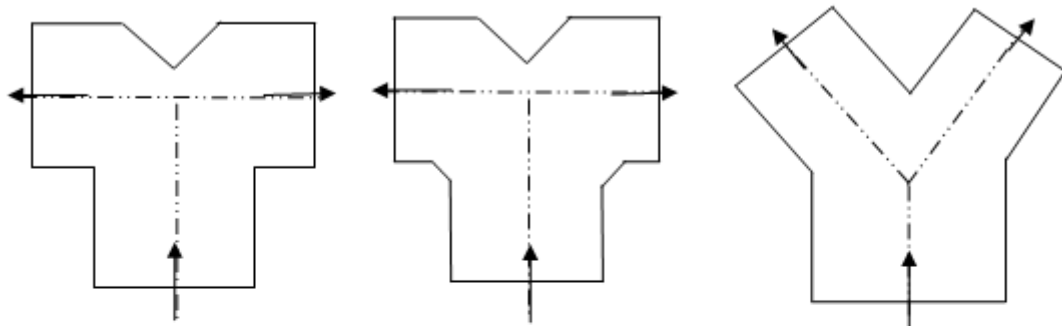
- It is assumed that the Administrator is already a competent Cats&Specs user, comfortable with creating and editing macros to create the necessary database elements.
- The Catalogue and Specification work covered in this tutorial can be done in the OUTFITTING DESIGN or PARAGON module. Since the work is mainly command line and macro driven, it is recommended to use OUTFITTING DESIGN with Read/Write access to the catalogue. To do this the Administrator should work in a project with such access rights, and then update the final project using macros.
- In ADMIN, set OUTFITTING DESIGN module to Read/Write catalogue:  
EDIT MODULE DESI MODE CATA RW
- In ADMIN, also create a catalogue database separate from the AVEVA Solutions Ltd database, in which to create the User Defined Cats&Specs

#### 4.1.2 Requirements

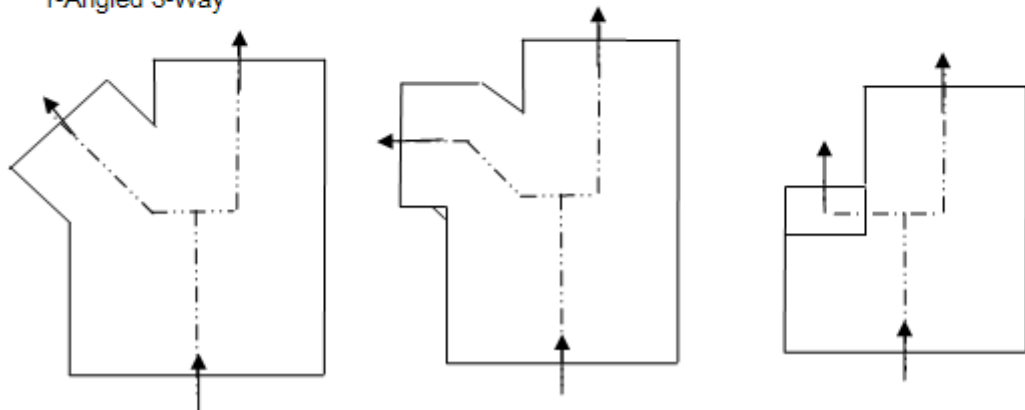
- Identify the new components that are required:

Example:

Y-Type 3-Way



1-Angled 3-Way



- Above is an example of 6 Threeway pieces that are not be covered by the Standard AVEVA Solutions Ltd sample HVAC catalogue.

- To make these pieces available as User Defined HVAC Fittings, follow this tutorial exercise:

### 4.1.3 Create Top Level Elements in the New Database

In the new catalogue database that has been created and added to the MDB, some top level elements are created to store the user defined HVAC catalogue.

NEW CATA /My-udHVACcata setstar

DESCRIPTION 'My Catalogue for User Defined HVAC Fittings

NEW SECT \*-DETTEXT

DESCRIPTION 'Detail text My Catalogue for User Defined HVAC Fittings'

NEW CATE \*-DETCATE

DESCRIPTION 'Detail text My Catalogue for User Defined HVAC Fittings

NEW SPWL /My-udHVACspecs

PURP HVAC

NEW SPEC /My-udHVACspec

PURP FITT

QUESTION ELEM

TQUESTION 'Element Type

TDEFAULT 'NONE

Notice in the above that the SPWL purpose is set to HVAC and the SPEC purpose is set to FITT. These settings are important because in OUTFITTING DESIGN this specification will then be listed on the HVAC User Defined Fittings form. Element type will be the first selector text on the same form.

### 4.1.4 Identify an Existing Similar Component

The most efficient way for the Administrator to create a new component is to copy an existing similar component and modify it.

Considering the 6 components in the example, copy /RSTHRE which is the standard component definition for a Rectangular Square Threeway

### 4.1.5 Macros to Copy an Existing Component

Write some simple macros to copy the existing component.

#### Examples:

#### copyMac1

/My-udHVACcata

tail

new sect \$1-SECT copy \$2-SECT rename \$2 \$1

\$.

**copyMac2**

```
$d2=
/My-udHVACcata-DETCATE
tail
new sdte $1 copy $2-DETAIL
rtext |$2|
$.
```

**myUDCata**

-- Macro to make My catalogue from copy of existing similar standard

```
$m/c:/MY-Macros/copyMac1 /My-Y-Type-3-Way1 /RSTHRE
$m/c:/MY-Macros/copyMac2 /My-Y-Type-3-Way1-Detail /RSTHRE
$m/c:/MY-Macros/copyMac1 /My-Y-Type-3-Way2 /RSTHRE
$m/c:/MY-Macros/copyMac2 /My-Y-Type-3-Way2-Detail /RSTHRE
$m/c:/MY-Macros/copyMac1 /My-Y-Type-3-Way3 /RSTHRE
$m/c:/MY-Macros/copyMac2 /My-Y-Type-3-Way3-Detail /RSTHRE
```

```
$m/c:/MY-Macros/copyMac1 /My-Angled-Type-3-Way1 /RSTHRE
$m/c:/MY-Macros/copyMac2 /My-Angled-Type-3-Way1-Detail /
RSTHRE
$m/c:/MY-Macros/copyMac1 /My-Angled-Type-3-Way2 /RSTHRE
$m/c:/MY-Macros/copyMac2 /My-Angled-Type-3-Way2-Detail /
RSTHRE
$m/c:/MY-Macros/copyMac1 /My-Angled-Type-3-Way3 /RSTHRE
$m/c:/MY-Macros/copyMac2 /My-Angled-Type-3-Way3-Detail /
RSTHRE
```

**copyMac3**

```
$1-GMSE
new DTSE $1-DTSE copy /RSTHRE -DETAIL-DATA rename /RSTHRE $1
NEX SCOM
DTREF $1-DTSE
```

**myUDCataDtse**

-- Macro to make My datasets from copy of existing similar standard

```
$m/c:/MY-Macros/copyMac3 /My-Y-Type-3-Way1 /RSTHRE
$m/c:/MY-Macros/copyMac3 /My-Y-Type-3-Way2 /RSTHRE
$m/c:/MY-Macros/copyMac3 /My-Y-Type-3-Way3 /RSTHRE
```

```
$m/c:/MY-Macros/copyMac3 /My-Angled-Type-3-Way1 /RSTHRE
$m/c:/MY-Macros/copyMac3 /My-Angled-Type-3-Way2 /RSTHRE
$m/c:/MY-Macros/copyMac3 /My-Angled-Type-3-Way3 /RSTHRE
```



#### 4.1.6 Run the Catalogue Macros

In OUTFITTING DESIGN or PARAGON (as discussed earlier)

**\$m//c:/MY-Macros/myUDCata**

**\$m//c:/MY-Macros/myUDCataDtse**

These macros will create the database elements for the 6 example components.

All elements will be named and organised in a consistent manner.

It is advised that all elements, including primitives and ppoint elements, are named.

The macros will output some catalogue errors but there is no need to be concerned about these, this is simply because the model Design Parameters are not set at this stage.

Catalogue error for component SCOM /My-Y-Type-3-Way1, catalogue primitive PTMIX /My-Y-Type-3-Way1-P6 - Design Parameter number ( 2 ) out of range.

#### 4.1.7 Macros to Create Specification References

Write a simple macro to create a Specification reference for the catalogue components created above.

##### **myUDSpec**

```
/ My-udHVACspec setst
tail
-- -----
NEW SELEC */3ways setst
DESC 'Rectangular Threeways'
QUES SPEC
TANS 'THRE'
TDEF 'NONE'
TQUES 'Specific'

NEW SPCOMPONENT */Y-Type1
TANS 'Y Type1'
Catref /My-Y-Type-3-Way1
Detref /My-Y-Type-3-Way1-Detail
NEW SPCOMPONENT */Y-Type2
TANS 'Y Type2'
Catref /My-Y-Type-3-Way2
Detref /My-Y-Type-3-Way2-Detail
NEW SPCOMPONENT */Y-Type3
TANS 'Y Type3'
Catref /My-Y-Type-3-Way3
Detref /My-Y-Type-3-Way3-Detail

NEW SPCOMPONENT */Angled-Type1
```

```
TANS 'Angled Type1'
Catref /My-Angled-Type-3-Way1
Detref /My-Angled-Type-3-Way1-Detail
NEW SPCOMPONENT */Angled-Type2
TANS 'Angled Type2'
Catref /My-Angled-Type-3-Way2
Detref /My-Angled-Type-3-Way2-Detail
NEW SPCOMPONENT */Angled-Type3
TANS 'Angled Type3'
Catref /My-Angled-Type-3-Way3
Detref /My-Angled-Type-3-Way3-Detail
```

Reminder:

- SPWL %purp HVAC, SPEC %purp FITT to appear in the HVAC User Defined Fittings form.
- Each level of SELE with %tquestion and %tans causes a further level of questions in the HVAC UD Fittings form.
- Beware that a too lengthy %tans may prevent it from fitting into the form.

### 4.1.8 Run the Specification Macro

In OUTFITTING DESIGN or PARAGON (as discussed earlier)

***\$m//c:/MY-Macros/myUDSpec***

These macros will create the specification elements for the 6 example components. The TANS texts are the words that will appear on the Design form for User defined HVAC fittings.

### 4.1.9 Observe the User Defined HVAC Fittings form

In Design-HVAC Designer Application and from the HVAC form select Category 'User Defined Fittings'.

The screenshot displays the 'User Defined HVAC Fittings' dialog box and the 'HVAC' panel. The dialog box has a 'Create' dropdown, 'Specification Data' section with a dropdown for 'My User Defined HVAC Fittings' and checkboxes for 'Default' and 'Auto', a 'Current Selection' table, and a 'Specific' table. The 'HVAC' panel on the right includes 'Categories' (User Defined Fittings), 'Available Types' (Options...), 'Orientation' (CE), 'Leave Direction' and 'Leave 'A' Axis' text boxes, 'Position' section with 'At' and 'Through' dropdowns (both set to 'Cursor'), 'Move by' (E0N0U0) and 'Distance' (0) text boxes, 'Copy ID...' and 'Modify CE...' buttons, and a 'Connect' section with 'Component' (to Previous) and 'Head' (to Tail of ID Branch) dropdowns.

Current Selection	
Element Type - Rectangular Threeways	

Specific	
"Y Type1"	My-Y-Type-3-Way1
"Y Type2"	Myi-Y-Type-3-Way2
"Y Type3"	My-Y-Type-3-Way3
"Angled Type1"	My-Angled-Type-3-Way1
"Angled Type2"	My-Angled-Type-3-Way2
"Angled Type3"	My-Angled-Type-3-Way3

The Specification created is displayed, and the selectors available to select the 6 catalogue items. At the moment if you select any of these they will all be the same as the copied component /RSTHRE. So the next stage is to edit these components to be unique to match the initial requirements.

#### 4.1.10 Make a Sketch

For the example choose to make the 1st component of the 6 Threeway components illustrated previously. Make a pencil sketch of the component and mark it with all the variable Design Parameters to be used. It is recommended that the Administrator follows, as closely as possible to the list of Design Parameter/Properties listed in the *HVAC User Guide* appendix B. For example DESP[2] and DESP[3] are the arrive duct size etc.



The long list of data elements (Properties of the Design element) can be shortened by setting the LHIDE attribute to true. Therefore, for the example only the following DATA elements set to LHIDE false are needed:-

AARR -	A of the Arrive Duct size (DESP[2])
BARR -	B of the Arrive Duct size (DESP[3])
ALEA -	A of the Leave Duct size (DESP[4])
ABRA -	A of the Branch Duct size (DESP[41])
ATHR -	Arrive Throat (DESP[12])
LTHR -	Leave Throat (DESP[13])
BRLE -	Branch Length (DESP[7])
AOFF -	Offset A (DESP[10])
BANG -	Angle B (DESP[10])

The easiest way to do this is to use the List utility to add all data elements to a list and action the command LHIDE true, then navigate to the ones required for input and manually modify LHIDE false.

These are the properties that will appear on the Create/Modify User Defined components form:

Property	Value	Icon
A of Arrive	800.00	Icon
B of Arrive	400.00	Icon
A of Leave	800.00	Icon
Leave Throat	0.00	Icon
Branch Length	0.00	Icon
A offset	0.00	Icon
Arrive Throat	0.00	Icon
Angle B	0	Icon
A of Branch	300.00	Icon

Buttons: OK, Default, Reset, Cancel

Modify the text, set defaults and reorder the data elements to improve the presentation. To give:

Property	Value
A of Arrive	800.00
B of Arrive	400.00
A of Leave	800.00
A of Branch	800.00
Arrive Throat	0.00
Leave Throat	0.00
Branch Throat	0.00
Inset Depth	0.00
Inset Angle	90

A PLOT file property will be completed later using a OUTFITTING DRAFT picture of a sample component created in OUTFITTING DESIGN, but first, the geometry has to be completed.

#### 4.1.14 Hidden Properties

Although only the above properties are shown, some of the other properties may need to be set, such as TYPE, SUBT, SHAP, FACE

*The TYPE property Attributes*

Type DATA

Dkey TYPE

Ptype unset

Pproperty ( ATTRIB WDESP[66 ] )

Dproperty ( HASH ( 'THRE' ) )

Purpose DESP

Number 66

Dtitle Type

Punits unset

Ruse 1

Lhide true

*The STYP property (Specific Type) Attributes*

Type DATA

Dkey STYP

Ptype unset

Pproperty ( ATTRIB WDESP[67 ] )

Dproperty ( HASH ( 'YTYP' ) )

```
Purpose DESP
Number 67
Dtitle Type
Punits unset
Ruse 1
Lhide true
```

```
The SHAP property (Shape RECT, CIRC or OVAL) Attributes
Type DATA
Dkey SHAP
Ptype unset
Pproperty ( ATTRIB WDESP[40 ] )
Dproperty ( HASH ( 'RECT' ) )
Purpose DESP
Number 40
Dtitle Type
Punits unset
Ruse 1
Lhide true
```

```
The FACE property (Shape RECT, CIRC or OVAL) Attributes
Type DATA
Dkey FACE
Ptype unset
Pproperty ( ATTRIB WDESP[30 ] )
Dproperty ( HASH ( 'RECT' ) )
Purpose DESP
Number 30
Dtitle Type
Punits unset
Ruse 1
Lhide true
```

The FACE property is subtly different from the SHAP property; mainly because of Branch connectors that can be of circular shape but connected to a rectangular or circular or flat oval main.

#### 4.1.15 Properties for Initial Joint Settings

It is suggested that for initial creation the User Defined HVAC Fittings are created with a default joint of RE; to do this, set the following DATA elements as:

```
*-ARRJ
Pproperty ( ATTRIB WDESP[58 ] )
Dproperty ( HASH ( 'RE' ) )
*-AVAL
```

```
Pproperty ( ATTRIB DESP[68 ] )
Dproperty 0
```

```
*-LEAJ
Pproperty ( ATTRIB WDESP[59 ] )
Dproperty ( HASH ( 'RE' ) )
*-LVAL
Pproperty ( ATTRIB DESP[69 ] )
Dproperty 0
```

```
*-BJNT
Pproperty ( ATTRIB WDESP[60 ] )
Dproperty ( HASH ( 'RE' ) )
*-BVAL
Pproperty ( ATTRIB DESP[70 ] )
Dproperty 0
```

#### 4.1.16 Property for Leave Tubing

For the correct leave tubing to be used for User Defined HVAC Fittings, it is necessary to create a DATA element in your DATASET

```
NEW DATA *-LSTU
DKEY LSTU
PTYP TEXT
PPRO ( ID /CADCHVACSPEC/RTUBE )
DTIT 'Lstube for component'
LHIDE true
```

**Note:** ID /CADCHVACSPEC/RTUBE is generally used for Straight components but ID /CADCHVACSPEC/RTUBEA generally for non-angular components such as bends and threeways.

#### 4.1.17 Properties for HVAC Sketches

There are some properties required for all HVAC components because the standard HVAC Sketches functionality expects them. These are:

```
DATA */rtext (Property RTEX)
DATA */Ductsizes (Property DUCT)
DATA */Detail (Property DETA)
DATA */Joints (Property JOIN)
DATA */Fixing (Property FIXI)
```

These properties are strings of text that are evaluated to describe the duct component.

For the example these may be:

```
Property RTEX
Pproperty ( 'Rectangular Threeway Y Type1' )
```



```

Property DUCT (example 900x700 to 600x700 and 500x700)
Pproperty (STR (DDESP[2] ) + 'x' + STR (DDESP[3] ) + ' to ' +
STR (DDESP[4] ) + 'x' + STR (DDESP[5] ) + ' and ' + STR
(DDESP[41] ) + 'x' + STR (DDESP[42] ) )
Property DETA
Pproperty ( ' Throats ' + STR (DDESP[12] ) + ';' + STR
(DDESP[13] ) + ';' + STR (DDESP[7] ) + ' Inset ' + STR
(DDESP[10] ) + ' V angle ' + STR (DDESP[63] ) )
Property JOIN (example FJ50 ; FJ40 ; FJ40)
Pproperty ( 'Joints ' + WDESP[58] + STR (DESP[68] ) + ';' +
WDESP[59] + STR ( DESP[69] ) + ';' + WDESP[60] + STR
(DESP[70] ) )
Property FIXI (In this case fixing is not relevant; this is
usually for the likes of attachments)
Pproperty ( ' ' )

```

#### 4.1.18 Model Set Design Parameters

The component is already in a state where it can be created in OUTFITTING DESIGN or PARAGON although the Geometric representation will be not correct.

If working in OUTFITTING DESIGN use the Create User Defined HVAC Fittings form to create an instance of the new component i.e. select the element, set some property values, and apply the form.

If working in PARAGON create a macro to set the model Design Parameters, such as:

```

model set des para 1 0
Repeat for 100 parameters set to 0
model set des para 2 900
model set des para 3 700
model set des para 4 600
model set des para 5 700
model set des para 41 500
model set des para 42 700
model set des para 7 150
model set des para 10 200
model set des para 12 150
model set des para 13 150
model set des para 63 90
-- 21 to 29 for Joints
model set des para 21 50
model set des para 22 50
model set des para 23 5
model set des para 24 50

```

model set des para 25 50

model set des para 26 5

model set des para 27 50

model set des para 28 50

model set des para 29 5

DESP[21] to [29] are reserved for the Arrj, Leaj and Bjnt

In OUTFITTING DESIGN these could be set by command line using desp n21 50 desp n22 50 desp n23 5 etc. However...

For Joints Settings in OUTFITTING DESIGN: When the element is created, modify the joints using SHOW !!HVCJOINTMOD

### 4.1.19 Edit the Point Set

The Point set \*-PTSE was inherited from the copied component, but it is now easy to modify the PTAX, PTMI, PTCA elements to be positioned using the new parameters.

In OUTFITTING DESIGN at the newly created Threeway element, use GOTO PTREF to navigate to the PTSE element and view it in the Members list.

Attributes of the Parrive point:

*Name* /My-Y-Type-3-Way1-PA1

*Type* PTAX

*Lock* false

*Owner* /My-Y-Type-3-Way1-PTSE

*Description* unset

*Number* 1

*Pconnect* RECT

*Pbore* ( ATTRIB DDESP[2 ] + ATTRIB DDESP[3 ] )

*Pdistance* ( ATTRIB DESP[12 ] + ATTRIB DESP[4 ] / 2 )

*Paxis* -Z

*Pskey* unset

*Purpose* unset

*Pvifilter* 0

*Pzaxis* Y

*Pwidth* ( ATTRIB DDESP[2 ] )

*Pheight* ( ATTRIB DDESP[3 ] )

#### Reminders:

- P1, P2, P3 reserved for 3 connections arrive, leave and branch
- P6 is required on all items at PL of the item, perpendicular to PL. This is used to aid connection of components where the appware by default uses: CONN and X is P6 of PREV although core code can now use the logic based on the PWIDTH and PHEIGHT attributes.
- P61 62 etc series are used as key dimension points to aid drafting. These are usually at the corners of the arrive duct size, add as many as required.

Some commands to aid visualisation:

- In OUTFITTING DESIGN - repre pp on pp num on update
- In OUTFITTING DESIGN - pin6 at P6    pin6 dir p6    or pin6 dir p6 at p6    etc.

### 4.1.20 Edit the Geometry Set

Again, the geometry set \*-GMSE was inherited from the copied component, but it is now easy to modify the Primitive elements to be positioned using the new parameters.

In OUTFITTING DESIGN at the newly created Threeway element, use GOTO GMREF to navigate to the GMSE element and view it in the Members list.

#### Reminders:

- Name all elements using setstar\* to aid recognition
- Normal representation lev 0 - 10
- Negatives representation lev 9 - 10
- Flanges representation lev 6 - 10
- Insulation representation lev 7 - 10
- Remember to check these before the item is finished. It is suggested to use reporter to check these and a macro to make sure they are all corrected.

### 4.1.21 Create a PLOT

When the component looks OK in OUTFITTING DESIGN, create an example element that can be used on a OUTFITTING DRAFT drawing to make a Plotfile.

Create the drawing in a similar style to the standard Plotfiles, where the philosophy was to do a Plan and elevation and an Isometric view giving all the data as on the Properties input form. There is a standard HVAC representation rule available in the OUTFITTING DRAFT database that can be used to do a detailed Level 9, holes ON drawing.

The Plotfile should be named the same as the CATREF.

The PLOT property attributes:

```
Type DATA
Dkey PLOT
Ptype LPLT
Pproperty ( ATTRIB FLNM OF CATR )
Dproperty ( 'HVACADV' )
Purpose PLOT
Dtitle Plotfile
Lhide false
```

Pproperty is the name of the file.

Dproperty is the name of the directory within the %pdmsplots% directory.

### 4.1.22 Testing

When the Geometry, Point Set, Data Set, Detail Text and PLOT are complete it is advisable to do some testing:

- Level6, level4, level9, level7 - Make sure the Design element displays correctly, each time combined with holes on/off, insulation on/off

- Test that implied tube displays correctly when a following item is moved to create a gap.
- Test that the automatic fill with straights utility works as expected when the new component is used in the branch
- Test that the HVAC Spooling and Sketches functionalities work as expected and produce good data on the final sketch.

## 5 Detail Specifications

A Detail Specification is a table of rules to define duct ranges with different Joints, standard length, material thickness or stiffening.

**Detailing Specification Generator**

Modify Specification: TUTORIAL Sheet Material = MS

Rect MIN	Rect MAX	Joints	Std Leng	Gauge	Stif siz	Max spac
0	300	FJ30	1200	2.0	30	1800
301	500	FJ50	1200	3.0	50	1800
501	1200	FJ7550	3000	3.0	7550	500
1201	1800	FJ8060	3000	3.0	8060	500
1801	9999	FJ10065	3000	3.0	10065	500
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0

Circ MIN	Circ MAX	Joints	Std Leng	Gauge	Stif siz	Max spac
0	500	FJ25	3000	1.6	25	1800
501	700	FJ30	3000	2.0	30	1200
701	1000	FJ30	3000	2.0	30	900
1001	1200	FJ40	3000	2.5	40	900
1201	1500	FJ40	3000	2.5	40	900
1501	1800	FJ40	3000	2.5	40	600
1801	9999	FJ40	3000	2.5	40	600
0	0	NULL	0	0	0	0

Oval MIN	Oval MAX	Joints	Std Leng	Gauge	Stif siz	Max spac
0	300	FJ30	3000	2.0	30	1800
301	500	FJ50	3000	3.0	50	1800
501	1200	FJ7550	3000	3.0	7550	500
1201	1800	FJ8060	3000	3.0	8060	500
1801	9999	FJ10065	3000	3.0	10065	500
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0
0	0	NULL	0	0	0	0

Reset Values Display Named Spec Save Spec Make Current Dismiss

This information for HVAC is currently not stored in the specification database but in system files. The default directory for this is %pdmsdflts%/hvacadvspecs, however, this can be changed by the Administrator in the control file, xmaincontrol, mentioned earlier.

The list of detail specifications available to the user is defined in

%pdmsdflts%/hvacadvspecs/aaaspeclist:

DW142TABLE6	DW142TABLE6
DW142TABLE7	DW142TABLE7
MODELONLY	MODELONLY
TUTORIAL	TUTORIAL

These lines refer to files that have been saved into the same directory named: example

%pdmsdflts%/hvacadvspecs/tutorial and xtutorial

When defining these files Administrators must make sure that they have r/w access, whereas the users will never have write access to these files.

## 6 Insulation Specifications

Insulation is applied at Branch level by setting of the ISPEC attribute. There is currently one insulation specification, named /CADCHVACISPEC, available in the HVAC application. However, if a User Defined Insulation specification is required it will be necessary for the HVAC Administrator to create a similar specification in a CATA database:

```
new spec /MyISpec copy /CADCHVACISPEC rename /CADCHVACISPEC /MyISpec
```

The SPWL will have a PURP HVAC and the SPEC will have a PURP INSU

The SPEC will have the MATREF set to a material in the properties database that has a valid material density.

The database structure for the insulation is as follows:

SPWL

Purp HVAC

SPEC

Purp INSU

Question TYPE

Matref /MyInsulationMaterial

SELE

QUES TEMP

TANS 'INSU'

TDEF 'NONE'

SELE

DESC '1"

ANSW 24

MAXA 26

QUES PBOR

TDEF 'NONE'

SPCO /MyISpec/INSU25

MAXA 10000

CATREF /INSU25

```

SELE
DESC '1.1/4" - For when in imperial units
ANSW 29    -- for 30mm insulation
MAXA 31
QUES PBOR
TDEF 'NONE'

        SPCO /MyISpec/INSU30
        MAXA 10000
        CATREF /INSU30
        Etc...
    
```

The CATREF element also must exist and can be defined by the administrator:

```

SCOM /INSU25
PARAM 50
SCOM /INSU30
PARAM 60
    
```

By creating these Cats&Specs elements this means that:

- Insulation Spec and thicknesses will appear on the Create Branch form
- Insulation weight will be used in weight calculations
- Insulation can be shown graphically by using IPARAM[1] in the catalogue geometry. (Actually IPARAM[2] could also be used if required for 2 level insulation but the standard catalogue has not included this in its geometry).



## 7 User Definable Joints Set

Prior to VERSION 12.0 the joints available for use on the HVAC components were a fixed set of joints, such as FJ25, FJ30, RE etc., all defined in the macro hvcjoints.pmlobj. The HVAC Administrator is now able to define joints for rectangular, circular and flat oval ductwork.

There are 6 new sections (SECT) in the HVAC catalogue database.

```

/CADCHVACCATA-Joints-RECT
/CADCHVACCATA-Joints-CIRC
/CADCHVACCATA-Joints-FOVA
/CADCHVACCATA-Joints-RECT-Imp
/CADCHVACCATA-Joints-CIRC-Imp
/CADCHVACCATA-Joints-FOVA-Imp

```

These sections hold dataset elements (DATASET) for each joint, and each dataset has 7 data elements, .../DESC .../CODE .../ALPH .../NUME .../HVJA .../HVJB .../HVJC

### Example:-

```

/CADCHVACCATA-Joints-RECT/FJ30
DESC ' 30 x 30 x 4 Angle Flange Joint (FJ30) '
FUNC 'FJ30'

/CADCHVACCATA-Joints-RECT/FJ30/DESC
DKEY DESC
PTYP TEXT
PPRO ( ' 30 x 30 x 4 Angle Flange Joint (FJ30) ' )
DTIT 'Description'

/CADCHVACCATA-Joints-RECT/FJ30/CODE
DKEY CODE
PTYP TEXT
PPRO ( 'FJ30' )
DTIT 'Code'

```

/CADCHVACCATA-Joints-RECT/FJ30/ALPH

DKEY ALPH

PTYP TEXT

PPRO ( 'FJ' )

DTIT 'Alpha'

/CADCHVACCATA-Joints-RECT/FJ30/NUME

DKEY NUME

PTYP TEXT

PPRO ( '30' )

DTIT 'Numeric'

/CADCHVACCATA-Joints-RECT/FJ30/HVJA

DKEY HVJA

PTYP REAL

PPRO ( 30 )

DTIT 'A Dimension'

/CADCHVACCATA-Joints-RECT/FJ30/HVJB

DKEY HVJB

PTYP REAL

PPRO ( 30 )

DTIT 'B Dimension'

/CADCHVACCATA-Joints-RECT/FJ30/HVJC

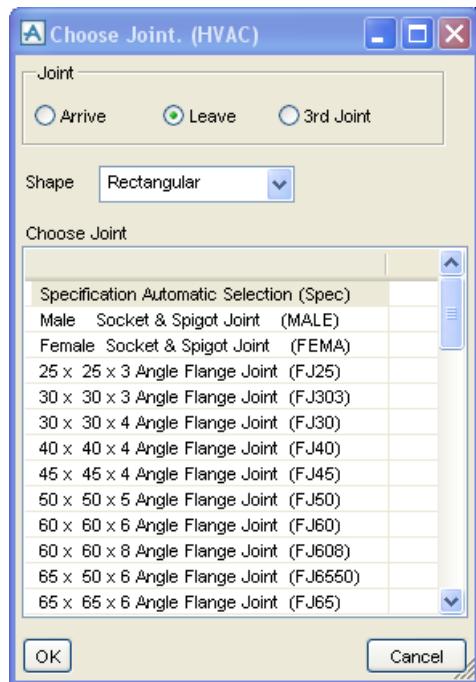
DKEY HVJC

PTYP REAL

PPRO ( 4 )

DTIT 'C Dimension'

The data in these data elements define a joint and all its relevant information to be used and displayed in the Joints form.



The joints provided in the standard product now use this new mechanism so that HVAC Administrators can remove and create joints. The standard joints and codes available currently are:

Joints for Components of any shape:

MALE or M	Socket and spigot male connection
FEMA or F	Socket and spigot female connection
FJ25	25x25x3 (1"x1"x $\frac{1}{8}$ ") equal angle section joint
FJ303	30x30x3 ( $\frac{1}{4}$ "x $\frac{1}{4}$ "x $\frac{1}{8}$ ") equal angle section joint
FJ30	30x30x4 ( $\frac{1}{4}$ "x $\frac{1}{4}$ "x $\frac{3}{16}$ ") equal angle section joint
FJ40	40x40x4 ( $\frac{1}{2}$ "x $\frac{1}{2}$ "x $\frac{3}{16}$ ") equal angle section joint
FJ45	45x45x4 ( $\frac{3}{4}$ "x $\frac{3}{4}$ "x $\frac{3}{16}$ ") equal angle section joint
FJ50	50x50x5 (2"x2"x $\frac{3}{16}$ ") equal angle section joint
FJ60	60x60x6 ( $\frac{1}{4}$ "x $\frac{1}{4}$ "x $\frac{1}{4}$ ") equal angle section joint
FJ608	60x60x8 ( $\frac{1}{4}$ "x $\frac{1}{4}$ "x $\frac{5}{16}$ ") equal angle section joint
FJ6550	65x50x6 ( $\frac{1}{2}$ "x2"x $\frac{1}{4}$ ") unequal angle section joint
FJ65	65x65x6 ( $\frac{1}{2}$ "x $\frac{1}{2}$ "x $\frac{1}{4}$ ") equal angle section joint

FJ70	70x70x7 ( $2\frac{3}{4}$ "x $2\frac{3}{4}$ "x $\frac{5}{16}$ " ) equal angle section joint
FJ7550	75x50x6 (3"x2"x $\frac{1}{4}$ " ) unequal angle section joint
FJ75	75x75x7 (3"x3"x $\frac{5}{16}$ " ) equal angle section joint
FJ8060	80x60x6 ( $3\frac{1}{4}$ "x $2\frac{1}{4}$ "x $\frac{1}{4}$ " ) unequal angle section joint
FJ80	80x80x8 ( $3\frac{1}{4}$ "x $3\frac{1}{4}$ "x $\frac{5}{16}$ " ) equal angle section joint
FJ8010	80x80x10 ( $3\frac{1}{4}$ "x $3\frac{1}{4}$ "x $\frac{3}{8}$ " ) equal angle section joint
FJ90	90x90x9 ( $3\frac{1}{2}$ "x $3\frac{1}{2}$ "x $\frac{7}{16}$ " ) equal angle section joint
FJ10065	100x65x6 (4"x $2\frac{1}{2}$ "x $\frac{3}{8}$ " ) unequal angle section joint
FJ10080	100x80x8 (4"x $3\frac{1}{4}$ "x $\frac{3}{8}$ " ) unequal angle section joint
FJ100	100x100x8 (4"x4"x $\frac{3}{8}$ " ) equal angle section joint
FB253	25x3 (1"x $\frac{1}{8}$ " ) flat bar joint
FB254	25x4 (1"x $\frac{5}{32}$ " ) flat bar joint
FB304	30x4 ( $1\frac{1}{4}$ "x $\frac{5}{32}$ " ) flat bar joint
FB305	30x5 ( $1\frac{1}{4}$ "x $\frac{3}{16}$ " ) flat bar joint
FB354	35x4 ( $1\frac{3}{8}$ "x $\frac{5}{32}$ " ) flat bar joint
FB405	40x5 ( $1\frac{1}{2}$ "x $\frac{3}{16}$ " ) flat bar joint
FB505	50x5 (2"x $\frac{3}{16}$ " ) flat bar joint
FB606	60x6 ( $2\frac{1}{4}$ "x $\frac{1}{4}$ " ) flat bar joint
FB6010	60x10 ( $2\frac{1}{4}$ "x $\frac{3}{8}$ " ) flat bar joint
FB8010	80x10 ( $3\frac{1}{4}$ "x $\frac{3}{8}$ " ) flat bar joint
FB8012	80x12 ( $3\frac{1}{4}$ "x $\frac{1}{2}$ " ) flat bar joint
CH7638	76x38 (3"x $1\frac{1}{2}$ " ) rectangular channel section joint
CH10251	102x51 (4"x2" ) rectangular channel section joint
CH12763	127x63 (5"x $2\frac{1}{2}$ " ) rectangular channel section joint
CH15276	152x76 (6"x3" ) rectangular channel section joint
RE	Raw edge

SF25	Self flange 25mm (1")
SF40	Self flange 40mm (1 1/2")
SF50	Self flange 50mm (2")
WELD or W	Welded joint for branch connector or attachment fixed to a duct

Joints for Rectangular Components Only:

RE25	Raw edge, longitudinal seam notched back 25 (1")
RE40	Raw edge, longitudinal seam notched back 40 (1 1/2")
RE50	Raw edge, longitudinal seam notched back 50 (2")
DM30	Ductmate™ 30mm (1 1/8") flange
DM40	Ductmate™ 40mm (1 1/2") flange
IDC	Integral duct connector
IDF	Integral duct flange
VM20	Verromez™ 20mm (3/4") flange
VM30	Verromez™ 30mm (1 1/8") flange
VM40	Verromez™ 40mm (1 1/2") flange
FLAT	For spigot plates only

A PML object HVACJOINTS is the only place that controls the HVAC Joint storage location.  
method .hvcJoints()

-- Set defaults for the object members

if (!!cdHVACunits eq 'MM') then

!this.rectangularJointsStorage = object DBREF('/CADCHVACCATA-Joints-RECT ')

!this.circularJointsStorage = object DBREF('/CADCHVACCATA-Joints-CIRC ')

!this.flatOvalJointsStorage = object DBREF('/CADCHVACCATA-Joints-FOVA ')

otherwise:

!this.rectangularJointsStorage = object DBREF('/CADCHVACCATA-Joints-RECT-Imp ')

!this.circularJointsStorage = object DBREF('/CADCHVACCATA-Joints-CIRC-Imp ')

!this.flatOvalJointsStorage = object DBREF('/CADCHVACCATA-Joints-FOVA-Imp ')

endif

endmethod

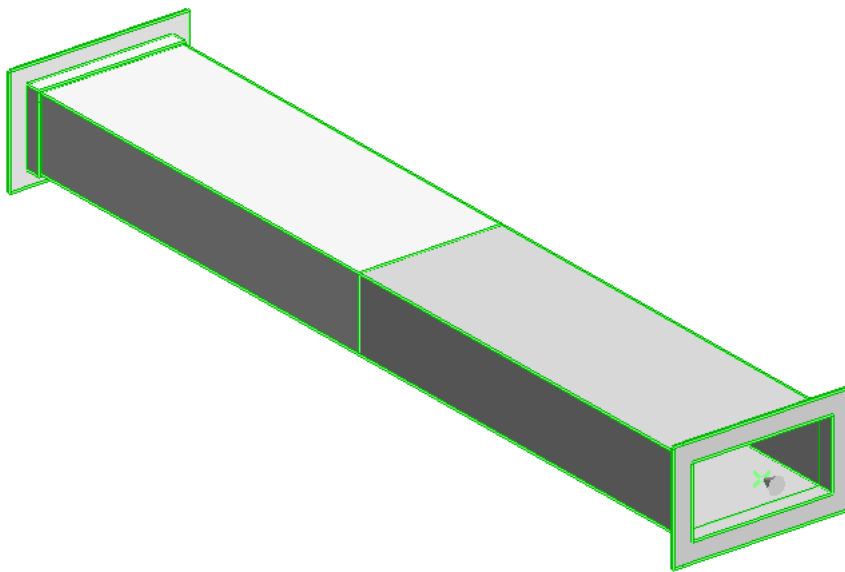
## 7.1 Male/Female Socket & Spigot Joints (Lap Joints) Example

As an example of how the user defined joints can be easily manipulated, consider Male/Female Socket & Spigot joints, often referred to as lap joints:

Assuming the collar is fixed to the Female end in the workshop.

Set the Joint to FEMA on the detailing spec joints

At creation time the application then selects a male after each female.



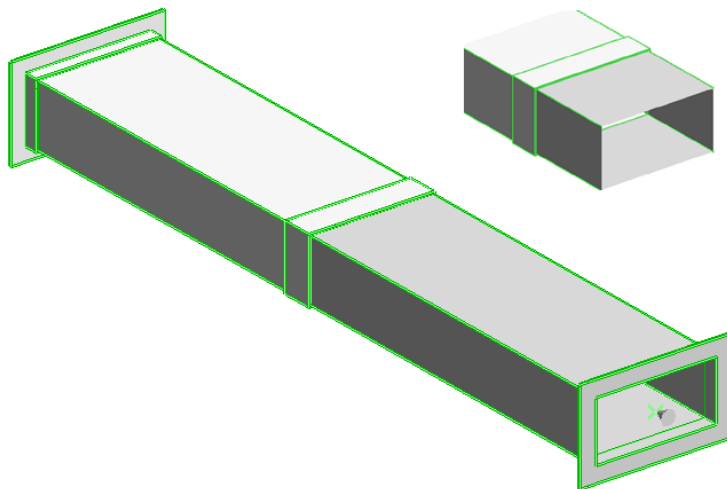
The above does not show the collar thickness. (Default)

So without the green line outline the joint just looks like a butt joint

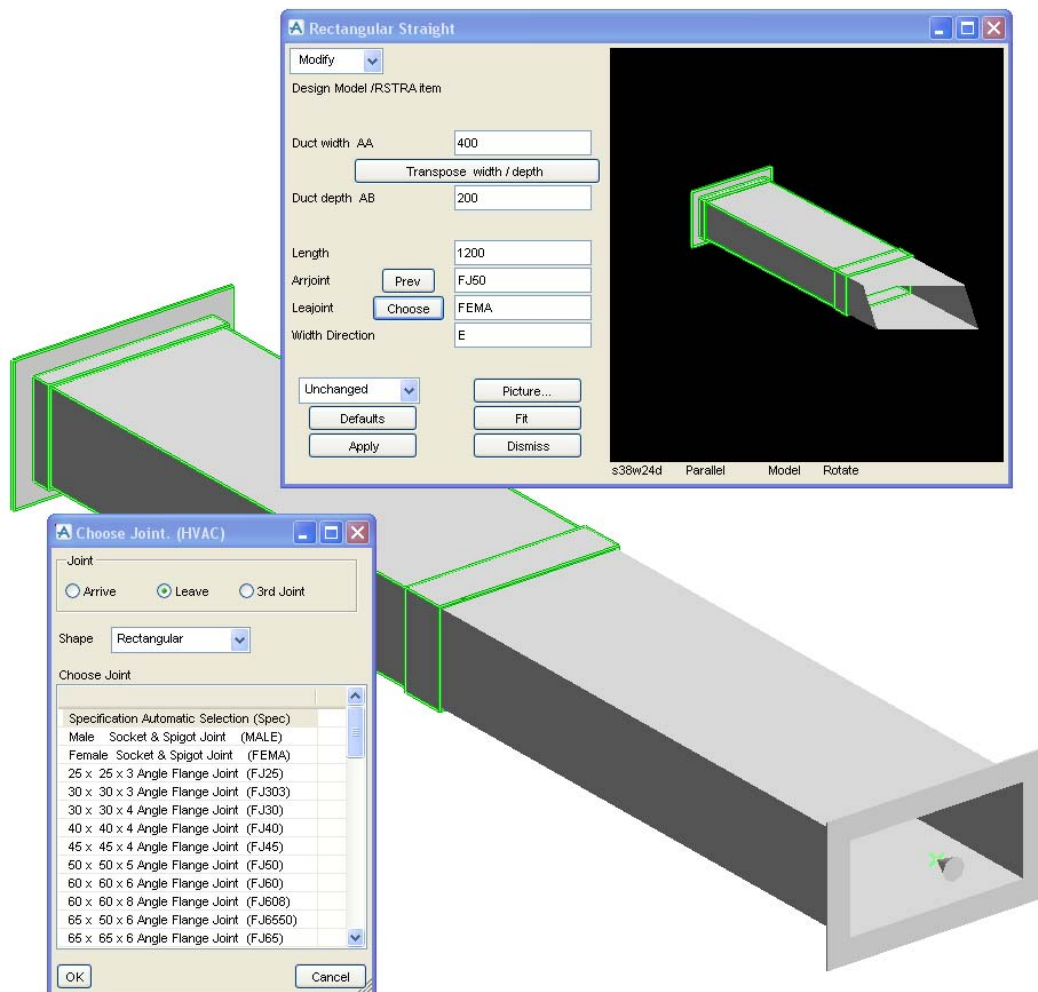
It is possible to show a collar by setting the

/CADCHVACCATA-Joints-RECT/FEMA/HVJA PPRO ( 100 )

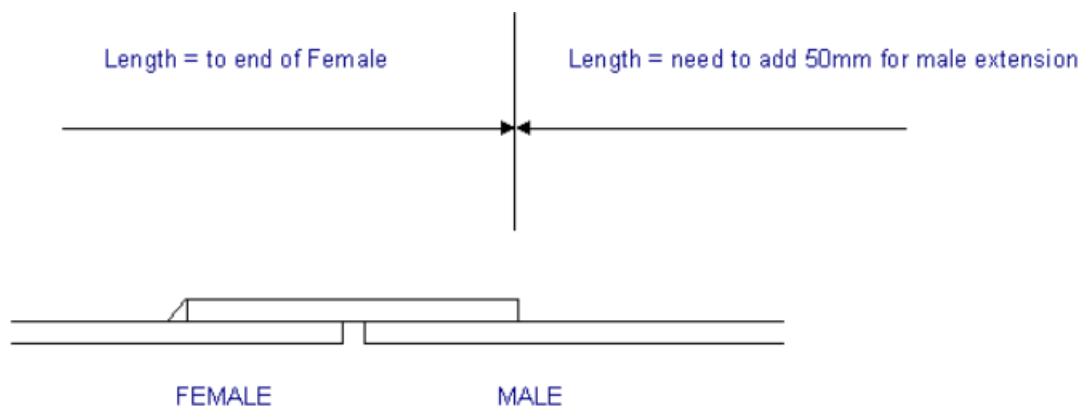
/CADCHVACCATA-Joints-RECT/FEMA/HVJB PPRO ( 3 )



The above selection was from the Choose Joint which you can see gives you Male/Female Socket and Spigot description.



Note it must be clear to the user how to interpret the length of each piece because Length= PA to PL but you want 50mm male insert extra.





## 8 User Definable Stiffeners

Prior to VERSION 12.0 the stiffeners available for use on the HVAC components were a fixed set of stiffeners, such as 25, 30, 40 etc. all defined in the macro MSTIFSIZ. The HVAC Administrator is now able to define the stiffener sizes and codes.

There is a new section (SECT) in the HVAC catalogue database.

/CADCHVACCATA-Stiffeners

These sections hold dataset elements (DATASET) for each stiffener, and each dataset has 7 data elements, .../DESC .../CODE .../HVSA .../HVSB .../HVSC .../CONFIG .../SHAPE

**Example:-**

/CADCHVACCATA-Stiffeners/25

DESC '25x25x3 Angle'

FUNC '25'

/CADCHVACCATA-Stiffeners/25/DESC

DKEY DESC

PTYP TEXT

PPRO ( '25x25x3 Angle' )

DTIT 'Description'

/CADCHVACCATA-Stiffeners/25/CODE

DKEY CODE

PTYP TEXT

PPRO ( '25' )

DTIT 'Code'

/CADCHVACCATA-Stiffeners/25/HVSA

DKEY HVSA

PTYP REAL

PPRO ( 25 )

DTIT 'A Dimension'

/CADCHVACCATA-Stiffeners/25/HVSB

DKEY HVSB

PTYP REAL

PPRO ( 25 )

DTIT 'B Dimension'

/CADCHVACCATA-Stiffeners/25/HVSC

DKEY HVSC

PTYP REAL

PPRO ( 3 )

DTIT 'C Dimension'

/CADCHVACCATA-Stiffeners/25/CONFIG

DKEY CONF

PTYP TEXT

PPRO ( 'EXTERNAL' )

DTIT 'Internal/External configuration'

/CADCHVACCATA-Stiffeners/25/SHAPE

DKEY SHAP

PTYP TEXT

PPRO ( 'L' )

DTIT 'Stiffener shape'

The information in these data elements defines a stiffener and all its relevant details used for stiffener creation. The standard stiffener sizes and codes available currently are:

Stiffener	25	\$<25x25x3 Angle\$>	25 25 3
Stiffener	30	\$<30x30x4 Angle\$>	30 30 4
Stiffener	40	\$<40x40x4 Angle\$>	40 40 4
Stiffener	50	\$<50x50x5 Angle\$>	50 50 5
Stiffener	60	\$<60x60x6 Angle\$>	60 60 6
Stiffener	65	\$<65x65x6 Angle\$>	65 65 6
Stiffener	70	\$<70x70x7 Angle\$>	70 70 7

Stiffener	75	\$<75x75x7 Angle\$>	75 75 7
Stiffener	80	\$<80x80x8 Angle\$>	80 80 8
Stiffener	90	\$<90x90x9 Angle\$>	90 90 9
Stiffener	100	\$<100x100x10 Angle\$>	100 100 10
Stiffener	6550	\$<65x50x6 Angle\$>	65 50 6
Stiffener	7550	\$<75x50x6 Angle\$>	75 50 6
Stiffener	8060	\$<80x60x6 Angle\$>	80 60 6
Stiffener	10065	\$<100x65x6 Angle\$>	100 65 6
Stiffener	10080	\$<100x80x8 Angle\$>	100 80 8
Stiffener	253	\$<25x3 Flat bar\$>	25 0 3
Stiffener	254	\$<25x4 Flat bar\$>	25 0 4
Stiffener	304	\$<30x4 Flat bar\$>	30 0 4
Stiffener	305	\$<30x5 Flat bar\$>	30 0 5
Stiffener	354	\$<35x4 Flat bar\$>	35 0 4
Stiffener	405	\$<40x5 Flat bar\$>	40 0 5
Stiffener	505	\$<50x5 Flat bar\$>	50 0 5
Stiffener	606	\$<60x6 Flat bar\$>	60 0 6
Stiffener	6010	\$<60x10 Flat bar\$>	60 0 10
Stiffener	8010	\$<80x10 Flat bar\$>	80 0 10
Stiffener	8012	\$<80x12 Angle\$>	80 0 12
Stiffener	303	\$<30x30x3 Angle\$>	30 30 3
Stiffener	608	\$<60x60x8 Angle\$>	60 60 8
Stiffener	801	\$<80x80x10 Angle\$>	80 80 10
Stiffener	7638	\$<76x38 Channel\$>	76 0 38
Stiffener	10251	\$<102x51 Channel\$>	102 0 51
Stiffener	12763	\$<127x63 Channel\$>	127 0 63
Stiffener	15276	\$<152x76 Channel\$>	152 0 76

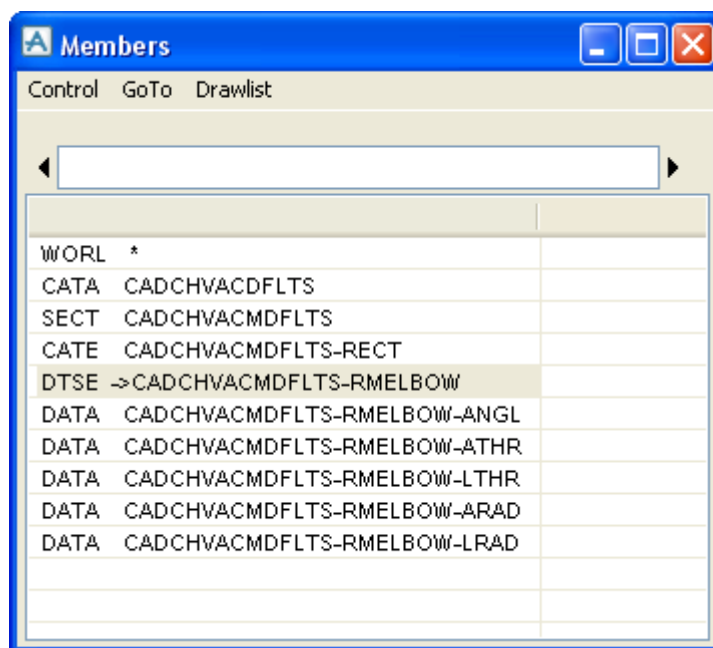
The code above are numbers such as 25, 30, 40 etc. but a code can be any text such as abc123, xyz789 etc.



## 9 Defaults

All the standard components have default values that can be changed by the user. For example a Taper piece may have a default length of 500mm when in metric and 20inches when in imperial. The defaults are the values that appear on the creation form as the initial value. The Administrator can change these to 600mm or 24inches by creating or editing data elements as follows:

The standard HVAC defaults are stored as



To make user defaults :

```
new cata /USERHVACDFLTS copy /CADCHVACDFLTS rename $ /CADCHVACDFLTS /
USERHVACDFLTS
```

Then modify the data values, for example:

```
/USERHVACMDFLTS-RMELBOW-ATHR dprop (150)
```

Etc.

There is then a file %pdmsdflts%/hvacadv/userhvacmdflts that sets /USERHVACMDFLTS as the default.

To force this to always be the default, the administrator can edit the file %pdmsui%/des/hvacadv/init.

## 9.1 Units

The defaults used must correspond to the units being used or else the default value of 500 may be interpreted as 500inches rather than the intended mm.

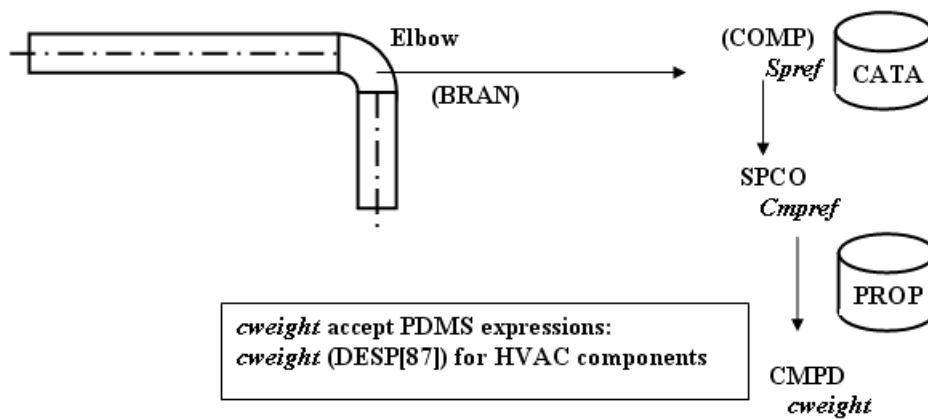
There is a concept of application units; where, variable !!CDHVACUNITS is set to 'MM' or 'INCH' in the defaults file.

The user can select different defaults from Settings>Ductwork Defaults...

## 10 Weights

The database mechanism for weights is as follows:

Consider a HVAC branch:



For HVAC components the weight is calculated and set as DESP[87] by a macro %pdmsui%/des/hvacadv/mweight when an element is created or modified.



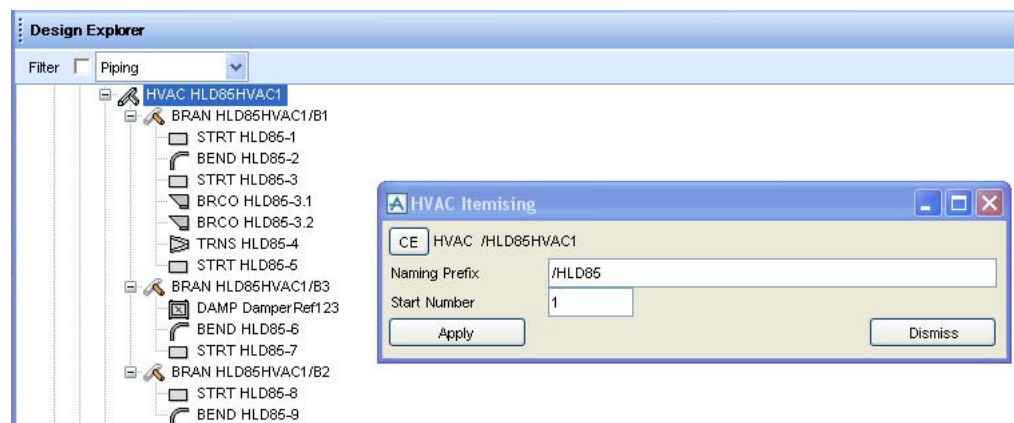


## 11 Auto Naming

The HVAC Administrator may define 'auto naming' rules for HVAC elements and HVAC branches, however, it is expected that a user would define the HVAC and branch names.

With regard to component names (branch members) the user has a utility that allows the HVAC elements to be assigned an item number and named accordingly.

This utility is called from Utilities>Automatic Itemising... and applies the same rules as HVAC Spooling where works fitted items are given a subnumber, for example 3.1 is a branch connector which is fitted to the above item 3.



An item is defined as works fitted by the property WKSF true.



## 12 HVAC Spools

HVAC Spools are generated in OUTFITTING DESIGN, and is basically a group of connected HVAC components designated to be fitted together in the workshop prior to site assembly.

The elements in the database are:

...HVAC

BRAN

Components

HSLIST

HSPOOL

HSPOOL etc...

There is a core PML object that can be used to interrogate HVAC Spool.

!x = object HVACSPOOLMANAGER()

Name	Result	Description	Remarks
HVACSPOOLMANAGER()		Creates an empty HVAC Spool Manager PML object	
GENERATEHVACSPOOLS (DBREF)DBREF - Any HVAC Element		Generates HSPOOLS and HSLIST which owns them in the database.	When GENERATEHVACSPOOLS is called from a HVAC element which already owns a HSLIST, it verifies the spool as it is, if found OK, no modification is done. If any differences or discrepancies present, then regenerate the appropriate spool/spools. This method does not delete the spool already created, but maintains the reference numbers of all the valid spools, so that the drawings generated from those spools remain intact.
DELETEHVACSPOOLS (DBREF)DBREF - Any HVAC Element		Delete HSLIST and HSPOOLS owned by the HVAC element	User cannot delete any spool or the HSLIST by any means other than this method. For ex. "Delete HSPOOL "will not delete the spool.

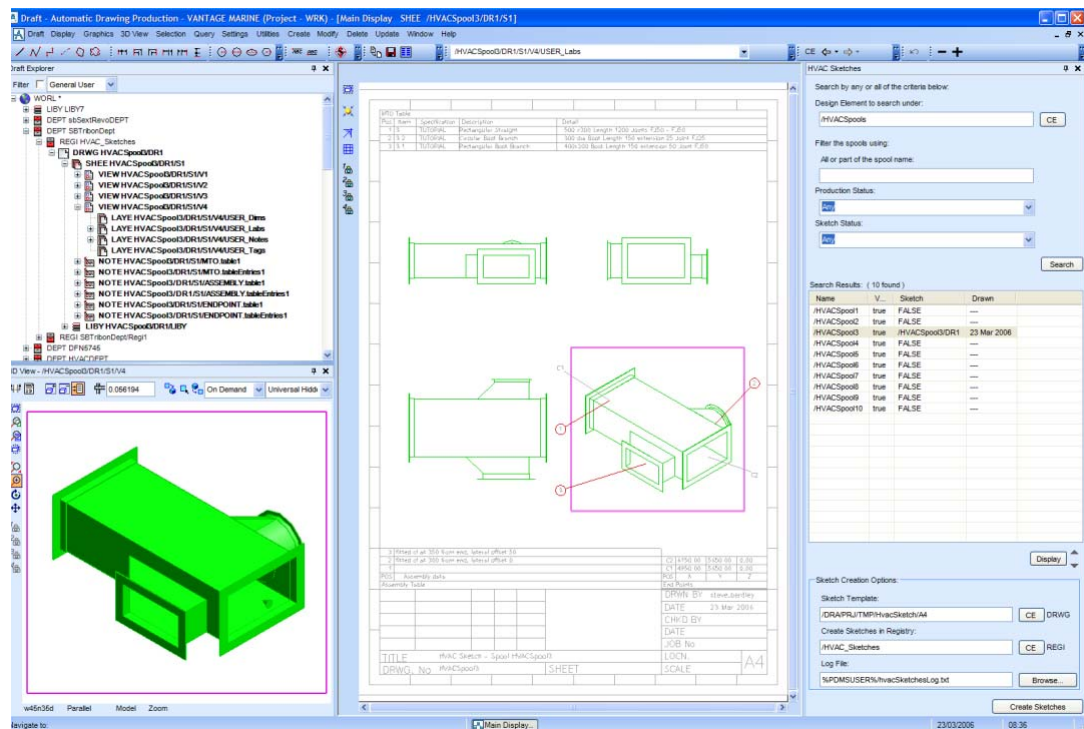
Name	Result	Description	Remarks
VERIFYHVACSPOOLS(DBREF)DBREF - Any HVAC Element	Array	If an element or elements in the constituent spools do not satisfy any of the criteria for a valid spool, error messages are returned as a string array. Returns an unset array if all the criteria are satisfied.	Format: <ELEMENT NAME> : <ERROR MESSAGE> Sample error message: 'HSLIST 1 of HVAC /HTEST : has 1 more spool(s) 'HSPPOOL 13 of HSLIST 1 of HVAC / HTEST : Invalid Spool (Start/End Reference Modified)
VERIFYSPPOOL(DBREF)DBREF - a HSPPOOL	String	If fails to satisfy any criteria, returns the error message; otherwise returns the message "Successful"	"Format:<ELEMENT NAME> : <ERROR MESSAGE> Sample error message: HSPPOOL 13 of HSLIST 1 of HVAC / HTEST : Invalid Spool (Start/End Reference Modified)
GETMTOELEMENTSFORSPOOL(DBREF HSPPOOL Type	Array	Returns the elements included in this HVAC spool	

## 13 OUTFITTING DRAFT Sketches

The HVAC user has functionality to create HVAC Sketches of Spools generated in OUTFITTING DESIGN, based on the Property WKSF (Works Fitted) True/False.

The HVAC Administrator must first set up the Templates and Backing Sheets to be used for the HVAC Sketches.

This is an example of the HVAC Sketch in OUTFITTING DRAFT:



The tables on the drawing will look something like this:

			C4	5850.00	6075.00	0.00
			C3	5800.00	5200.00	-50.00
	3	fitted cl at 300 from end, lateral offset 0	C2	6150.00	5650.00	0.00
	2	fitted cl at 350 from end, lateral offset 50	C1	4950.00	5650.00	0.00
POS.	Assembly data		POS	X	Y	Z
Assembly Table			End Points			

The data on these tables will come from the Design database.

### 13.1 HVAC Sketch Object

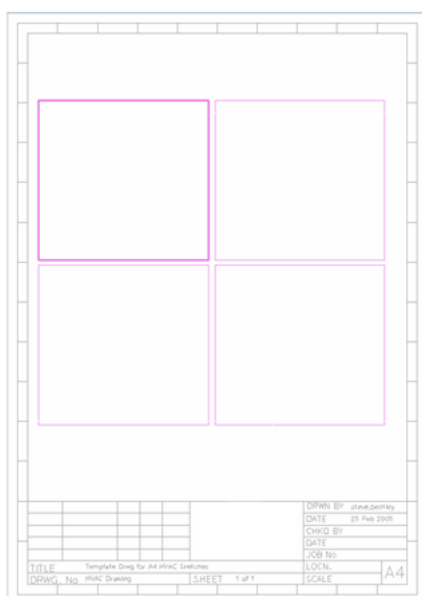
#### Attributes

Attribute	Return Type	Description
HVAC Spool	dbref	HVAC spool to create HVAC sketch from
Storage Area	dbref	Position in OUTFITTING DRAFT hierarchy where sketch is to be created
Drawing Template	dbref	Drawing template to be used to create HVAC sketch with
Drawing Prefix	string	Drawing name prefix
Sheet Prefix	string	Sheet name prefix
Log Messages	array	Messages created when processing the HVAC sketch
Sketch successfully generated	Boolean	True if sketch is successfully created

#### Functions

Attribute	Return Type	Description
Create HVAC sketch		Creates HVAC sketch from held data

#### 13.1.1 Drawing Template



This is a typical Template:

Each HVAC Sketch drawing is based on a Template which is used as the basic definition of the HVAC Sketch.

The Template Drawing contains views and layers like any other OUTFITTING DRAFT Template drawing.

For other Drawing information the Template Drawing references a 'Backing Sheet'

### 13.1.2 Backing Sheet

This is a typical backing sheet.

The image shows a typical backing sheet template. It features a large central rectangular area for drawing. At the top and bottom, there are title blocks. The bottom title block is divided into several sections, including fields for drawing title, date, and other metadata. The top title block also contains similar information. The entire sheet is framed by a thin border.

The new HVAC Sketch will reference the 'Backing Sheet', which is generally user-defined.

This is a standard backing sheet which will contain the drawing title block, with drawing data displayed via intelligent text e.g. #DATE<FR DRWG> and #:UDA\_Name etc.

In addition to the standard title block, the backing sheet is used to identify and locate 'TABLES' that are to be used on the HVAC Sketch.

These tables are identified by:

Material Take Off	- function 'MTO'	SpPurpose 'TABLE' / SpPurpose 'CELLS'
Assembly	- function 'ASSEMBLY'	SpPurpose 'TABLE' / SpPurpose 'CELLS'
End Points	- function 'ENDPOINT'	SpPurpose 'TABLE' / SpPurpose 'CELLS'

### 13.1.3 Tables

In database terms the Table is a NOTE of the Backing Sheet (BACK); there are two notes required, one for the Table headings and one for the Table cells. Both notes are positioned at the same point.



**Example:**

BACK named /DRA/MAS/BACKS/HVACSketch/A4 SETST

NOTE named \*/ExampleTable function 'ENDPOINT SpPurpose 'TABLE'

NOTE named \*/ExampleCells function 'ENDPOINT SpPurpose 'CELLS'

POS	X-COORD	Y-COORD	Z-COORD	End Points
POS	X	Y	Z	

				DRWN BY	#AUTH<FR DRWG>
				DATE	#DATE<FR DRWG>
				CHKD BY	
				DATE	
				JOB No	
TITLE				#DTITL	
DRWG. No				#STITL	
SHEET				LOCN.	A4
				SCALE	

The above is an example of a table defined on a backing sheet. Although this table is visible in the view, it will in practice have its visibility flag (LVIS) set to false. The reason being that this table is used by copying onto the HVAC Sketch Drawing then the cells of the table are populated with data from the actual HVAC Spool. The figure below shows the table in situ on the final HVAC Sketch Drawing.

C4	5850.00	6075.00	0.00
C3	5800.00	5200.00	-50.00
C2	6150.00	5650.00	0.00
C1	4950.00	5650.00	0.00
POS	X	Y	Z
End Points			

### 13.1.4 MTO Tables

MTO Table				
Pos	Item	Description	Duct Sizes	Joints
TAG	STR	DESCRIPTION	PROP DUCT	PROP JOIN
		PROP DETA		

MTO Table - Specification, TUTORIAL				
Pos	Item	Description	Duct Sizes	Joints
1	3	Rectangular Straight Length 1200	500x300	Joints FJ50; FJ50
2	3,1	Rectangular Boot Branch Boot Length 150	400x200	Joint FJ50
3	3,2	Circular Boot Branch Boot Length 150	300dia	Joint FJ25

The above figures show the MTO/Material Take-off tables first on the backing sheet and then on the finished drawing. On this type of table the 'cells' data need to be attributes of the HVAC Spool elements. E.g. DTXR and DTXS attributes as used in the Description and Detail columns.

The user can also use PROP attributes such as PROP RTEK, PROP DUCT, PROP DETA etc as shown below

## 13.2 Assembly Tables and Endpoint Tables

TAG PROP FIXI			
POS	Assembly data		
	Assembly Table		

POS X=COORD Y=COORD Z=COORD			
POS	X	Y	Z
	End Points		

The above figures show the Assembly and End Point tables first on the backing sheet and then on the finished drawing. On the assembly type of table the 'cells' data need to be attributes of the HVAC Spool elements. E.g. PROP FIXI attribute as used in the Assembly data column. Any attributes or expressions can be used. The data in the End Point table is controlled by the System.

### 13.2.1 Styles

All Drawing Styles and Representations are inherited from the template drawing.

These include the View Representations, text colours and font size for Labels and Dimensions.

#### Examples

VIEW  
Rrsf/DRA/PRJ/RERP/GEN/BASIC  
LAYER  
TSIZE 3mm  
Etc.

### 13.2.2 Common Object

The system uses 1 object that does all the work to produce HVAC Sketch Drawings. This is so a user does not have to use the form and graphics mode to produce a batch of drawings.

The common object is a Global instance of a hvacSketches object called !!hvacSketch.

The key members are:

!!hvacSketch.createIn	= DBREF (Must be an existing Registry - REGI element)
!!hvacSketch.selectedTemplate	= DBREF (Must be an existing Drawing - DRWG element)
!!hvacSketch.hvacSpool	= DBREF (Must be an existing HVAC Spool -HSPOOL element)

Optional members are:

!!hvacSketch.logFile	= FILE (The Form or User must write and read this file)
!!hvacSketch..drawingPrefix	= STRING (Default is 'DR')
!!hvacSketch..sheetPrefix	= STRING (Default is 'S')

Other Members set and used in the background by the system:

!!hvacSketch..type	= STRING (Will always be 'drawing' or 'drtmpl')
!!hvacSketch..drawing	= DBREF (System records the new drawing)
!!hvacSketch..sheet	= DBREF (System records the new sheet)
!!hvacSketch..backingSheet	= DBREF (System records the backing sheet being used)
!!hvacSketch..mtoHeadings	= ARRAY (Array of strings read from backing sheet MTO table)

!!hvacSketch..assemblyHeadings = ARRAY (Array of strings read from assembly table)

!!hvacSketch..logData = ARRAY (Array of comment strings that user or form can read)

Example

!!hvacSketch.createIn = object DBREF ('/MyRegistry')

!!hvacSketch.selectedTemplate = object DBREF ('/MyTemplateDrawing')

!!hvacSketch.hvacSpool = object DBREF ('/MyHvacSpool')

-- Then to create the sketch

!!hvacSpool.apply()

### 13.2.3 Log Messages

To write any message to the Log Data from any PML function use :

!!hvacSketchesLog('Text of your choice')

To clear the messages from the Log Data use:

!!hvacSketch.emptyLogData()

To write to the log File use:

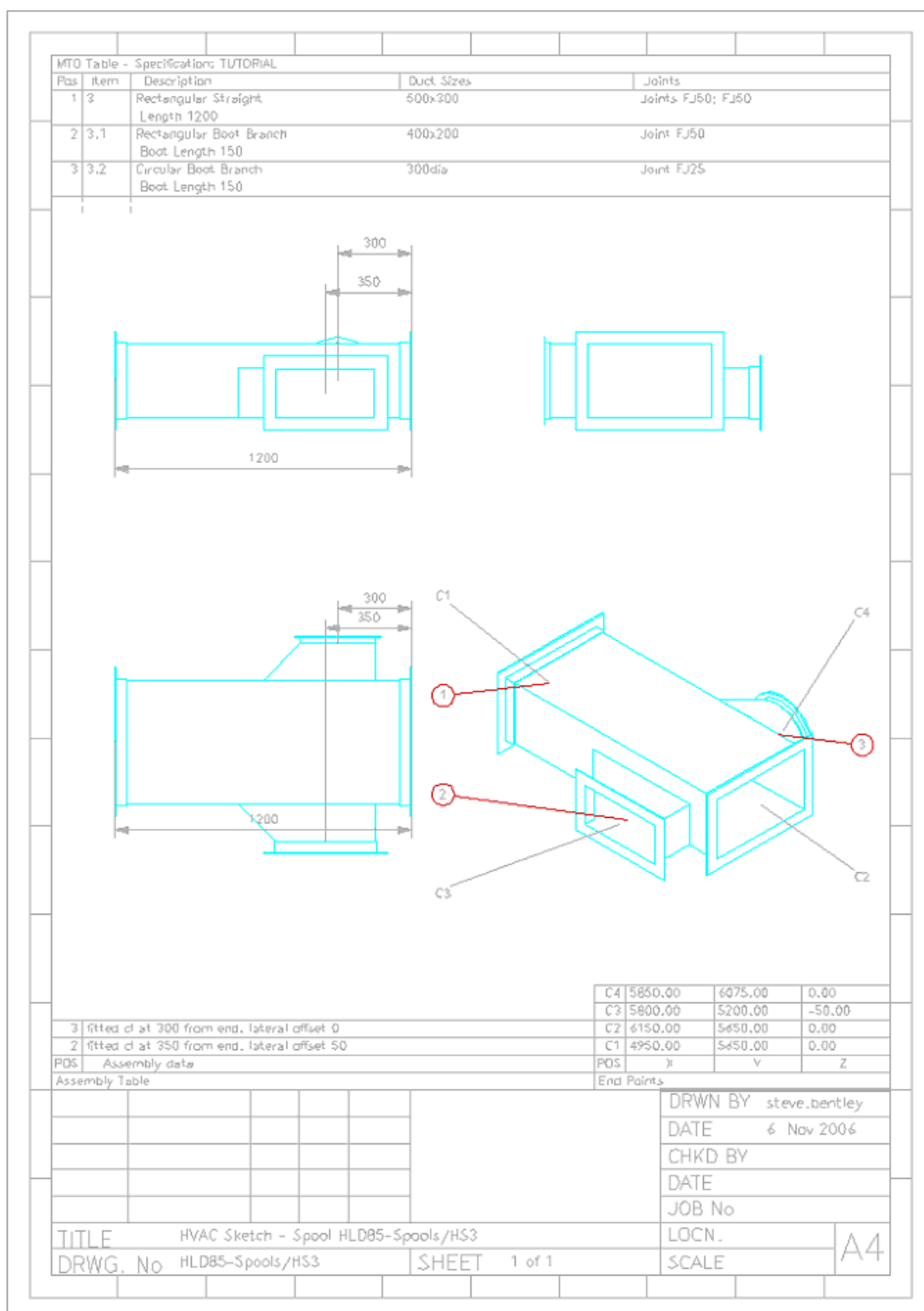
!!hvacSketch.logFile = object FILE('%pdmsuser%/hvacSketches.txt')

!!hvacSketch.openLogFile()

!!hvacSketch.writeLogFile() - This write the contents of .logData to the .logFile

!!hvacSketch.closeLogFile()

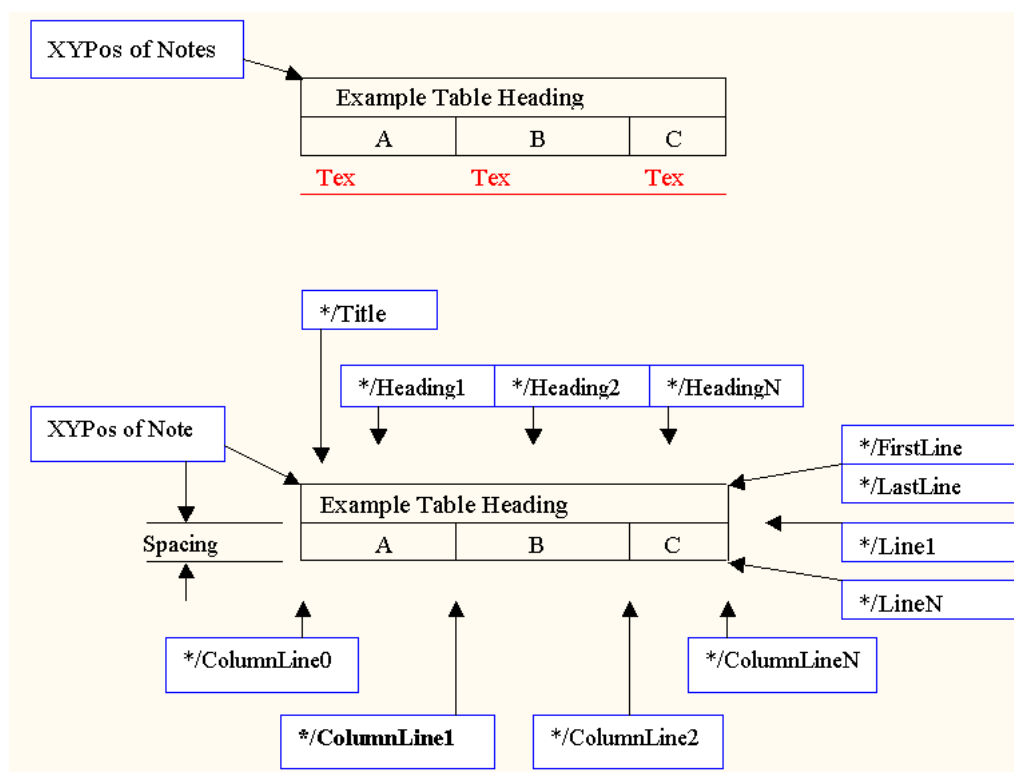
### 13.3 Example of the Final Sketch



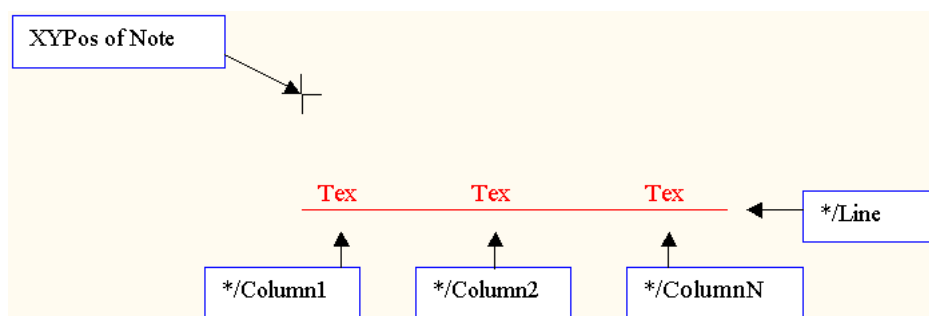
### 13.3.1 How to Define Tables

-- Under a 'Backing Sheet'

BACK /ExampleBack SETST



**Note:** The \*/ColumnLine1 direction of 'From Point' and 'To Point' defines the direction of the rows. The \*/ColumnLine1 'From Point' and 'To Point' distance defines the spacing of the rows.



Example continued....

-- Create NOTES

NOTE \*/---Table SETST

FUNC '----' ('----' can be MTO, ENDPOINT or ASSEMBLY)

SpPurpose TABLE

Set the XYpos and usual attributes for text size colour etc.

Create and name TEXP and STRA elements under NOTE. In the example below there are 4 TEXP elements and 7 STRA elements (Shown in Black)

NOTE \*/---Cells SETST

FUNC '---' ('---' can be MTO, ENDPOINT or ASSEMBLY)

SpPurpose TABLE

Set the XYpos and usual attributes for text size colour etc.

Create and name TEXP and STRA elements under NOTE. In the example below there are 3 TEXP elements and 1 STRA element (Shown in Red).

### 13.3.2 Dimensions

Dimensions are controlled from the Template Drawing:

A VIEW will only be dimensioned if it has a LAYER with a PURPOSE of 'DIMA';

If it does, then the dimensions will go into that layer.

The style of the dimension will be cascaded from the owning layer.

### 13.3.3 Tags

View Tags are controlled from the Template Drawing:

A VIEW will only be tagged if it has a LAYER with a PURPOSE of 'LABA';

If it does, then the tags will go into that layer.

The style of the tag will be cascaded from the owning layer, or taken from a symbol template in the case of component tags.

A typical symbol may look like this:



To control how the components of the HVAC Spool are tagged:

Firstly:

A LAYER with PURPOSE of 'LABA'

Must own a TASK element with a SpPurpose of 'TAGDEF'

Which owns 4 Task Parameter elements (TKPARA)

With FUNCTION equal to 'TEMPLATE', 'OFFSET', 'TPEN' and 'FPEN'

And suitable TPVALUES

### Example

LAYER

TASK

TKPARA

FUNC 'TEMPLATE' TKPARA '/MySymbol'

TKPARA

FUNC 'OFFSET' TKPARA '10 10'

TKPARA

FUNC 'TPEN' TKPARA '1'

TKPARA

FUNC 'FPEN' TKPARA '11'

When tagging views the system will create a Symbolic Label (SLAB) for each component, using the attributes of the above task parameters.

Secondly:

A LAYER with PURPOSE of 'LABA'

Must own a TASK element with a SpPurpose of "ARRLAB"

Which owns 6 Task Parameter elements (TKPARA)

And specific FUNCTIONS and suitable TPVALUES



**Example**

LAYER

TASK

TKPARAM

FUNC 'Top Side' TKPARAM 'On'

TKPARAM

FUNC 'Bottom Side' TKPARAM 'Off'

TKPARAM

FUNC 'Left Side' TKPARAM 'On'

TKPARAM

FUNC 'Right Side' TKPARAM 'On'

TKPARAM

FUNC 'Margin' TKPARAM '5'

TKPARAM

FUNC 'Minimum Gap' TKPARAM '1'

When tagging views the system will now arrange the Label around the view, using the attributes of the above task parameters.

## 13.4 HVAC Sketches Created in Batch

The common object !!hvacSketch can be used in a macro to be run as a batch job:

```
-- Initialise variables
```

```
!allSpools = ARRAY()
```

```
!element = /myZone
```

```
-- Array of spools to process
```

```
var !allSpools collect all HSPool for $!element
```

```
!numberOfSpools = !allSpools.size()
```

```
-- Set the Global instance of the !!hvacSketch
```

```
!!hvacSketch.createIn = object DBREF ('/MyRegistry')
```

```
!!hvacSketch.hvacSketchLogFile = object FILE'%pdmswk%\myLog')
```

```
!!hvacSketch.selectedTemplate = object DBREF ('/MyTemplateDrawing')
```

```
!!hvacSketch.hvacSpool = object DBREF ('/MyHvacSpool')
```

```
WARNINGS OFF
```

```
-- Log progress - Put a start entry into the logfile
var !clock clock
!createIn = !!hvacSketch.createIn.name
!template = !!hvacSketch.selectedTemplate.name
!!hvacSketchesLog('HVAC Sketching Log')
!!hvacSketchesLog('=====')
!!hvacSketchesLog(' ')
!!hvacSketchesLog('Starting the log file at $!clock')
!!hvacSketchesLog('Element to be processed = $!element')
!!hvacSketchesLog('Template being used for all drawings = $!template')
!!hvacSketchesLog('All drawings being created in registry = $!createIn')
!!hvacSketchesLog(' ')

-- Log progress
!!hvacSketchesLog('$!numberOfSpools drawings are to be created')
!!hvacSketchesLog('-----')
!!hvacSketchesLog(' ')

-- ***** HVAC Sketches Code...
*****

-- Run drawing creation
do !i indices !allSpools

!spool = !allSpools[!i].dbref()

-- Log progress
prompt 'Generate HVAC Sketch $!i of $!numberOfSpools'
var !clock clock
!!hvacSketchesLog('Generating HVAC Sketch $!i of $!numberOfSpools for $!spool.fullName - $!clock')

-- ***** This is the command that does all the work
*****
!!processhvacSketches(!spool)

-- Log progress
var !clock clock
!!hvacSketchesLog('*Completed HVAC Sketch $!i of $!numberOfSpools for $!spool.fullName - $!clock')
!!hvacSketchesLog(' ')

enddo
```

```
-- Log progress - Put an end entry into the logfile
var !clock clock
!!hvacSketchesLog('Ending the log file at $!clock')

-- Open the log file
!!hvacSketch.openLog()

-- Write to the log file
!!hvacSketch.writeLog()

-- Close the log file
!!hvacSketch.closeLog()

-- Empty the log data array
!!hvacSketch.emptyLogData()

WARNINGS ON
-- end of Macro
```

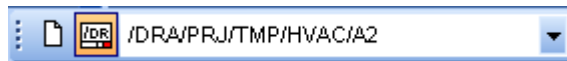


## 14 OUTFITTING DRAFT General

Creating OUTFITTING DRAFT drawings of HVAC, such as Plans or General arrangements, is like any other discipline in OUTFITTING DRAFT. Sample representation rules and styles exist in the AVEVA Solutions Ltd sample projects, however, the Administrator may choose to create company or project standard representations for the same.

It is also recommended that the HVAC OUTFITTING DRAFT Administrator creates a set of symbols such as End of Duct symbols, Air Flow Arrows, Duct Sizes etc. Note that (#DESP[2]) intelligent text expressions can be used.

The OUTFITTING DRAFT Administrator should also create a template Drwg and sheet so the HVAC user has quick access to creating a new drawing using the 'Create from Default Template' toolbar.





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