A large, light blue wireframe sphere is positioned on the left side of the page, partially overlapping the title area. It consists of a grid of lines forming a sphere, with a smaller, similar sphere nested inside it, creating a sense of depth and technical design.

**AVEVA**

MARINE

# Pipework Support Design User Guide

[www.aveva.com](http://www.aveva.com)

## Disclaimer

Information of a technical nature, and particulars of the product and its use, is given by AVEVA Solutions Ltd and its subsidiaries without warranty. AVEVA Solutions Ltd and its subsidiaries disclaim any and all warranties and conditions, expressed or implied, to the fullest extent permitted by law.

Neither the author nor AVEVA Solutions Ltd, or any of its subsidiaries, shall be liable to any person or entity for any actions, claims, loss or damage arising from the use or possession of any information, particulars, or errors in this publication, or any incorrect use of the product, whatsoever.

## Copyright

Copyright and all other intellectual property rights in this manual and the associated software, and every part of it (including source code, object code, any data contained in it, the manual and any other documentation supplied with it) belongs to AVEVA Solutions Ltd or its subsidiaries.

All other rights are reserved to AVEVA Solutions Ltd and its subsidiaries. The information contained in this document is commercially sensitive, and shall not be copied, reproduced, stored in a retrieval system, or transmitted without the prior written permission of AVEVA Solutions Ltd. Where such permission is granted, it expressly requires that this Disclaimer and Copyright notice is prominently displayed at the beginning of every copy that is made.

The manual and associated documentation may not be adapted, reproduced, or copied, in any material or electronic form, without the prior written permission of AVEVA Solutions Ltd. The user may also not reverse engineer, decompile, copy, or adapt the associated software. Neither the whole, nor part of the product described in this publication may be incorporated into any third-party software, product, machine, or system without the prior written permission of AVEVA Solutions Ltd, save as permitted by law. Any such unauthorised action is strictly prohibited, and may give rise to civil liabilities and criminal prosecution.

The AVEVA products described in this guide are to be installed and operated strictly in accordance with the terms and conditions of the respective licence agreements, and in accordance with the relevant User Documentation. Unauthorised or unlicensed use of the product is strictly prohibited.

First published September 2007

© AVEVA Solutions Ltd, and its subsidiaries 2007

AVEVA Solutions Ltd, High Cross, Madingley Road, Cambridge, CB3 0HB, United Kingdom

## Trademarks

AVEVA and Tribon are registered trademarks of AVEVA Solutions Ltd or its subsidiaries. Unauthorised use of the AVEVA or Tribon trademarks is strictly forbidden.

AVEVA product names are trademarks or registered trademarks of AVEVA Solutions Ltd or its subsidiaries, registered in the UK, Europe and other countries (worldwide).

The copyright, trade mark rights, or other intellectual property rights in any other product, its name or logo belongs to its respective owner.

# Pipework Support Design User Guide

---

<b>Contents</b>	<b>Page</b>
-----------------	-------------

## Pipework Support Design

<b>Read This First</b> .....	<b>1:1</b>
<b>Scope of the Guide</b> .....	<b>1:1</b>
Intended Audience .....	1:1
Assumptions .....	1:1
About the Tutorial Exercise .....	1:1
Further Reading .....	1:2
<b>How the Guide is Organised</b> .....	<b>1:2</b>
<b>Introducing OUTFITTING</b> .....	<b>2:1</b>
<b>Introducing the Structure of OUTFITTING</b> .....	<b>2:1</b>
<b>Strengths of OUTFITTING</b> .....	<b>2:1</b>
<b>Introducing OUTFITTING Hangers and Supports</b> .....	<b>3:1</b>
Locating the Support .....	3:1
Support Configuration .....	3:1
Connecting Supports .....	3:2
Standard Hanger Configurations .....	3:2
Utilities .....	3:2
Catalogues Supplied with the Product .....	3:2
Drawing Facilities .....	3:3
<b>Starting to Use Hangers &amp; Supports</b> .....	<b>4:1</b>
Logging In .....	4:1

<b>OUTFITTING Startup Display</b> .....	<b>4:2</b>
<b>Setting the Defaults</b> .....	<b>4:3</b>
<b>Hangers and Supports Database Hierarchy</b> .....	<b>4:4</b>
Setting the Storage Areas .....	4:6
<b>Hangers and Supports Toolboxes</b> .....	<b>4:7</b>
<b>Displaying the Model</b> .....	<b>4:7</b>
<b>Creating a Goalpost Support</b> .....	<b>5:1</b>
<b>Positioning the Support Plane</b> .....	<b>5:1</b>
<b>Creating the Framework, and Classification</b> .....	<b>5:3</b>
<b>Creating a Subframework</b> .....	<b>5:4</b>
<b>Creating Template Members</b> .....	<b>5:4</b>
<b>Configuring the Support</b> .....	<b>5:7</b>
<b>Modifying the Support Template</b> .....	<b>5:9</b>
<b>Checking the Member Connections</b> .....	<b>5:9</b>
<b>Applying the Steel Profiles</b> .....	<b>5:10</b>
<b>Building the Support</b> .....	<b>5:12</b>
<b>Support Schedule</b> .....	<b>5:12</b>
Support Schedule Headers and Footers .....	5:13
<b>Creating a Single Hanger</b> .....	<b>6:1</b>
<b>Creating a Two-plane Support</b> .....	<b>7:1</b>
<b>Create the First Subframework</b> .....	<b>7:2</b>
<b>Checking the Clearances</b> .....	<b>7:2</b>
<b>Create the Second Subframework</b> .....	<b>7:2</b>
<b>Completing the Support</b> .....	<b>7:3</b>
<b>Creating Bracing Members</b> .....	<b>8:1</b>
<b>Creating the Goalpost Support</b> .....	<b>8:1</b>
<b>Toolbox Icons</b> .....	<b>A:1</b>
<b>Icons on the Support Creation Toolbox</b> .....	<b>A:1</b>
<b>Icons on the General Toolbox</b> .....	<b>A:1</b>
<b>Icons on the Modify Template form</b> .....	<b>A:2</b>
<b>Hangers and Supports Database Hierarchy</b> .....	<b>B:1</b>

<b>Automatic Drawing Production</b> .....	<b>C:1</b>
<b>Batch Macro Generation Form</b> .....	<b>C:1</b>
Restraint List .....	C:2
Checking Data Consistency .....	C:2
Producing Drawings .....	C:3
<b>Setting the Drawing Defaults</b> .....	<b>C:4</b>
Setting the Overall Defaults .....	C:4
Setting the Library Pointer Defaults .....	C:7
Setting the Standard Scale Defaults .....	C:9
Setting the Reference Plate Defaults .....	C:11
Setting the Title Block Default Data .....	C:13
<b>Creating and Running Drawing Batch Macros</b> .....	<b>C:14</b>
<b>Saving the Defaults</b> .....	<b>C:15</b>
<b>Other Relevant Documentation</b> .....	<b>D:1</b>
<b>AVEVA OUTFITTING Introductory Guides</b> .....	<b>D:1</b>
<b>AVEVA OUTFITTING Reference Manuals</b> .....	<b>D:1</b>
<b>General Guides</b> .....	<b>D:2</b>



# 1 Read This First

## 1.1 Scope of the Guide

This guide introduces the facilities provided by AVEVA OUTFITTING for the creation of Pipe Hangers and Supports and their incorporation into Specifications which make them accessible to other OUTFITTING designers. A key feature of the guide is a hands-on tutorial exercise which is incorporated throughout.

If you are not yet familiar with the use of the OUTFITTING DESIGN module, it is recommended that you first work through one or more of the discipline-specific 'getting started' guides (Pipework Design User Guide, Structural Design Using OUTFITTING, etc.) and practise using the various Design applications. You need to be proficient in the use of OUTFITTING DESIGN before you try to create hangers and supports for use by others.

### 1.1.1 Intended Audience

This guide has been written for engineers familiar with hanger design practices, who may or may not have prior knowledge of OUTFITTING.

### 1.1.2 Assumptions

For you to use this guide, the sample OUTFITTING project, Project SAM, must be correctly installed on your system, and you must have read/write access to the project databases.

It is assumed that:

- you know where to find OUTFITTING on your computer system
- you know how to use the Windows operating system installed on your site
- you are familiar with the basic Graphical User Interface (GUI) features as described in the AVEVA document *Getting Started with OUTFITTING*.
- you are familiar with the main principles of managing catalogue and specifications in OUTFITTING databases using the PARAGON and SPECON modules
- you are familiar with OUTFITTING DESIGN to the level of AVEVA's Basic Training Course
- you are familiar with OUTFITTING DRAFT if you intend to use Automatic Drawing Production.

Contact your systems administrator if you need help in either of these areas.

### 1.1.3 About the Tutorial Exercise

All the steps of the exercise are numbered sequentially throughout the guide.

### 1.1.4 Further Reading

You can find a list of relevant AVEVA documentation in [Other Relevant Documentation](#).

## 1.2 How the Guide is Organised

This guide contains the following chapters and appendices:

<a href="#">Read This First</a>	introduces this guide and summarises its scope.
<a href="#">Introducing OUTFITTING</a>	introduces the structure and strengths of OUTFITTING
<a href="#">Introducing OUTFITTING Hangers and Supports</a>	summarises the facilities available in the Hangers & Supports application, and the sequence of operations needed to create a support. Note that the examples in this guide only illustrate some of the basic features of the application.
<a href="#">Starting to Use Hangers &amp; Supports</a>	describes how to log in to OUTFITTING, start up the application and set some administrative options. It also summarises the Hangers and Supports database hierarchy, which is shown in more detail in <a href="#">Hangers and Supports Database Hierarchy</a> .
<a href="#">Creating a Goalpost Support</a>	provides a tutorial which covers the basics of creating the steelwork and hangers for a typical 'goalpost' support, checking the support, and producing a support schedule.
<a href="#">Creating a Single Hanger</a>	describes how to create a hanger-only support using the Hanger configurations supplied.
<a href="#">Creating a Two-plane Support</a>	describes how to create a support for pipes on other items running in two different directions.
<a href="#">Creating Bracing Members</a>	describes how to add bracing members to a support template.
<a href="#">Toolbox Icons</a>	is a key to some of the icons on the main 'toolbox' forms.
<a href="#">Hangers and Supports Database Hierarchy</a>	shows how Hanger and Support elements are stored.
<a href="#">Automatic Drawing Production</a>	describes how to set up the defaults for Automatic Drawing Production in OUTFITTING DRAFT
<a href="#">Other Relevant Documentation</a>	identifies other sources of information which supplement and expand upon the details given in this guide.

## 2 Introducing OUTFITTING

This chapter gives:

- the structure of OUTFITTING
- the strengths of OUTFITTING

### 2.1 Introducing the Structure of OUTFITTING

OUTFITTING comprises the following functional parts:

- modules
- applications.

A **module** is a subdivision of OUTFITTING that you use to carry out specific types of operation. This guide covers the following modules:

- OUTFITTING DESIGN, which you use for creating the 3D design model

An **application** is supplementary program that has been tailored to provide easy control of operations that are specific to a particular discipline. The applications you will use for support design work in this guide are:

- Pipe Hangers & Supports
- In the OUTFITTING DRAFT module, the Automatic Drawing Production application

You can switch quickly and easily between different parts of OUTFITTING.

### 2.2 Strengths of OUTFITTING

In OUTFITTING, you have a powerful suite of facilities for the modification, design validation and documentation of logically interconnected steelwork and/or concrete structures.

The emphasis is on maximising both design consistency and design productivity:

- The design modelling functions incorporate a degree of apparent intelligence that enables them to make sensible decisions about the consequential effects of many of your design choices. This allows you to implement a sequence of related decisions with a minimum of effort.
- You can incorporate modifications into your design at any stage without fear of invalidating any of your prior work, because data consistency-checking is an integral part of the product. OUTFITTING automatically manages drawing production, material take-off reports, and so on, by reading all design data directly from a common set of databases, to prevent errors from being introduced by transcribing information between different disciplines.
- The applications let you check all aspects of your design as work progresses. This includes on-line interdisciplinary clash detection, so the chances of errors and

inconsistencies reaching the final documented design are reduced to an exceptionally low level.

- The applications are controlled from a GUI. This means that all design, drawing and reporting operations are initiated by selecting choices from menus, and by entering data into on-screen forms. For ease of use, many common actions are also represented by pictorial icons.

## 3 Introducing OUTFITTING Hangers and Supports

This Chapter summaries:

- the facilities available in the Hangers & Supports application
- the sequence of operations needed to create a support

The Pipe Hangers & Supports application forms part of a family of engineering design applications for use with AVEVA's OUTFITTING 3D solid modelling ship design system. They enable designers to model pipe supports in considerable detail, from a range of user-configurable standard designs, using an extensive catalogue of support components. Standard supports are issued against standard drawings, and a support schedule may be produced, showing a variety of user-defined data, including parameterised support dimensions.

Support creation can include both the structural steel and the hanger components themselves. For example, a goalpost support may consist of three or more steel sections and their joint details, together with spacers and U bolts. A hanger-only support could consist of lug, rod, turnbuckle and pipe clamp.

The application can check all aspects of the design as work progresses, including on-line interdisciplinary clash detection.

User customisation can be applied to automatic support numbering and classification.

### 3.1 Locating the Support

A support is first located by positioning a plane in the 3D model. The quickest way of doing this is by identifying the piping to be supported in a graphical view. Support location and orientation can be determined by the position of a piping component, by a distance from a previous support, or by explicit coordinates. Each pipe to be supported is identified, and the hanger type (e.g. grip or non-grip U bolt, clamp, etc.) is chosen for each. In this context, 'hanger' is used to mean the component attaching to the pipe, and can include support from above or below. Thus a single support can include a number of hangers: one per pipeline.

### 3.2 Support Configuration

Having located the support and identified the supported lines, a basic support configuration is chosen from a set of specification-based standards. These can be user defined, but a sample set is provided, including a one- or two-level goalpost, a braced cantilever, an L bracket, etc.

The configuration determines the basic shape and jointing information. It may be standard (with parameterised dimensions) or special. The dimensions of a standard support template

can be changed, but it cannot have extra members added. Special templates can be modified by adding members for further support or bracing, and changes to jointing information or support dimensions.

### 3.3 Connecting Supports

Supports may be connected to floors, ceilings, primary or secondary steel. This includes extending members to reach their connections, and providing a connected structural model. Furthermore, a new hanger may be added to an existing support to take an extra line. Once the configuration is complete, steel profiles are selected by choosing from a support steel specification.

### 3.4 Standard Hanger Configurations

Supports which have no steelwork (such as a spring hanger with rods and clamps) use standard hanger configurations defined by the Hangers & Supports administrator (a sample set is provided). The designer selects the attachment points on the pipeline and the structure, and chooses the hanger configuration from a specification. All components within the hanger are then selected automatically from a hanger specification, sized, orientated and connected together. Some user interaction may be prompted for if design parameters are required; for example, spring presets.

### 3.5 Utilities

A set of utilities helps the support designer to be productive. These include sophisticated copy and move operations, with automatic adjustment of supporting elements to allow for changes in relative pipe positions. For example, a sloping line can be supported by designing the first support, then copying it at desired intervals. Necessary changes in elevation (and thus parameterised dimensions) are accommodated automatically. In addition, a graphical coloured maximum span indication can be shown, based on span tables stored in the catalogue.

### 3.6 Catalogues Supplied with the Product

A sample vendor Hanger Catalogue is supplied with the application.

AVEVA would like to acknowledge the assistance provided by Pipe Supports Ltd (PSL), upon whose range of *Comet Pipe Support Systems* catalogues this data is based.

In addition, a selection of the PSL Variable Effort Supports are also supplied, including Top Suspended (3 types) and Base Mounted (1 type). All spring types and working ranges are covered. The application allows the designer to enter the working load at design time to ensure that correct component sizing takes place for material take-off. The catalogue has full component and material descriptions, ordering codes, and where necessary, details additional components which need to be ordered apart from the main item itself (e.g. locknuts, bolts). A specification will be supplied which includes all the components available in this catalogue.

## 3.7 Drawing Facilities

OUTFITTING generates drawings by using live links to the design data to ensure that new drawings always reflect the current state of the progressing design model. As the design progresses, up-to-date industry standard engineering drawings, to international standards, can be created on demand.

The Hangers & Supports application for use with OUTFITTING DRAFT provides fully automatic production of annotated and dimensioned fabrication drawings for hangers and supports, incorporating location plans, full material take-off, and support schedules. A range of user customisation options are available, with basic drawing layout being controlled by a user-defined backing sheet. Only minimal user post-processing (such as tidying label positions) is required to complete a drawing.

Drawings may be created in either batch or interactive mode.



## 4 Starting to Use Hangers & Supports

This chapter explains:

- how to log in to OUTFITTING
- how to set some administrative options
- the Hangers and Supports database hierarchy

### 4.1 Logging In

This is the first step of the tutorial exercise.

**Exercise begins:**

1. In the **OUTFITTING Login** form give the name of the **Project** in which you want to work: enter Sample.
2. Give your allocated **Username**: enter HANGER.  
This username has been setup so that you will have Read/Write access to a Catalogue database, as well as a OUTFITTING DESIGN database. This is necessary so that you can add your new template into a specification at a later stage of the exercise.
3. Give your allocated **Password**: enter HANGER.
4. Give the part of the project Multiple Database (**MDB**) you want to work in: enter HANGER.
5. Give the name of the **Module** you wish to use: select **Design**.

Make sure that you leave the **Read Only** box unchecked, so that you can modify the database as you work.

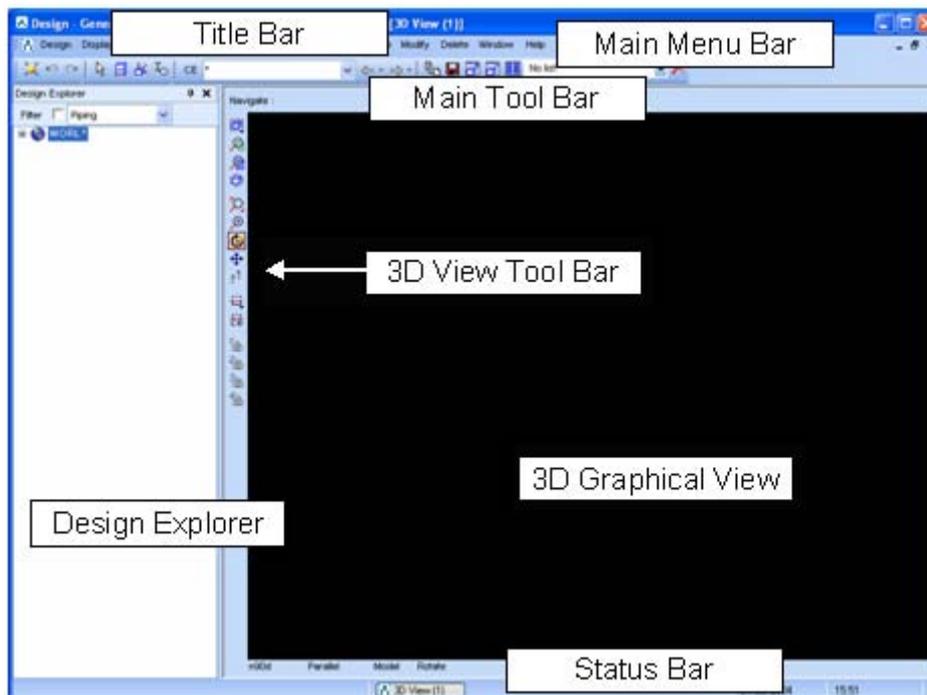
When you have entered all the necessary details, the form looks as shown:



Click **OK**.

## 4.2 OUTFITTING Startup Display

When OUTFITTING has loaded, your screen looks like this:



As labelled above, the display comprises the following:

- **Title Bar** - shows the current OUTFITTING module, and its sub-application if applicable.
- **Main Menu Bar** - the area you use to make menu selections.

- **Main Tool Bar** - has a number of icon buttons and drop-down lists that offer shortcuts to a selection common OUTFITTING operations and standard settings.
- **Design Explorer** - shows your current position in the OUTFITTING database hierarchy. To move to a different point in the database, you click on the appropriate item in the list.
- **3D Graphical View** - the window in which you display the design model graphically as you build it. A pop-up menu (which you access with the right-hand mouse button) enables you to control how the model is represented. This window also has its own tool bar.
- **Status Bar** - displays information about the current status of your operations.

You can reposition or minimise these windows at any time using standard window management facilities.

**Exercise continues:**

6. Select **Design>Hangers & Supports** from the main menu.
7. In the displayed **Default Specifications** form, from the **Hanger Specification** scrollable list, select Pipe Supports Ltd.
8. In the displayed **Default Steel Specifications** form, from the **Support Steel Specification** scrollable list, select British Support Steel.

**Note:** That the default specifications are shown below the tool bar.

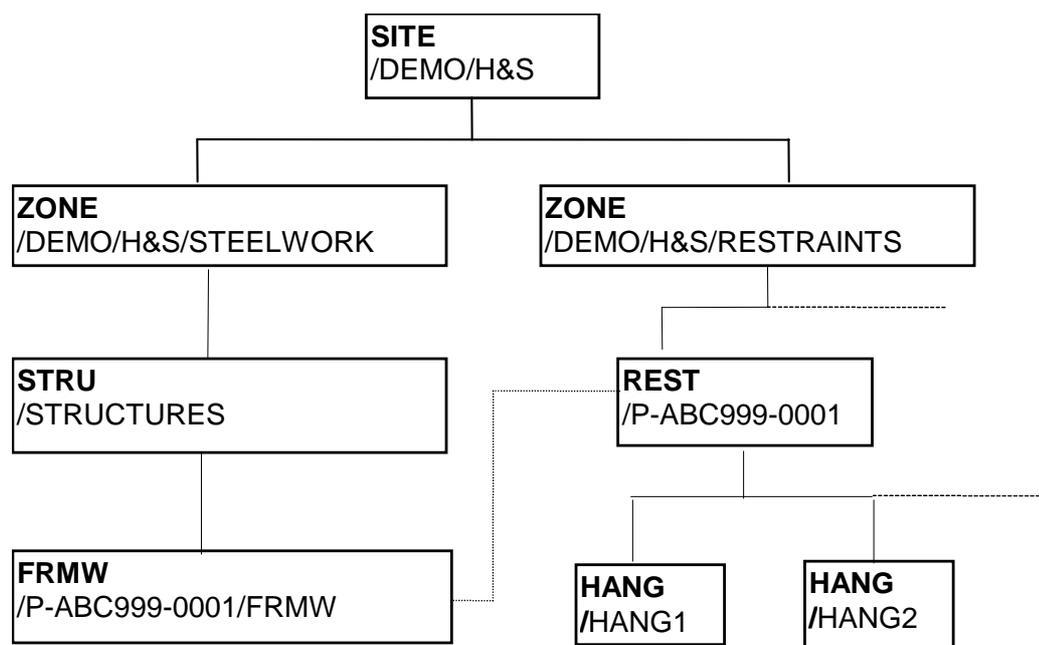
## 4.3 Setting the Defaults

Now set some user defaults:

9. Select **Settings>Defaults>Main** the **H&S User Defaults** form is displayed.  
The options are:
  - **Name**  
As supplied, the user defaults file is named DES-SUPP-DFLTS, and is stored in the directory defined by %PDMSUSER%. You can enter a different name for the defaults file here.
  - **Revision**  
You can enter a revision number for the defaults file. This is for your own information; it is not used by the application.
  - **H&S Admin**  
You must have an administrative area to which you have write access. By default, this is a Site named /HS-ADMIN. To change your administrative area, select the site in the **Design Explorer** and click **CE**.
  - **Autonaming Area**  
Enter text which will be used in autonaming supports. The way the default autonaming rules are set up, this text will be the second element in the name, after the classification code. For example, if the classification code for a support for pipes only is P, and the text entered here is ABC999, supports (Restrains) will be named P-ABC999, followed by a number as specified in the rules.
10. Select **File>Save** to save the settings in the current file (shown at the top of the form) or **File>Save As** to save as a new file.
11. Click **Dismiss** to close the form.

## 4.4 Hangers and Supports Database Hierarchy

The main administrative element for a Support or Hanger is the Restraint (REST). The Restraint name is the name of the support. All Support database elements are linked by references and any part of the support can be traced back to the Restraint: see the diagram below:

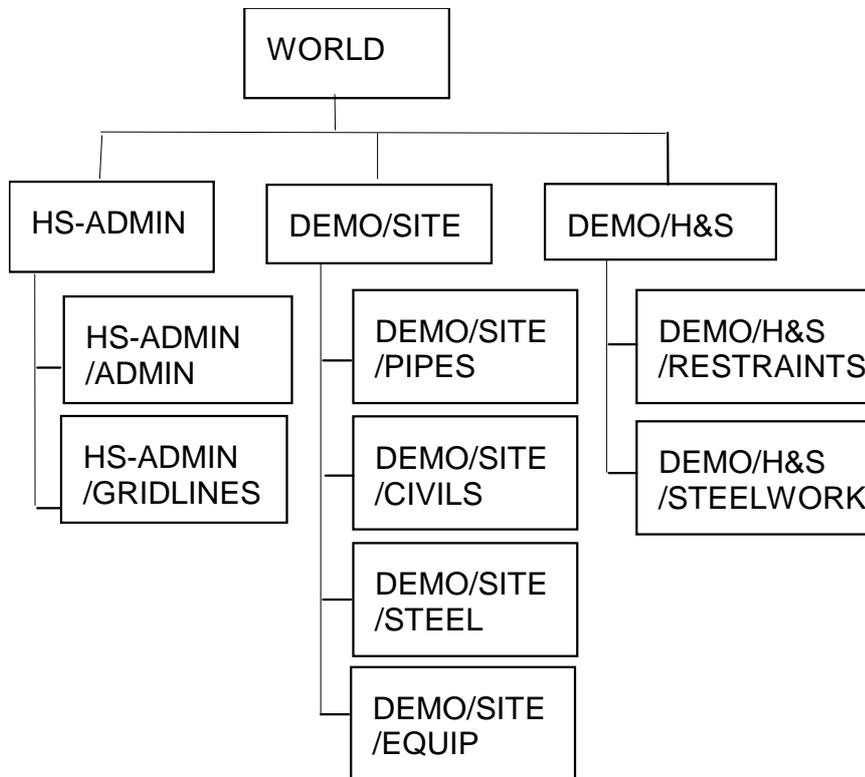


In the Hangers & Supports application, Restraints are created under Zones. The Hangers (HANG elements) are owned by a Restraint. Restraints have a similar function to Pipes, and Hangers have a similar function to Branches.

Hangers connect pipework to steelwork or civils. Hangers connect to Fittings (FITT) in the steelwork or civil and ATTAs in the pipework. Restraints contain all the Hanger (pipe-to-steelwork connection) information.

Every Support assembly has an associated Framework. The Framework (FRMW) owns at least one Subframework (SBFR): if the Hangers in the assembly are in different planes, you will need to create a Subframework for each plane. The Subframework contains all the steelwork data. Frameworks are owned by Structures (STRUC) or Substructures (SUBS).

The examples in this manual are based on the MDB /HANGER, supplied with the product, which contains the following Sites and Zones:

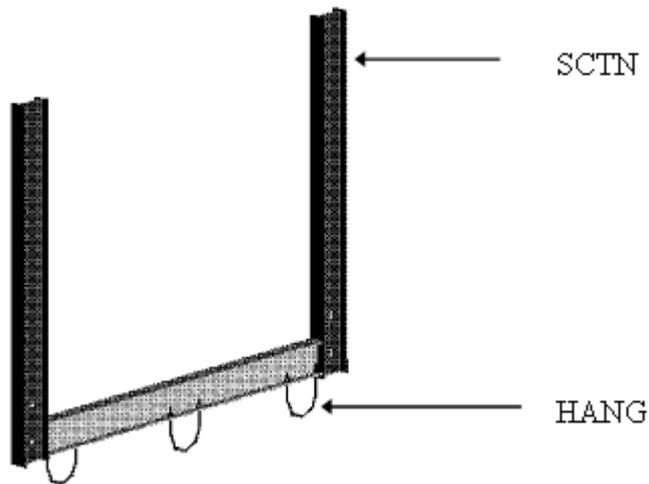


The Site DEMO/SITE contains the model which will be the starting point for the tutorial. This includes Zones which contain Pipes, Primary Steelwork and Civils.

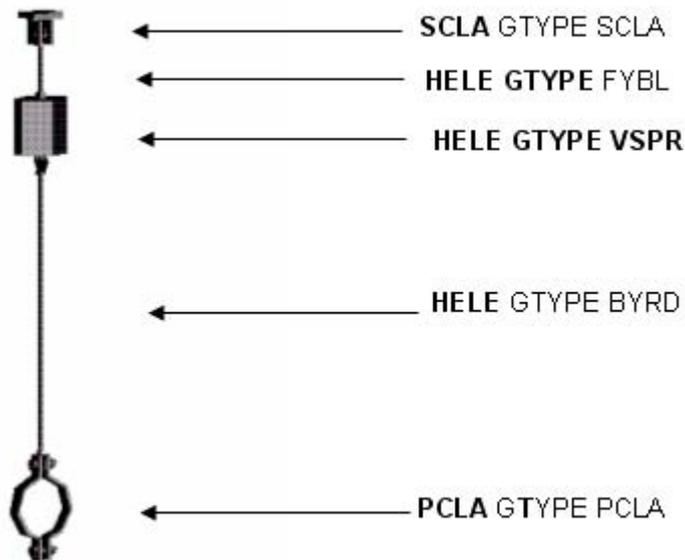
The Site DEMO/H&S contains empty Zones where the Hangers and Supports you create will be stored.

The Site HS-ADMIN contains construction aids for you to use when adding the Hanger and Support elements to the model supplied.

The design elements in a typical Support are shown below.



The design elements in a typical Hanger are shown below.



#### 4.4.1 Setting the Storage Areas

Now define the **storage areas** where the design elements will be created.

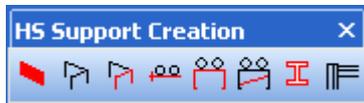
12. Create a Structure named SUPPORT-STEEL under the Zone /DEMO/H&S/ STEELWORK.
13. Select **Settings>Storage Areas** to display the **Storage Areas** form.

14. Set the storage area for **Restraints** by first of all making sure /DEMO/H&S/ RESTRAINTS is your current element (click on it in the **Design Explorer**), then selecting Zone from the **Restraints** options, and set **Name** to /DEMO/H&S/ RESTRAINTS.
15. Set the storage area for Frameworks by selecting Structure from the **Frameworks** option button and setting **Name** to /STRUCTURES.

**Note:** The storage areas are shown in the main menu window.

## 4.5 Hangers and Supports Toolboxes

Two toolboxes are provided to help you use the commonest options in the Application. All the steps can be carried out by selecting options from the main menu: the toolbox is a quick method of displaying the forms you need in the order you need them.



The **Support Creation** toolbox helps you to create support assemblies. To display it, select **Utilities>Toolboxes>Support Creation** from the main menu.

Selecting each icon in turn will display the sequence of forms you need.



The **General** toolbox provides general utilities which help you to create support assemblies and individual hangers. To display it, select **Utilities>Toolboxes>General** from the main menu.

## 4.6 Displaying the Model

16. Add the Zone /DEMO/SITE/PIPES to the Drawlist.
17. Select **Utilities>Reference Data**. The **Reference Definition Application** form is displayed.
18. Select **Settings>Storage Areas>Define** from the **Reference Definition Application** form menu. Set the storage area for grids to HS-ADMIN/GRIDLINES/GRIDS.
19. Select **Display>Gridlines** from the **Reference Definition Application** form menu. On the **Display Gridlines** form, select level FL1 and set the **Tag with** options to **Key** and **At Ends**. Click **Add**.
20. Looking West, zoom in on the five pipes running East-West on the South side of the model. These are:
  - PIPE-SAM-100-1
  - PIPE-SAM-100-2
  - PIPE-SAM-100-3
  - PIPE-SAM-250-1
  - PIPE-SAM-300-1

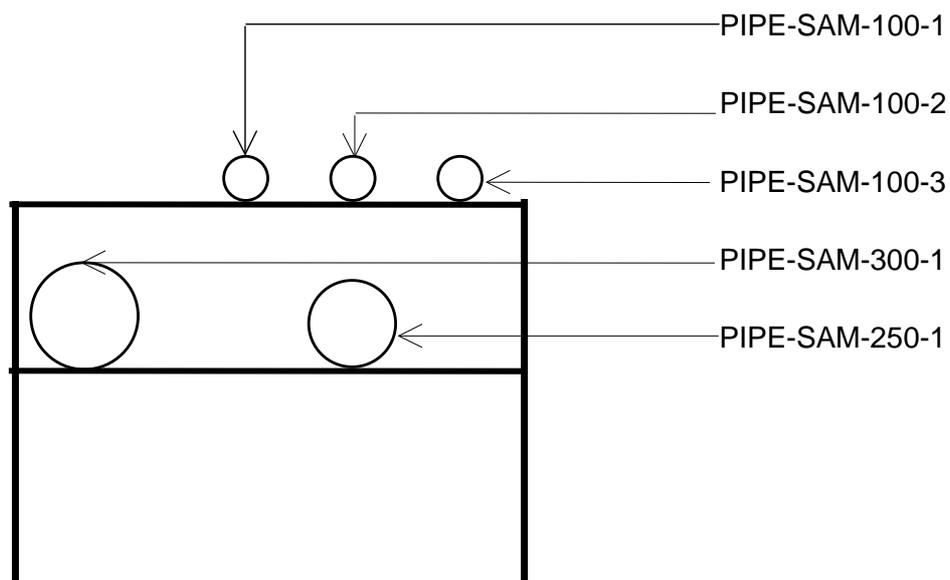


## 5 Creating a Goalpost Support

This chapter covers:

- creating the steelwork and hangers for a typical goalpost support
- checking the support
- producing a support schedule

The support assembly which you are going to create consists of a two-level goalpost support for five pipes. It is shown in the following diagram.



### 5.1 Positioning the Support Plane

You start to define a support assembly by setting the position of the support plane. Note that this plane is supplied in the form of a BOX element under HS-ADMIN/ADMIN/SUPPLANE.

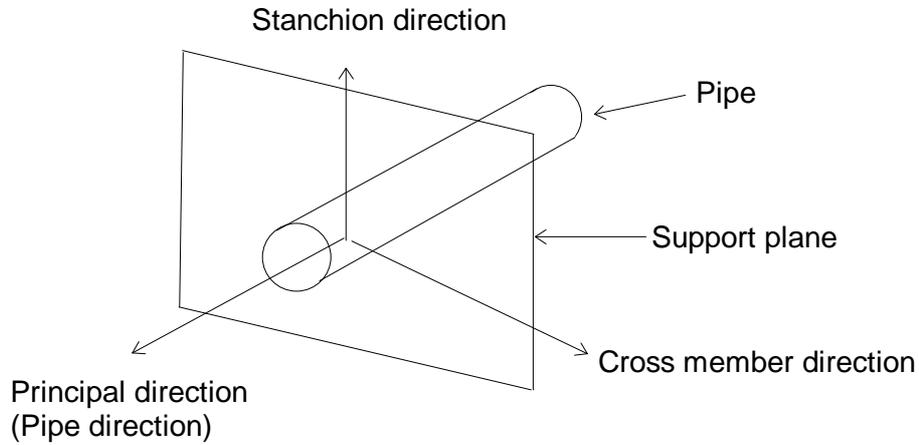
The Support Plane defines:

The **Principal Direction**, (PD), the direction of the support plane. In this case, it will be East.

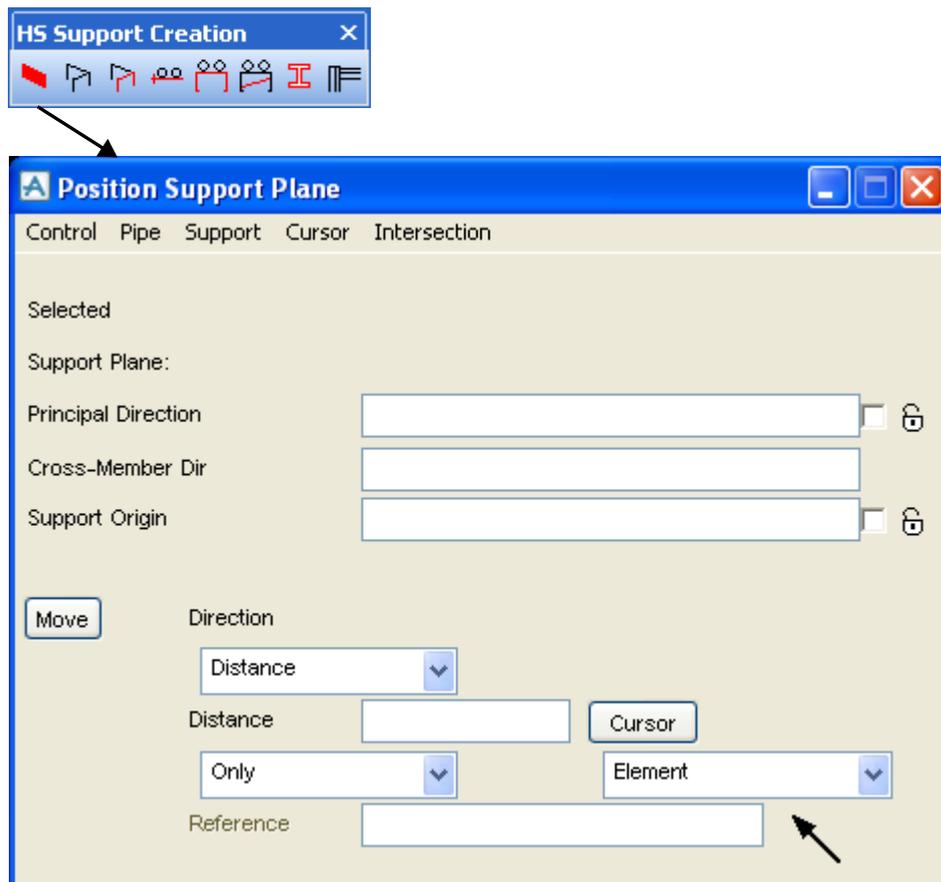
The **Cross Member Direction**, (XM). In this case, it will be North.

The **Support Origin**. In this case it will be E6000, N0, D60

This is shown in the diagram:



Select the first icon on the **Support Creation** toolbox. The **Position Support Plane** form is displayed:



You need to position the plane with respect to the pipes which will be supported.

21. Give an initial position for the support plane by selecting **Pipe>Select** from the menu on the form and picking one of the Pipes which will be supported. The name of the **Selected** Pipe is shown at the top of the form.
22. Move the plane to gridline **Q** by selecting Gridline from the list under the **Cursor** menu, then click the **Cursor** button and use the pointer to pick gridline **Q**. You may need to manipulate the view to see the appropriate gridline; use the facilities available from the **3D View** shortcut menu.
23. Change the Distance option to Through, change the Element option to Gridline, click the arrow and pick gridline **Q**. The **Move Direction** will now be given as E.
24. Click **Move** to move the plane.
25. Check that the settings on the form are as given in *Positioning the Support Plane*. (If any of them are different then change them accordingly; in particular, the **Support Origin** may differ, do not forget to **Move** the support plane if you have to change its origin.)
26. Close the form.
27. If you have not already done so, switch off the display of the support plane by selecting the first icon on the **General toolbox**. This icon toggles the support plane on and off.



## 5.2 Creating the Framework, and Classification

When you create a Framework in the Hangers & Supports application, a Framework (FRMW) and a Restraint (REST) are created in the areas that you set on the **Storage Areas** form.

Supports are classified according to the type of element they support: for example, Pipes only, Cable Trays, etc. The classification affects how the support is named: with the autonaming rules supplied, the type is shown by the first letter in the name, but this may be changed in your system.

**Exercise continues:**

28. Click the second icon on the **Support Creation** toolbox:



29. The **Support Class** form is displayed. Select **Pipes only** and **OK** the form.

**Note:** The **Support Class** form is not displayed if classification has been switched off by the System Administrator using the **Classification Field** form.

30. The **Name Support** form is displayed, showing a name generated from the default you set on the **User Defaults** form. For example, If the default is ABC999, the name generated will be P-ABC999-0001. Click **OK**. The default name for an automatically generated drawing is also shown.

**Note:** If you make a mistake, and you want to delete the Support and start again, select **Delete>Support** from the main menu. This will delete the whole support tidily. You should not delete template members using the normal **Delete** option on the main menu.

### 5.3 Creating a Subframework

31. Select the third icon on the **Create Support** toolbox to create a Subframework.

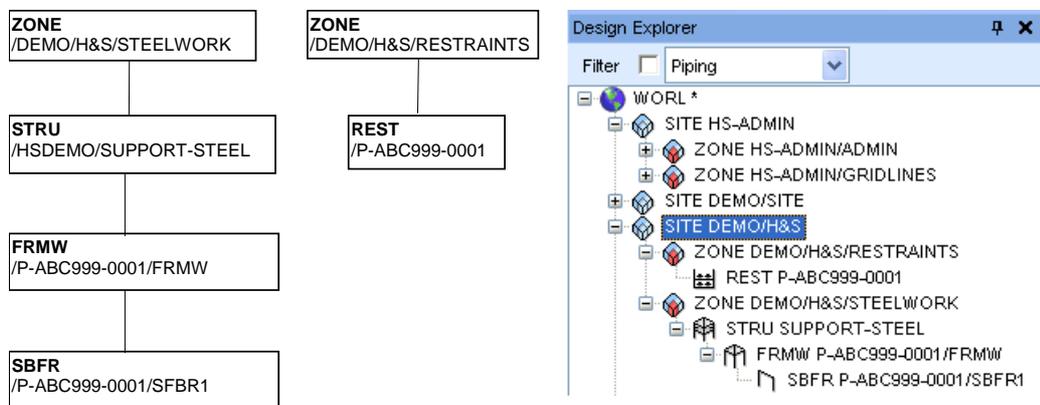


Note that you must be at a Framework to create a Subframework.

You must create a Subframework in the Hangers & Supports application before the steelwork Sections for the support are created. There must be a Subframework, positioned using the Support plane, for each direction of pipes which are supported. This is further illustrated in [Creating a Two-plane Support](#).

**Note:** You can add out-of-plane bracing members to a Subframework, it is the plane of the main supporting members that is defined.

The data structure (if you have chosen to use the text ABC999 to autaname supports) now looks like this:



### 5.4 Creating Template Members

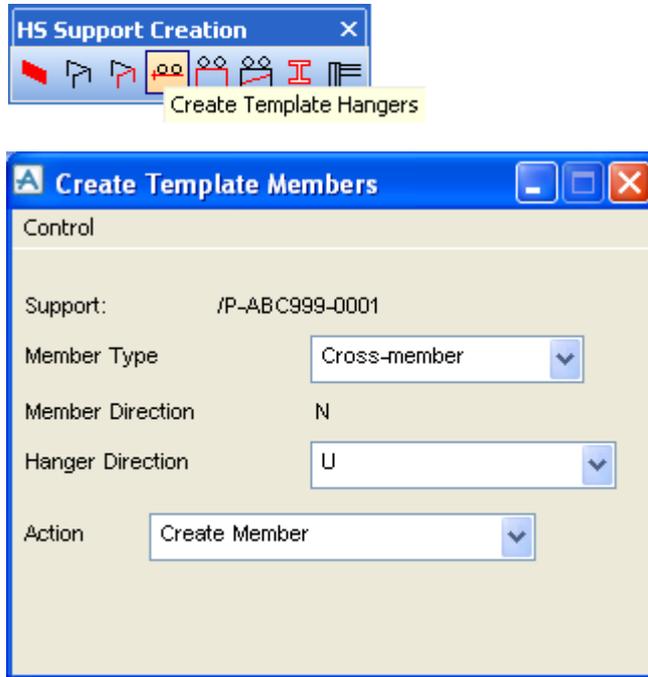
A Support Template contains the right number of stanchions, cross-members and hangers for the configuration and the number of Pipes or other elements to be supported.

An N-level goalpost support will be used in this exercise, which will be created with two stanchions and the correct number of cross-members for supporting the Pipes you select. In this case, it will have two cross-members.

You will need to create the other stanchions and bracing members separately, but for now you will just create the basic structure.

Exercise continues:

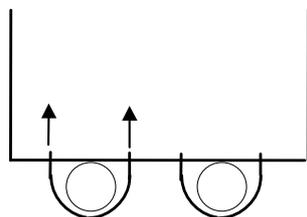
32. Navigate to Subframework P-ABC999-0001/SBFR1. Select the fourth icon on the **Create Support** toolbox. The **Create Template Members** form is displayed:



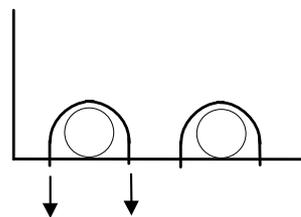
33. The name of the **Support** is shown at the top of the form.

Other parts of the form are:

- **Member Type** which defines the type of Member you are going to create (stanchion or cross-member).
- **Member Direction** which tells you the direction the Member will have. The direction is determined by the direction of the pipes being supported.
- **Hanger Direction** which allows you to set the Hanger Direction. The hanger direction depends on whether the pipes are above or below the cross-member supporting them. See the figure below:



Hanger direction UP



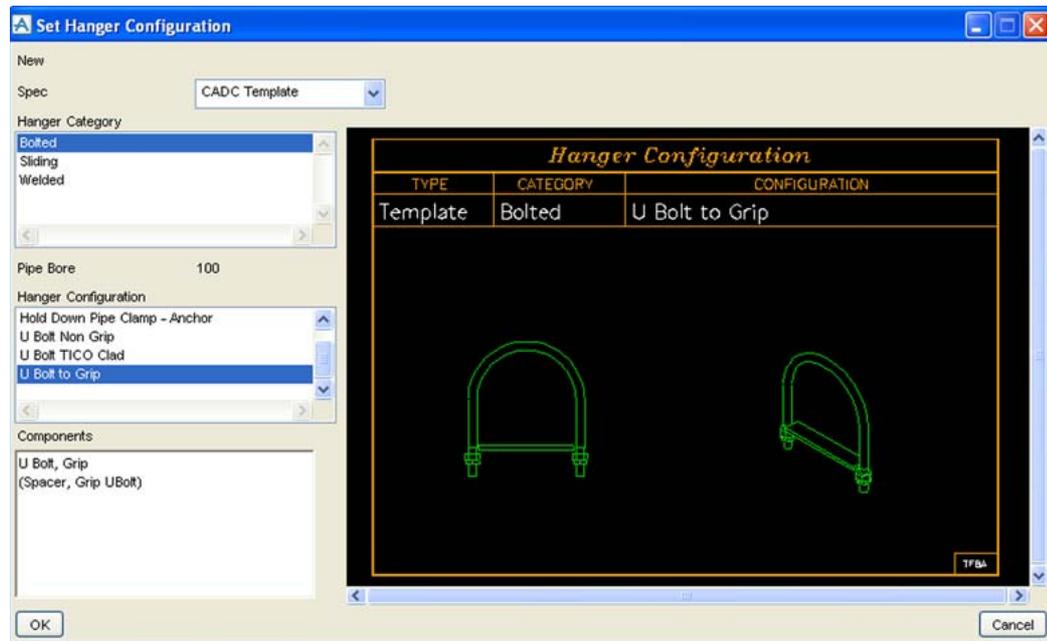
Hanger direction DOWN

The **Action** list allows you to create and delete Members, and to create Hangers. Once you start creating a Member, the options change to allow you to create Hangers on that member, as described below.

**Note:** If you make a mistake, you can delete a Member by setting **Action** list option to Delete Member. Remember that if you want to delete the Support and start again, select **Delete> Support** from the main menu.

34. Set the Hanger Direction to D.
35. From the **Action** list, select Create Member.
36. The **Action** option list selection will change to Create Hanger, and a message will appear at the bottom of the form confirming the type of Member created and the Hanger direction. For example: Creating Cross Member with Hanger Dir D.
37. Select Create Hanger, and you will be prompted to pick a Pipe. Pick the Northern-most 100 bore Pipe. In the displayed **Set Hanger Configuration** form:
  - Set **Spec** to CADC Template
  - Set **Hanger Category** to Bolted
  - Set **Hanger Configuration** to U Bolt to Grip

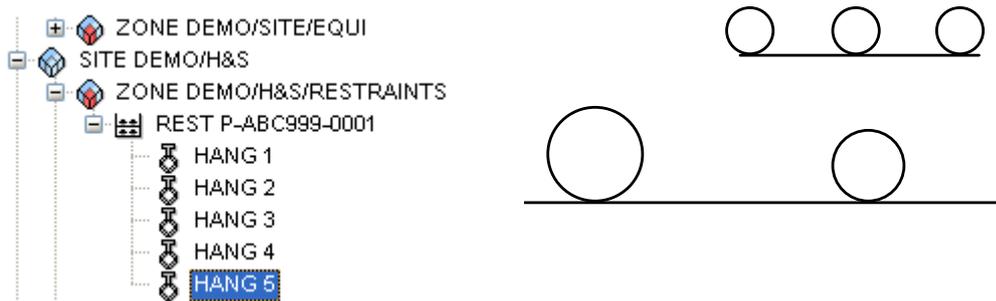
The form should now appear as shown.



**Note:** At this stage, an Attachment Point (ATTA) is also created as a member of PIPE/SAM-100-3/B1. The steelwork for the support is positioned at the minimum hanger length from the Pipe.

38. Click **OK** to accept the selection.
39. Now you need to create another Hanger with the same configuration. From the **Action** list on the **Create Template Members** form, select Copy Last Hanger, and pick the centre 100 bore Pipe of the three. The **Set Hanger Configuration** form will not be displayed. Now select Copy Last Hanger again, and pick the third 100 bore Pipe.
40. You have now created all the Hangers for all the Pipes supported by this cross-member. Select End this Member. The **Action** option list will return to showing Create Member.

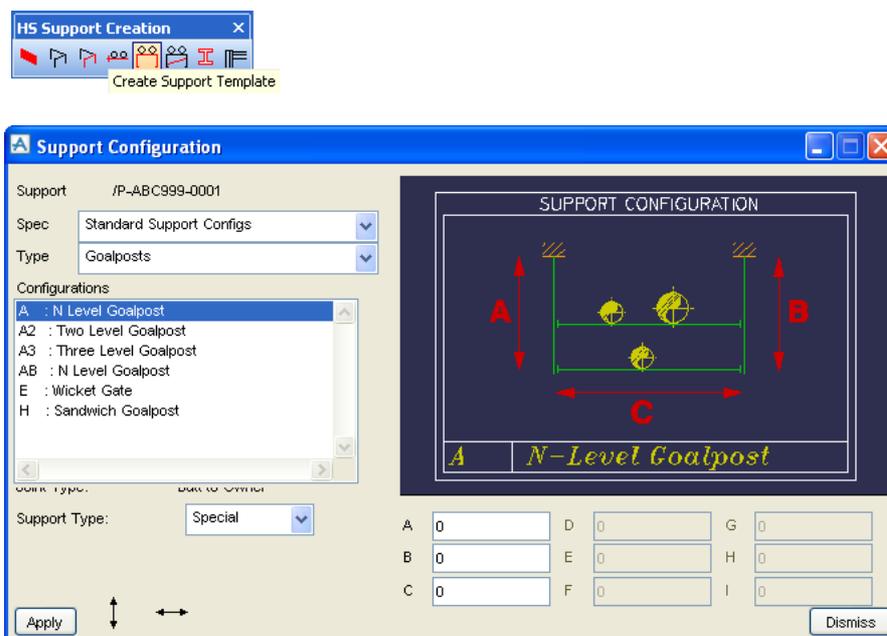
41. Next, create the template member for the lower Pipes. Select **Create Member** and then **Create Hanger**, and pick one of the Pipes. The **Set Hanger Configuration** form will be displayed again: use the same configuration and click **OK**.
42. Select **Create Hanger** again, and pick the last Pipe. **OK** the **Set Hanger Configuration** form and select **End this Member** from the **Create Template Members** form.
43. When you have created all five hangers, select **Control>Close** on the **Create Template Member** form. The relevant part of the **Design Explorer** hierarchy, and a diagram of the template you have just created, are shown below.



## 5.5 Configuring the Support

Next you configure the support.

44. Select the **Create Support Template** icon on the **Support Creation** toolbox. The **Support Configuration** form displays, with the name of the **Support** being configured shown at the top of the form:



45. Within the Specification you have selected, there are three Types of configuration:
  - **Goalposts** have two stanchions and varying numbers of cross-members.

- **Cantilever** supports have one or two cross-members, and optionally a bracing member.
- **L-brackets** have a stanchion and one or two cross-members.

You should choose the configuration closest to the one you require. You must define all the members in the template: for example, if you choose a 2-level goalpost you must specify at least two levels of pipes.

The **Configurations** list shows configurations for the selected configuration type. The picture on the form shows a parameterised diagram of the configuration type. The **Joint Type** under the list shows the joint type for the selected configuration.

The **Support Type** can be set to Standard or Special. You can change the sizes of the members of a standard support but you should not add extra members.

When you have configured the support, the parameters will be shown in the text boxes below the picture. You can change them if you need to: this is illustrated in the example in [Creating a Two-plane Support](#).

The **Invert** and **Mirror** buttons reconfigure the support, and any members which have been added to the template will be removed. This means that you should orientate the support correctly before adding any extra members to the template.

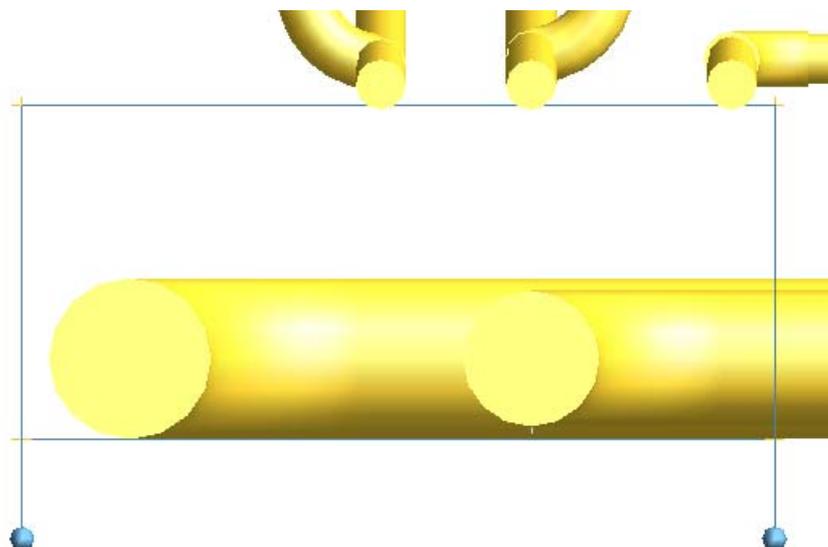
Invert  $\updownarrow$  changes the stanchion direction (and also the principal direction).

Mirror  $\leftarrow\rightarrow$  changes the cross-member direction (and also the principal direction).

**46. On the Support Configuration form:**

- Set **Spec** to Standard Support Configs.
- Set **Support Type** to Special, because you are going to modify the configuration by adding bracing members.
- Set **Type** to Goalposts.
- From **Configurations** select N Level Goalpost.

When you click **Apply**, the support configuration is calculated. The configured support template is shown in the graphical view as illustrated.

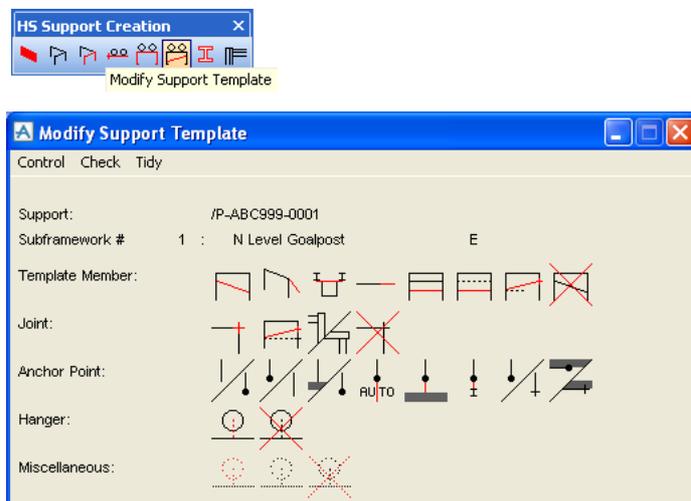


- The cross-members are shown as solid lines.
  - The stanchions are shown as solid lines in the active colour.
  - The stanchions end in anchor points, shown as small spheres.
  - The joints between members are shown as small crosses.
47. If necessary, click the Flip button, , to orientate the support so that the stanchions point upwards.

## 5.6 Modifying the Support Template

The next step is to connect the template by attaching the stanchions to the floor.

48. Select the sixth icon on the **Support Creation** toolbox. The **Modify Support Template** form is displayed. (If the current element is not part of a support assembly, you will be prompted to pick a member of the support.)



**Support** shows the name of the support being modified.

**Subframework #** shows the number of the subframework within the support, the subframework configuration type and the principal direction of the support.

49. Now add the floor DEMO/SITE/CIVILS/GROUND to the drawlist.
50. From **Anchor Point** select the **Anchor to Civil** icon . You will be prompted to pick an anchor point and the civil for connection. Repeat this process to connect both the anchor points to the floor.

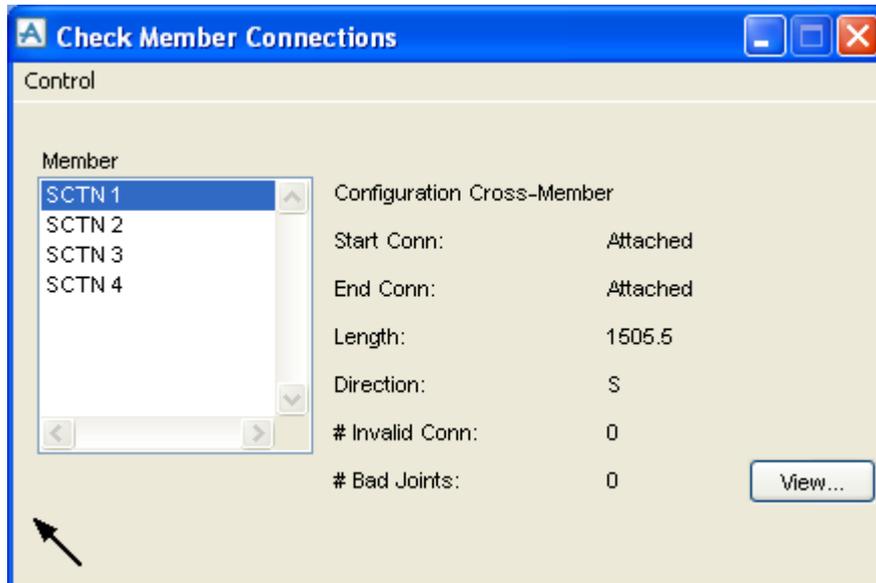
## 5.7 Checking the Member Connections

Before you add extra members to the support template, you should understand how the members of the template are connected to each other.

Each member has a **Start** and an **End**. Each start and end has a **Connection type**, which can be **Attached**, **Anchored**, **Owner** or **None**.

The connections between one template member and another are Joints. Each Joint has an **Owner** and an **Attached** member. If you are going to add members to a template, the current element must be the element which owns the Joint.

51. Select **Check>Support** from the menu at the top of the **Modify Support Template** form, and the **Check Member Connections** form displays

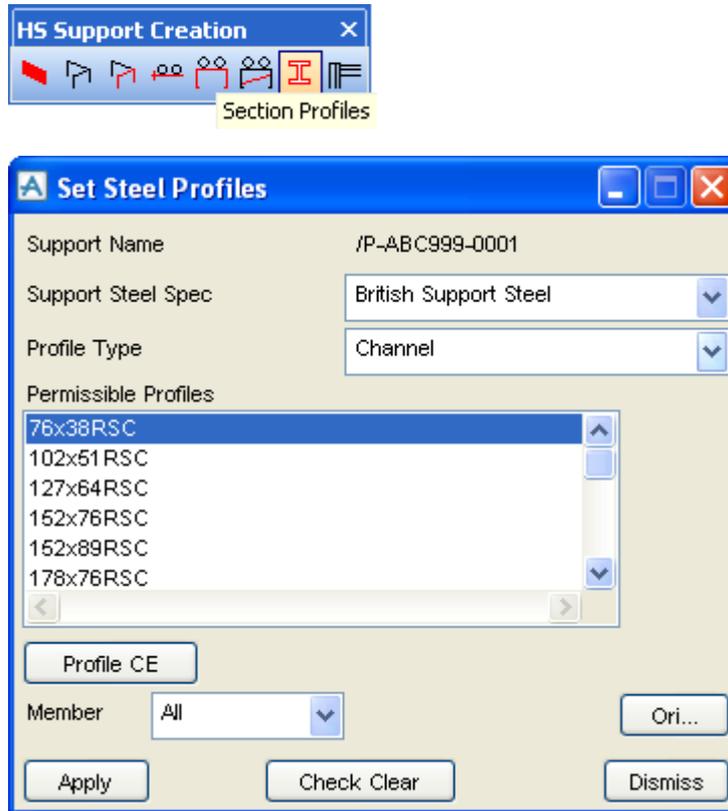


52. In the **Member** scrollable list of SCTNs, select a member. The information about the member is then shown on the form.
53. Click View to see the Start and End of the member shown by letters in the graphical view. Alternatively, select the **arrow** button and pick the member in the graphical view.

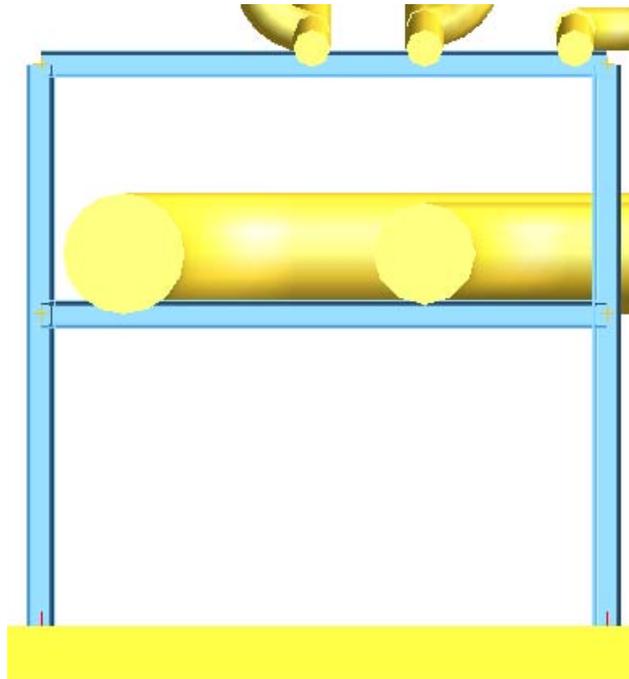
## 5.8 Applying the Steel Profiles

Now specify the steel profiles for the support.

54. Select the seventh icon on the **Support Creation** toolbox. The **Steel Profiles** form is displayed.



55. The **Support Name** is shown at the top of the form. Set **Support Steel Spec** to British Support Steel.
56. From **Profile Type**, select Channel.
57. From **Permissible Profiles** select 76x38RSC profile.
58. From the **Member** option list, select All, and then click **Apply**. Click **YES** on the resulting **Confirm** message. The profile will be applied to all members.



59. Click the **Check Clear** button to check the clearances. If there is a problem, the **Check End Clearances** form will be displayed, showing the required and actual clearances. Clicking **Apply** will move the sections to the required clearances.

**Note:** The clearance checking will only move the steelwork outwards. It may still appear to intersect the pipes until the support is built; see [Building the Support](#).

60. When you have applied the profiles to the support, you can orientate each steel section if necessary. Select **Ori** and the **Set Steel Orientation** form will be displayed allowing you to orientate the steel sections.

## 5.9 Building the Support

When you have created and configured a support assembly, you must build it. Building supports creates the hanger components, selects, orientates and positions them, and checks that their lengths and degrees of freedom are suitable.

61. Select the final icon on the **Support Creation** toolbox to build the support.



## 5.10 Support Schedule

In addition to the general Reports Utility, there is a Support Schedule template provided with the application which allows you to select standard data relating to Hangers and Supports.

The report will be generated for all supports under the current element, so make sure that you are at a suitable place in the database, for example at the Zone DEMO/H&S/RESTRAINTS

62. Select **Utilities>Schedules**. The **Support Schedule** form is displayed.

The **Output** can be set to **File**, **Screen** or **Screen & File**. If you select one of the **File** options, you can set a page length, and also headers and footers for the report. See [Support Schedule Headers and Footers](#).

The **Column Spacing** is the number of characters between columns.

**Standard Data** options set up columns with the content, column title and width shown. You can switch each item on or off, and change the column title and width. The selectable options are as follows:

- **Support No.:** name of the support.
- **Hanger No.:** number of the hanger in the support.
- **Supported Line:** name of the Pipe being supported.
- **Pipe Nom Size:** Pipe nominal bore.
- **Support Type:** type shown on the **Support Configuration** form.
- **Support Description:** description of the support shown on the **Support Configuration** form.
- **Support Drwg No.** is set in the UDA :DRAINFO in the support catalogue.
- **Support Coords** shows the origin of the support.
- **Parameters** shows the dimensions of the support template, as shown on the **Support Configuration** form.

The **Additional (Expression relative to Hanger)** option sets up columns which you can use to define your own output of Hanger data. There is an example expression supplied.

63. Switch on the options you want and click **Apply**. If you have selected **File** or **Screen & File** you will be prompted for a filename. If you have selected **Screen** or **Screen & File** the report will be displayed on the screen in the **Support Schedule Display** form.

### 5.10.1 Support Schedule Headers and Footers

You can create headers and footers for support schedules by selecting **Header** or **Footer** on the **Support Schedule** form. Enter the header or footer on the forms displayed.

You can type an expression into the text pane, or just use text.



## 6 Creating a Single Hanger

This chapter describes how to create a support consisting of a single Hanger with no associated steelwork, using one of the standard Hanger configurations supplied.

The Hanger will support the Pipe /PIPE/SAM-600-1 and it will be attached to the floor.

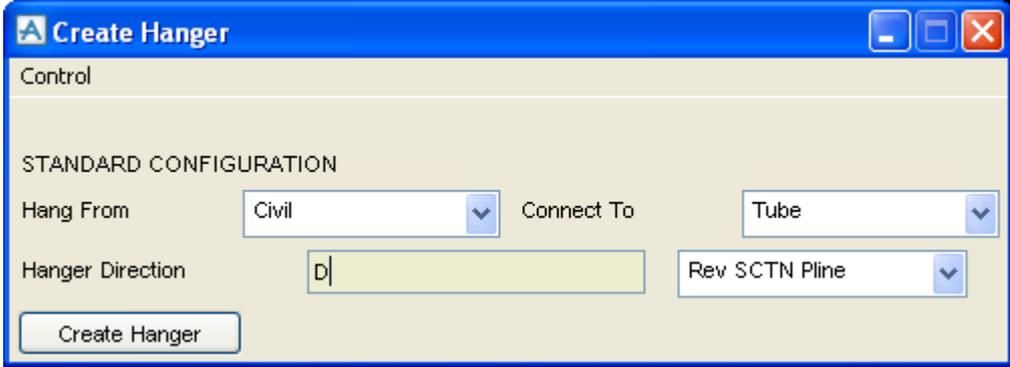
### Exercise continues

64. Select **Create>Hanger>Standard Config** from the main menu.

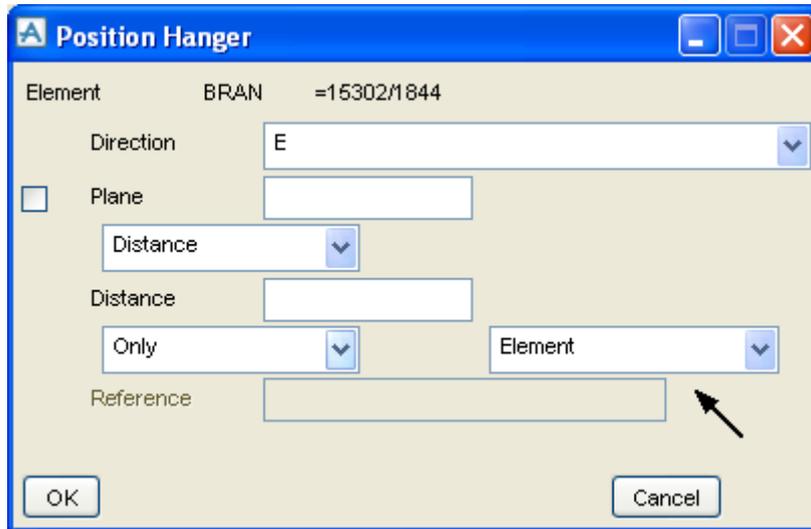
In the displayed **Create Hanger** form:

- Set **Hang From** option to Civil
- Set **Connect To** option to Tube
- Enter **Hanger direction** : Down (the direction is always Pipe>Structure)
- Set the adjacent drop-down list to Rev SCTN Pline

The form looks as shown.



65. Click **Create Hanger**. When prompted, pick the Pipe PIPE/SAM-600-1. The **Position Hanger** form is displayed, showing the name of the element being supported, in this case the Branch, and the direction of the element (East).



66. To position the Hanger:

- Change the Distance option to Through
- Change the Element option to Gridline

Then click  and pick gridline **G**. Click **OK**.

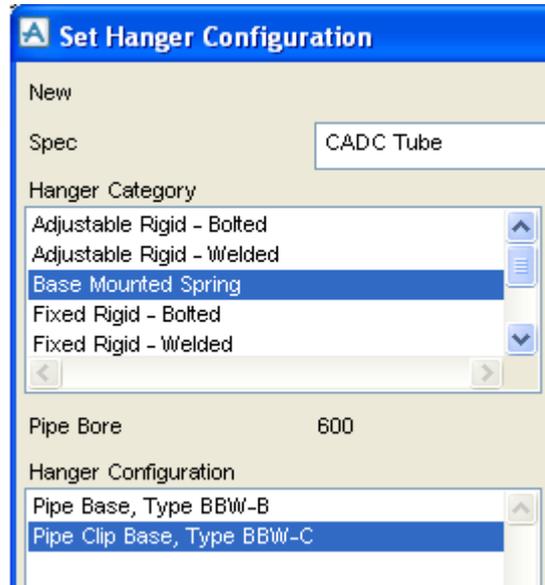
67. You will be prompted to pick a civil element for the connection: pick the floor.

68. Confirm the Classification (Pipes only) from the **Support Class** form and the Support Name from the **Name Support** form.

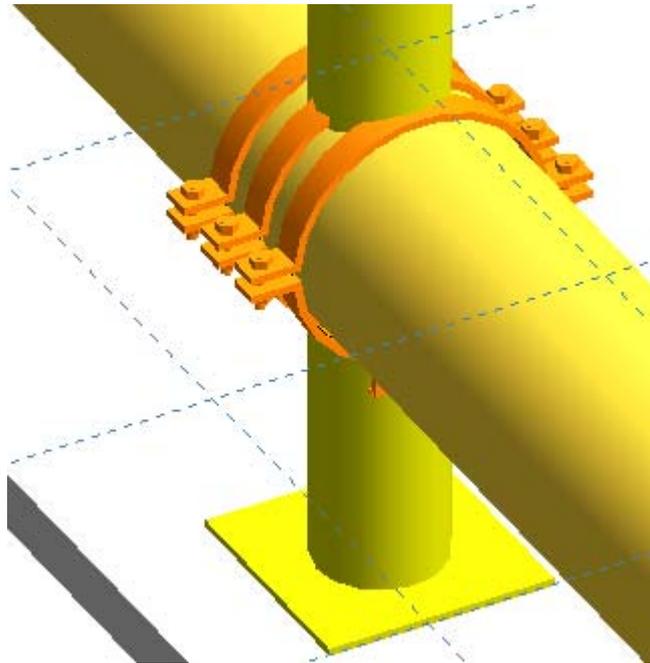
69. In the displayed **Set Hanger Configuration** form:

- Enter **Spec** : CADC Tube
- Set **Hanger Category** to Base Mounted Spring
- Set **Pipe Bore** to 600
- Set Hanger Configuration to Pipe Clip Base, Type BBW-C

The form looks as shown.



70. Click **OK** on the **Set Hanger Configuration** form and the Hanger position is displayed as a dashed line. You will be prompted to confirm that you want to build the Hanger.
71. The **CHOOSE** form is displayed for each of the Hanger components for which there is a choice in the specification:
  - OK** the **CHOOSE** form.
  - (Use **Settings>Choose Options** to set **Selection Criteria** to include working load.)
72. The **Support Load** form will be displayed: you must give a suitable value, for example, 80000 N. **OK** the form.
73. The **CHOOSE** form reappears. For the circular hollow section pedestal, choose an outside diameter of 323.9 (CHS PEDESTAL 323). **OK** the form. The Hanger will then be completed as shown:



**Note:** Although there is no steelwork associated with this support, the Framework, Subframework and PNODE are still created under the Structure DEMO/H&S/STEELWORK/P-ABC999-0002/FRMW.

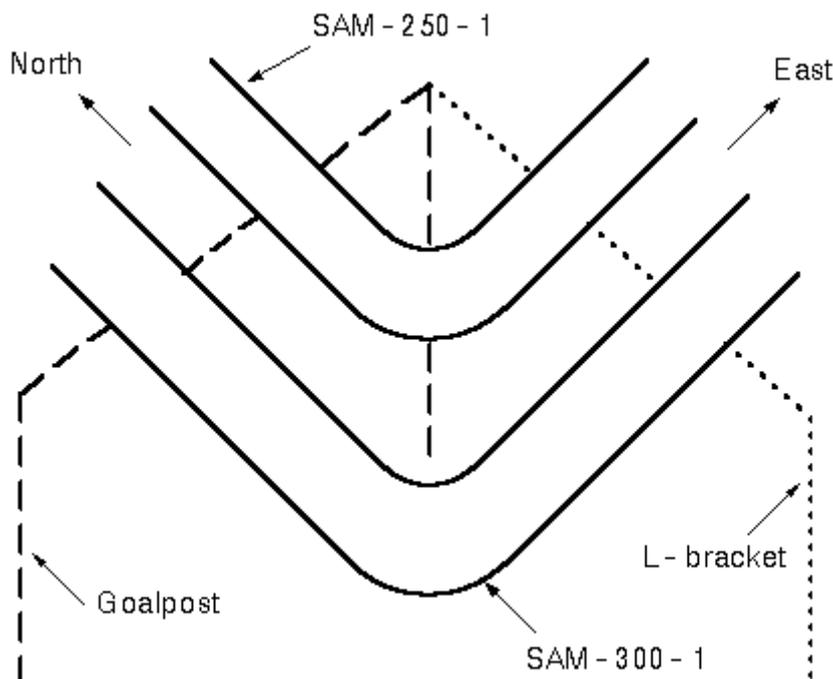
## 7 Creating a Two-plane Support

This chapter illustrates how to create a support for pipes or other items running in two different directions.

The Branches which will be supported are SAM-250-1 and SAM-300-1, which run North-South along the West side of the Site and then turn and run West-East along the South side of the Site.

- You will need to create two Subframeworks, one for each pipe direction.
- You will need to use a combination of templates to obtain the right number of stanchions. In this case, use a goalpost template for the first Subframework, supporting the Pipes running North-South, and an L-bracket template for the second Subframework, supporting the Pipes running East-West, then join the unattached ends of the L-bracket to one of the stanchions of the Goalpost.

See the following diagram:



## 7.1 Create the First Subframework

The sequence of operations will be slightly different, because the first subframework must be positioned and configured correctly, and the steel profiles applied and clearances checked before the second subframework is started. Following a similar sequence of operations to that given in [Creating a Goalpost Support](#), carry out the following steps.

### Exercise continues:

74. Position the support plane for the North-South pipe run.
75. Move the plane to a clearance of 250 mm in front of the Element ELBO 5 of PIPE/SAM-250-1/B1.
76. Create the Framework.
77. Create the Subframework.
78. Create the template member in the usual way, with Hanger direction Up.
79. Configure the support as an N-level goalpost with the stanchions pointing down.
80. Change the length of the cross-member (dimension C on the **Support Configuration** form) to 2000, locking the start.
81. Attach the anchor points to the floor.

## 7.2 Checking the Clearances

82. **Apply** the steel profiles, for example, 203x76RSC, and check clearances. It is important that clearances are correct at this stage, because the second Subframework must be aligned with the stanchion of the first Subframework.

## 7.3 Create the Second Subframework

83. Position the support plane for the East-West pipe run.
84. Move the plane through the East stanchion of the first Subframework.
85. Create the Subframework.
86. Click  on the **Support Creation** toolbox. The **Select Section Plane** form is displayed, listing the two subframeworks. Choose the second one.

**Note:** The **Select Section Plane** form will be displayed every time you change the support in any way, so that you can select the correct subframework.

87. Create the template members in the usual way
88. Configure the support as an L-bracket. If necessary, use the **Mirror** icon to orientate the template so that the unattached end is towards the first subframework.

Now modify the Support Template as in the following steps:

89. Click  on the **Modify Support Template** form to make the anchor point on the end of the cross-member into a free end.
90. Click  and extend the cross member through the Stanchion of the first support and, when prompted, confirm that the member should be connected.

91. Click  to make the joint, picking the stanchion as the owner and the cross-member as the attached member.
92. Click  and attach the anchor point to the floor.

## 7.4 Completing the Support

Using the **Support Creation** toolbox:

93. Click  to apply the Steel profiles.
94. Click  to build the support.



## 8 Creating Bracing Members

This chapter explains how to create a bracing member for a goalpost support.

For this exercise, create a 2-level goalpost support for the three pipes running North-South on the East side of the site. These are:

PIPE/SAM/50-1  
PIPE/SAM/80-1  
PIPE/SAM/80-2

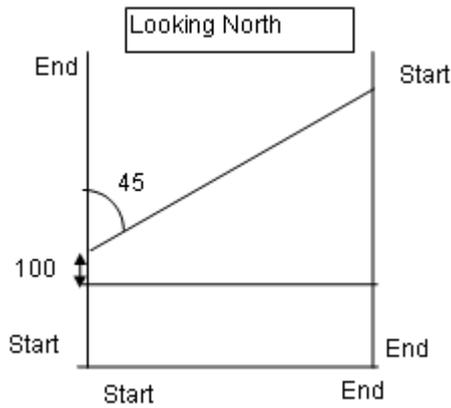
### 8.1 Creating the Goalpost Support

Create a goalpost support as summarised below. Refer to the procedure described in full in [Creating a Goalpost Support](#), if you need more information.

**Exercise continues:**

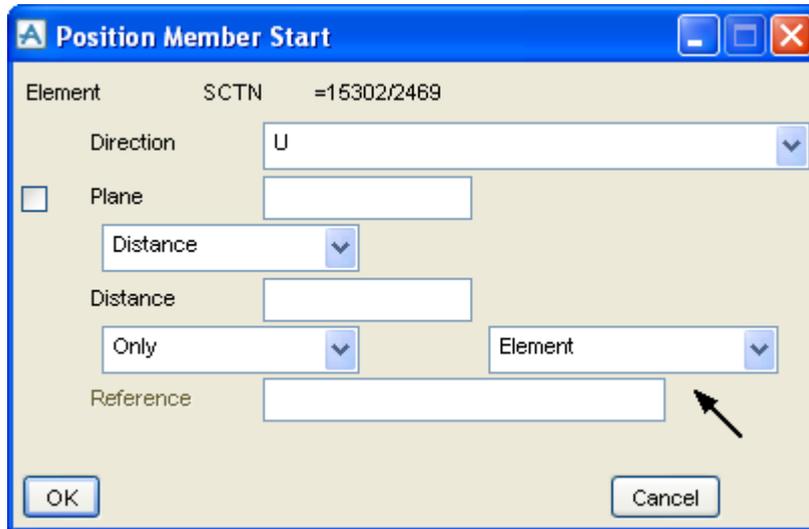
95. Add the Zone DEMO/SITE/STEEL to the Drawlist.
96. Position the Support Plane through SCTN 23, the steel section running East-West one square in from the North edge of the Site.
97. Create the Framework, Subframework and Template Members.
98. Configure the Support, making sure the anchors point upwards.
99. Display the **Modify Support Template** form. Connect the anchor points to SCTN 23 and the other to SCTN 31 by clicking the Anchor to Steel icon . You will see the **Selected Pline** form, with a list of suitable plines. Select pline BOS.
100. Set Steel Profiles to 76x38RSC.
101. Check the clearances.

Now you can create a brace member, 100 mm above the top cross member at a 45 degree angle to the new vertical members, as shown in the following diagram. The start and end points of the section are shown.



102. Click , on the **Modify Support Template** form. You will be prompted to pick the Owner of the new member: pick one of the main stanchions. The **Create New Template Member** form is displayed

103. For the **Start Connection**, change the **From Start** option on the **Create New Template Member** form to **Position**. The **Position Member Start** form is displayed:



On the **Position Member Start** form:

- Set Distance to 100.
- Change **Only** to **From** if the **Direction** is **U** or to **To** if the **Direction** is **D**.
- Use the selection arrow to pick the top cross-member and then click **OK**.

**104.** To set the **End** Position, on the **Create New Template Member** form:

- Select **Connection** and when prompted, pick the other vertical stanchion.
- Change **Z distance** option to **Angle**, and enter **U 45 E** or **U 45 W** according to which brace member is being constructed.
- Change **Direction** to **Degrees**, and the application will calculate the angle in degrees and enter it in the text box.
- Click **Apply**.

**105.** Now complete the Support in the usual way.

*End of exercise*



## A Toolbox Icons

### A.1 Icons on the Support Creation Toolbox

---

 Position Support Plane	Set the position of a new support plane (SBFR). The <b>Position Support Plane</b> form will be displayed.
 Create Framework	Create new support (FRMW & REST). if autclassification is switched on, displays the <b>Support Class</b> form. When you click <b>OK</b> on the <b>Support Class</b> form, or if autclassification is switched off, the <b>Name</b> form will be displayed. When you click <b>OK</b> on the <b>Name</b> form, a Framework element and a Restraint element will be created.
 Create SubFramework	Creates a Subframework at the currently set position, which stores the support plane.
 Create Template Hangers	Create template members from selected pipes. The <b>Create Template Members</b> form will be displayed.
 Create Support Template	Configure template members to standard configuration. The <b>Support Configuration</b> form will be displayed.
 Modify Support Template	Modify a template. The <b>Modify Support Template</b> form will be displayed.
 Section Profiles	Apply profile to template members. The <b>Steel Profiles</b> form will be displayed.
 Build Support	Build all support steel and hangers in a support.

---

### A.2 Icons on the General Toolbox

---

 Show Support Plane	Switch support plane on and off
 Maximum Span	Perform maximum span calculations for a support SBFR and highlight pipes accordingly. The <b>Max Span</b> form will be displayed.

---

 Support Axes	Show X, Y and Z axes for the current support SBFR. The <b>Support Axes</b> form will be displayed.
 Rename Supports	Perform automatic renaming of supports matching specified rules. The <b>Renumber</b> form will be displayed.
 Move Support	Move an entire support. The <b>Move Support</b> form will be displayed.
 Copy Support	Copy an entire support. The <b>Copy Support</b> form will be displayed.
 Measure Support	Access Design applicationware measuring facilities. The <b>Measure Options</b> form will be displayed.
 Build Single Hanger	Build a single hanger.
 Build Hangers	Build all hangers in a support.

### A.3 Icons on the Modify Template form

	Creates a Template member
	Creates an out-of-plane member
	Creates a new anchor beam
	Extends one end of a member
	Copies a member
	Moves a member
	Attaches a free end of a member to an existing member
	Deletes a member



Creates a joint at the junction of the selected members



Moves one attached end of the selected member and also the joint and member attached to it



Changes the owner of a joint



Deletes a joint



Changes a free end to an anchor point



Changes an anchor point to a free end



Unanchors and shortens an anchored member, keeping the anchor itself



Extends an anchor point to the nearest civil and creates an anchor



Extends an anchor point to the selected civil and creates an anchor



Extends an anchor point to the selected steelwork and creates an anchor



Creates an anchor at the selected anchor point



Creates a special anchor, using the direction of the civil, at the selected anchor point



Displays the Create Hanger form



Deletes a hanger



Creates an imaginary pipe



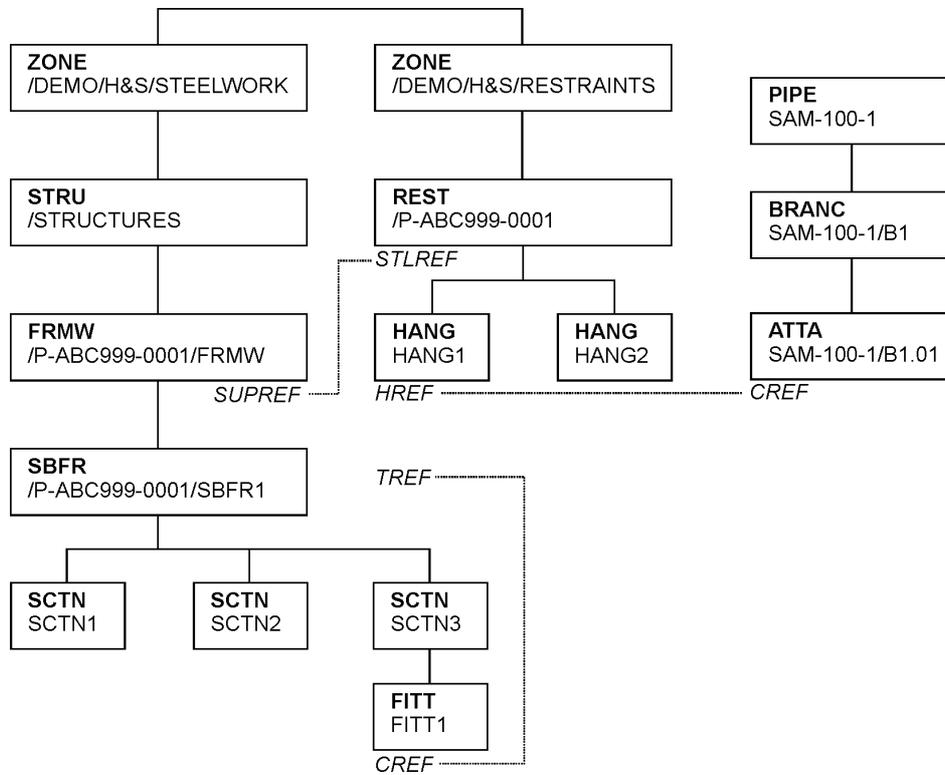
Modifies the attributes of an imaginary pipe



Deletes an imaginary pipe

## B Hangers and Supports Database Hierarchy

The links between elements in the OUTFITTING DESIGN Database are shown below:





## C Automatic Drawing Production

The OUTFITTING DRAFT Hangers & Supports Automatic Drawing Production Utility produces fully annotated and dimensioned engineering drawings of pipe hangers and supports, their associated supported items, and any associated main steelwork sections.

All settings needed to define the Hangers & Supports drawings can be saved in one or more macro files, and then the macros can be run as a batch process.

### C.1 Batch Macro Generation Form

In the OUTFITTING DRAFT Auto Drawing Production application, select **Create>Hanger & Support Drawings**. The **H&S Batch Macro Generation** form is displayed:

The current defaults file is shown in the **Defaults** area near the top of the form; the settings defined in this file are loaded automatically when you enter OUTFITTING DRAFT. You can change the default settings by selecting the options on the **Default\_Settings** menu at the top of the form.

The **Batch Dir/Macro** text boxes show the default file in which the drawing parameters will be stored if you save a macro without giving it a name.

The **Message Dir/File** text boxes show the file which will be used as the message file during batch macro execution. When processing has been completed, this file will contain a progress report of each drawing production cycle, together with any error messages output.

The **Log Dir/File** text boxes show the file which will be used as the log file during batch macro execution. This file is a standard OUTFITTING alpha log file which records the output response to each macro command line.

### C.1.1 Restraint List

The **Restraint list** defines the content of each drawing. The elements to be processed can be specified in the following ways:

- By entering an explicit restraint name in the text box.
- By entering the name of any element which has one or more restraints below it in the design hierarchy. All such restraints will be drawn.
- By reference to a OUTFITTING DRAFT Drawlist (IDLI) element which includes, either directly or by descent, one or more restraints.

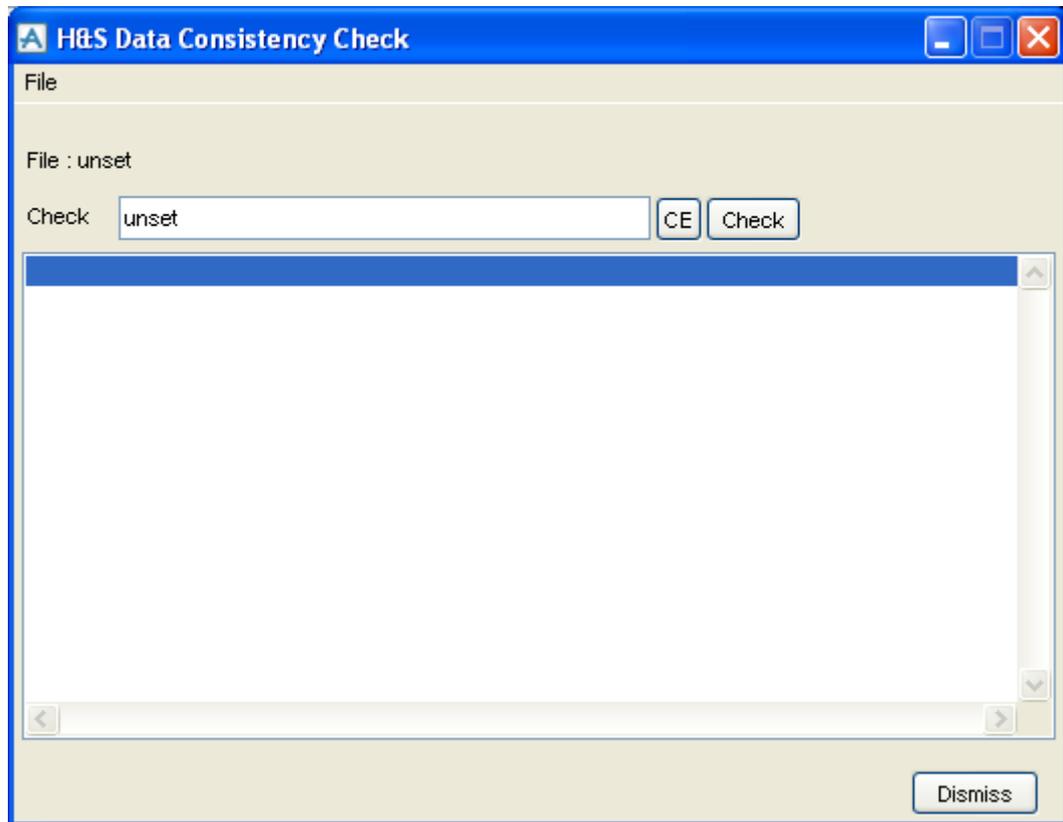
In each case, you can navigate to the required element in the **Design Explorer** and then use the **CE** button to enter the element name into the text box. Conversely, if you have typed a restraint name into the text box explicitly, you can click **-> Rest** or **-> Drwg** to make the Restraint or its associated Drawing the current element.

If you have specified a OUTFITTING DRAFT Drawlist for the restraint definition, you can modify the list from within the application. To do so, click **Modify list** and use the **Drawlist Management** form to edit the list in the usual way.

### C.1.2 Checking Data Consistency

It is usual to run data consistency checks on supports when they are created in OUTFITTING DESIGN's Hangers & Supports application. If you wish to re-check data consistency you can carry out the same process from within OUTFITTING DRAFT by clicking **Check...** on the **H&S Batch Macro Generation** form.

The **H&S Data Consistency Check** form will be displayed. The options are as follows:



Enter the element to be checked in the **Check** text box. You can use the **CE** button or type in the name. The element can be a single restraint or a higher level element above a restraint.

To start checking, click the **Check** button.

Any messages will be displayed in the scrollable text pane. If there are no errors which would affect drawing the restraint, the message NO DATA INCONSISTENCIES will be given.

If you want to save the list of messages to a file, select **File>Save As** from the menu. When the file has been saved, the filename will be shown at the top of the form.

### C.1.3 Producing Drawings

If you only use the preset defaults, you need only specify the restraint(s) to be drawn and the H&S Drawing Registry in order to generate complete drawings automatically. If you want to change the default settings, see next section.

When you have set up all the required formatting defaults and have specified which restraints are to be drawn, you can produce the resulting drawings in either of the following ways:

- If you wish to produce only a small number of drawings, you can initiate drawing production immediately from within the application. You will probably find this method efficient only for one-off drawings, since the drawing execution times are longer than those for batch mode.

- If you wish to produce many drawings, you can save all the current settings for the content and format of the drawings to a macro file. You can then run the macro file in batch mode to produce the drawings.

To generate a drawing of the hangers and supports defined by the current **Restraint list**, click **Process Now** on the **H&S Batch Macro Generation** form. The format of the drawing will be as defined by the current default settings and the drawing will be stored under the OUTFITTING DRAFT Registry defined by the **H&S Drawing Registry** setting on the **H&S Overall Defaults** form.

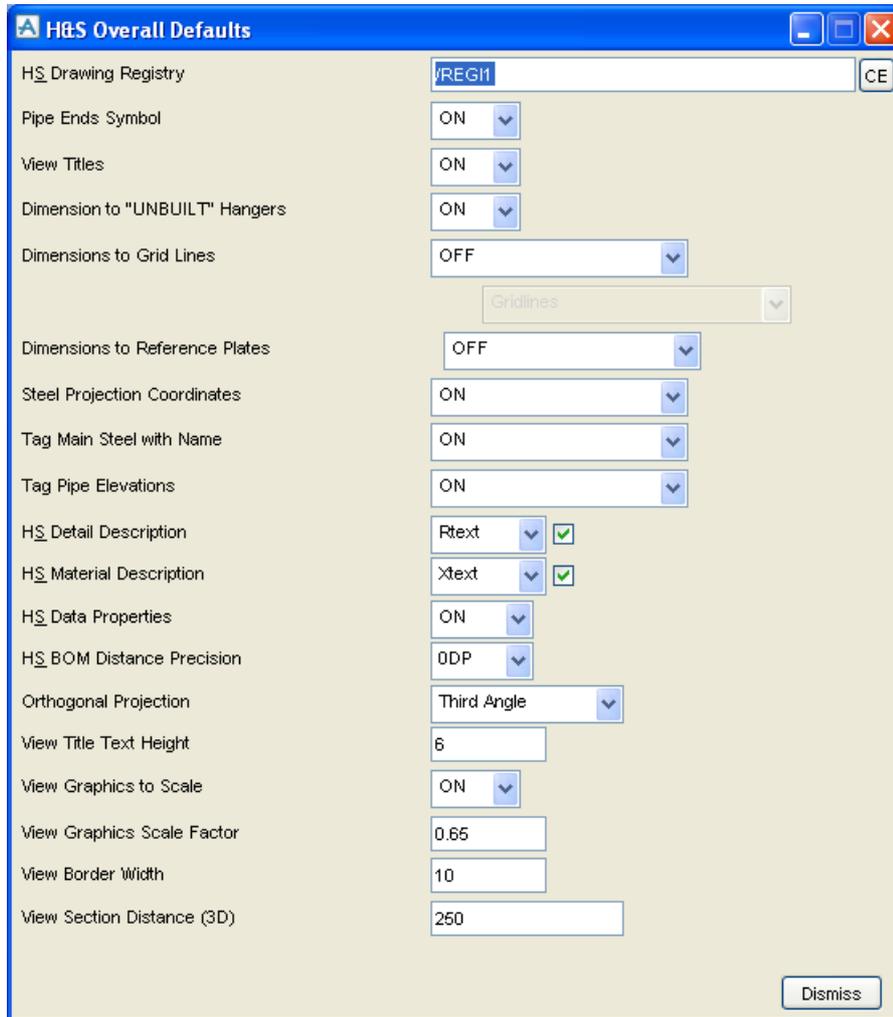
## C.2 Setting the Drawing Defaults

The **format** of each drawing is derived from a number of **default settings**. These will have been defined initially by the OUTFITTING DRAFT Administrator to suit your company's standards, although you can override most of the settings.

You can modify the drawing formats using the forms displayed when you select one of the options under **Default\_Settings** on the menu at the top of the **H&S Batch Macro Generation** form.

### C.2.1 Setting the Overall Defaults

To view or modify, the overall default settings, select **Default\_Settings>Overall** from the menu bar on the **H&S Batch Macro Generation** form. The **H&S Overall Defaults** form displays as shown.



### H&S Drawing Registry

This text box shows the name of the Draft Registry element under which new hanger and support drawings will be created. The name of each Drawing within the Registry is derived from the name of the restraint and a prefix, as specified in the OUTFITTING DESIGN Pipe Hangers & Supports application.

**CE** button allows you to copy the name of the current element into the text box in the usual way.

### Pipe Ends Symbols

If set to ON, the ends of pipes on the drawings will be shown by the symbols defined in the relevant library

### View Titles

If set to ON, the titles of the individual views in each drawing will be shown.

### Dimension to UNBUILT Hangers

If set to ON, dimensions will be plotted for all hangers owned by a restraint, including any standard hanger configurations which have been created but which have not yet been built; that is, those which exist in the OUTFITTING DESIGN DB as HANG elements but which have no members. If set to OFF, dimensions will be plotted only for those hangers which have been built.

### Dimension to Grid Lines

You can set this to plot dimensions which use predefined grid lines for their datum points in either of two ways:

- **Local to View** plots the dimensions directly on each view within the drawing.
- **On Location Plan** plots the dimensions on a separate keyplan view.

Gridlines option button allows you to select the STRUCture where the grid lines are stored.

### Dimension to Reference Plates

If set to ON, OUTFITTING DRAFT will plot dimensions which use predefined reference plate positions for their datum points.

**Note:** The **Dimension to Grid Lines** and **Dimension to Reference Plates** options are mutually exclusive. You must set one of them to OFF before you can use the other.

### Steel Projection Coordinates

If set to ON, the coordinates of projected steel sections will be plotted.

### Tag Main Steel with Name

If set to ON, all main steel sections which have been given OUTFITTING names will have those names plotted next to them on the drawings.

### Tag Pipe Elevations

If set to ON, the elevations of all pipe centrelines will be plotted.

### H&S Detail Description

#### H&S Material Description

The component descriptions shown in the material list on a hangers and supports drawing can include both the geometric description (derived from the attributes of a Catalogue DTEXT element) and the material description (derived from the attributes of a Catalogue MTEXT element).

In each case you can specify which of three attributes is to be used. The detail description can be taken from the RTEXT, STEXT or TTEXT attribute of the DTEXT element: the material description can be taken from the XTEXT, YTEXT or ZTEXT attribute of the MTEXT element.

To suppress the output of one or both types of descriptive text, set the corresponding toggle button to Off.

### H&S Data Properties

If this option button is switched on, all catalogue items with PURP set to DATA will be displayed.

**H&S BOM Distance Precision**

Use this option button to set number of decimal places displayed.

**Orthogonal Projection**

Use this option button to set the orthogonal projection of the plotted drawings to either **First Angle** or **Third Angle**.

**View Title Text Height**

Enter the required height (in mm) for the text used to show view titles (relevant only if **View Titles** is set to ON).

**View Graphics to Scale****View Graphics Scale Factor**

During the automatic drawing process, all design graphics are first scaled to fit the available drawing area and are then reduced by a further factor to allow space for adding dimensions and symbols.

**View Graphics Scale Factor**

Enter the required scaling factor in the text box for the second stage of this process.

**View Graphics to Scale**

If set to ON, the design graphics will be reduced a third time so that they are plotted to the nearest standard scale below that which results from the second stage. If this option is set to OFF, the graphics will be plotted to a non-standard scale.

The scale used will be shown in the drawing's title block.

The standard scales to which graphics may be plotted by the automatic drawing process are defined on the **H&S Standard Scales** form.

**View Border Width**

Enter the required width (in mm) for the border between the view frame and the view limits as defined in the backing sheet.

**View Section Distance (3D)**

Enter the 3D distance (in mm) at which the main steelwork is to be sectioned, measured from its connection point to the support steelwork.

## C.2.2 Setting the Library Pointer Defaults

To view or modify the default pointers to the library elements to be used during drawing production, select **Default\_Settings>Library Pointers** from the menu bar on the **H&S Batch Macro Generation** form. The **H&S Library Pointers** form displays as shown.

Item Name	Value	Action
Backing Sheet	/DRA/MAS/H&S_A2	CE
Pipe Elevation Symbol (LH)	/DRA/MAS/H&S/PELEVL	CE
Pipe Elevation Symbol (RH)	/DRA/MAS/H&S/PELEVR	CE
Main Steel Cutoff Symbol	/DRA/MAS/H&S/CUTOFF	CE
Main Steel Representation Style	/DRA/MAS/H&S/STYLES/MainSteel	CE
Pipe End Symbol (Front)	/DRA/MAS/H&S/PEND1	CE
Pipe End Symbol (Side)	/DRA/MAS/H&S/PEND2	CE
Loc'n Plan North Arrow Symbol	/DRA/MAS/H&S/NARR	CE
Left Hand View RRSF	/DRA/MAS/H&S/RULESETS/View1	CE
Right Hand View RRSF	/DRA/MAS/H&S/RULESETS/View2	CE
Loc'n Plan Grid Line Symbol PREFIX	/DRA/MAS/H&S/LOCPLAN	
Local Grid Line Symbol PREFIX	/DRA/MAS/H&S/GRID	
Reference Plate Symbol PREFIX	/DRA/MAS/H&S/REFP	

The first ten options on this form allow you to specify the names of the library elements from which the corresponding drawing data is to be derived. Each of these has an associated **CE** button so that you can copy the name of the current element without having to retype it. The final three options allow you to enter name prefixes to be used with dimensioning symbols.

**Note:** This form allows you to specify the names of existing library elements only. If you need to modify library elements (and have the necessary authorisation to do so), see the [Administrator Application User Guide](#) for further details.

The functions of the default settings on the form are as follows:

### Backing Sheet

This specifies the backing sheet to be added automatically to each drawing.

**Note:** The backing sheets used for automatic drawing production are intelligent, BACKs which have been specially set up for this purpose; they are not standard BACKs.

### Pipe Elevation Symbol (LH) and (RH)

These specify the symbols to be used to show pipe elevations (relevant only if Tag Pipe Elevations is set to ON on the **H&S Overall Defaults** form).

### Main Steel Cutoff Symbol

### Main Steel Representation Style

Each automatically produced Restraint drawing also shows part of any main steel section to which the associated hangers or supports are connected. These options specify how these steel sections are to be plotted.

### Pipe End Symbol Front

### Pipe End Symbol Side

Each automatically produced Restraint drawing also shows part of any pipe connected to an associated hanger. These options specify the symbols to be used to indicate the sectioned ends of such pipes (relevant only if Pipe Ends Symbol is set to ON on the **H&S Overall Defaults** form).

**Loc'n Plan North Arrow Symbol**

This specifies the symbol to be used for the North-pointing arrow on keyplan (location plan) views.

**Left Hand View RRSF  
Right Hand View RRSF**

These specify the settings of the Representation Ruleset Reference attributes for two VIEW elements, so that they point to the required Rulesets which are to be used when the corresponding views are plotted.

**Loc'n Plan Grid Line Symbol PREFIX**

Specifies the grid line symbol prefix to be used when **Dimension to Grid Lines** on the **H&S Overall Defaults** form is set to **On Location Plan**.

**Local Grid Line Symbol PREFIX**

Specifies the grid line symbol prefix to be used when **Dimension to Grid Lines** on the **H&S Overall Defaults** form is set to **Local to View**.

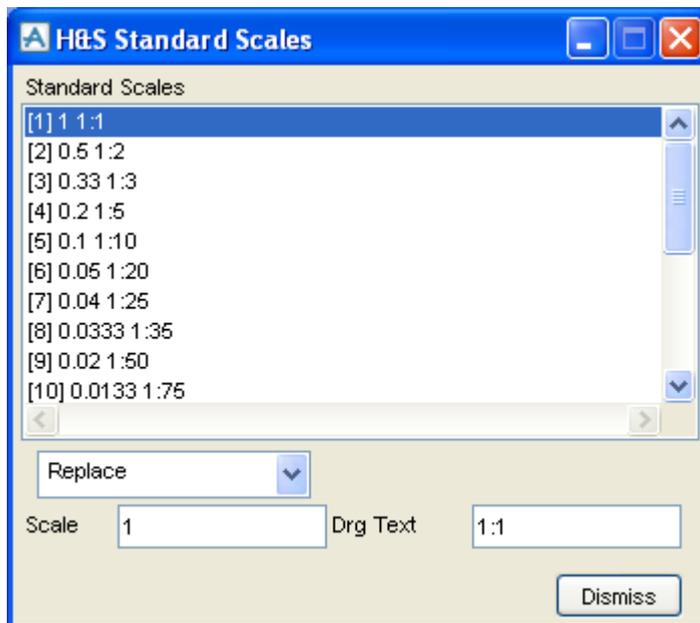
**Reference Plate Symbol PREFIX**

Specifies the reference plate symbol prefix to be used when **Dimension to Reference Plates** on the **H&S Overall Defaults** form is set to ON.

**Note:** All defaults are applied automatically as you set them. You can Dismiss the **H&S Library Pointers** form when you have finished with it without affecting the current settings. The settings will be saved from the **H&S Batch Macro Generation** form when you save a defaults file or create a batch macro.

### C.2.3 Setting the Standard Scale Defaults

To view, and if necessary modify, the default settings for the standard scales to be used during drawing production, select **Default\_Settings>Standard Scales** from the menu bar on the **H&S Batch Macro Generation** form. A **H&S Standard Scales** form displays as shown.



**Note:** Standard scales are relevant only if **View Graphics to Scale** is set to ON on the **H&S Overall Defaults** form.

The **Standard Scales** scrollable list shows all currently defined scales, each of which is defined in terms of a graphical scaling factor (e.g. 0.04) and an equivalent text description to be used in the drawing's title block (e.g. 1:25). The individual settings corresponding to the current list selection are shown in the **Scale** and **Drg Text** text boxes, ready for editing if necessary.

You can modify the list in any of the following ways:

Change the scaling factor and/or drawing text for an existing standard scale definition.

Add a new standard scale definition to the list.

Delete an existing standard scale definition from the list.

**Note:** The scales must be listed in descending order.

### Modifying a Standard Scale

To modify an existing standard scale definition:

1. Select the appropriate line in the list.
2. Edit the **Scale** and/or **Drg Text** entries as required.
3. Use the option button to select **Replace**.

The current list selection will be updated to the new settings.

### Adding a New Standard Scale

To add a new standard scale definition to the list:

1. Select a line in the list which is adjacent to (before or after, it does not matter which) the position for the new entry.

2. Edit the **Scale** and **Drg Text** entries to the settings required for the new standard scale definition.
3. Use the option button to select **Insert Before** or **Insert After**, relative to the currently selected line, as appropriate.

The newly defined standard scale will be inserted into the list in the specified position and the subsequent list items will be renumbered appropriately.

#### Deleting a Standard Scale

To delete an existing standard scale definition:

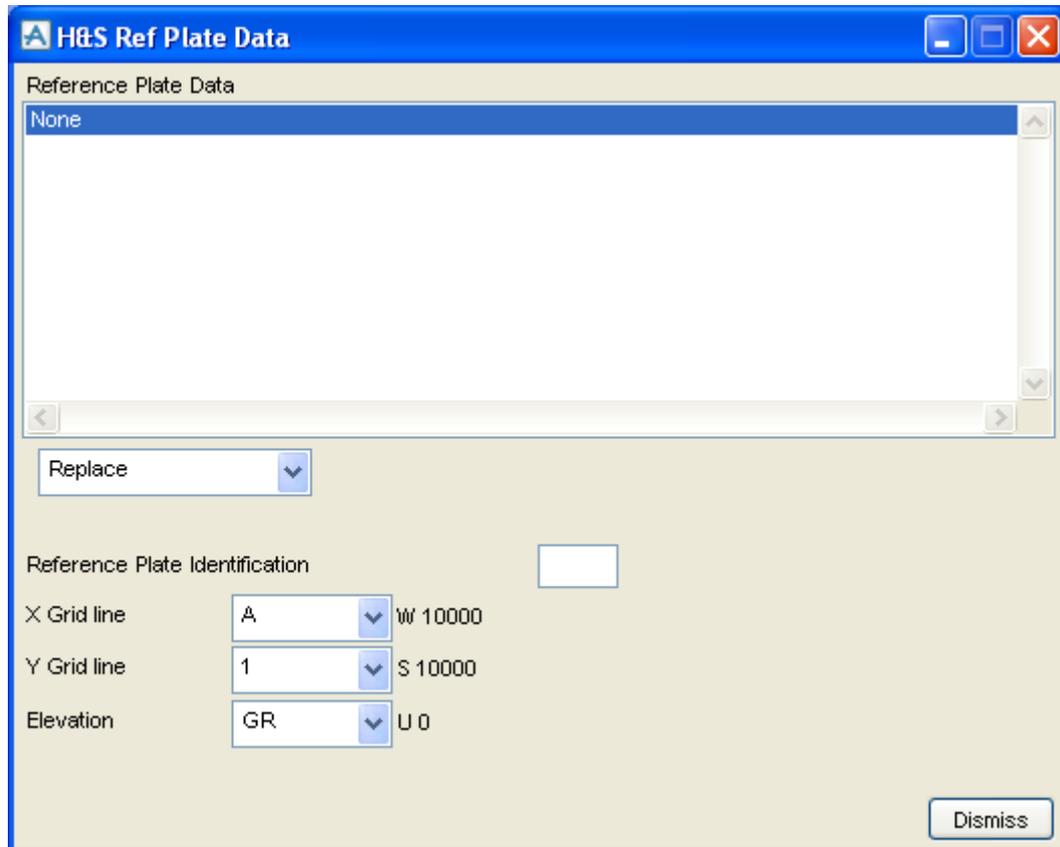
1. Select the appropriate line in the list.
2. Use the option button to select **Delete**.

The current list selection will be deleted from the standard scale definitions and the remaining list items will be renumbered appropriately.

**Note:** All defaults are applied automatically as you set them. You can Dismiss the **H&S Standard Scales** form when you have finished with it without affecting the current settings. The settings will be saved from the **H&S Batch Macro Generation** form when you save a defaults file or create a batch macro.

### C.2.4 Setting the Reference Plate Defaults

To view, and if necessary modify, the default settings for the positions of reference plates, select **Default\_Settings>Reference Plates** from the menu bar on the **H&S Batch Macro Generation** form. The **H&S Ref Plate Data** form displays as shown.



**Note:** Reference plates are relevant only if **Dimension to Reference Plates** is set to ON on the **H&S Overall Defaults** form.

### Reference Plate Definitions

The 3D **position** of a reference plate is defined in terms of the intersection of a pair of **X** and **Y grid lines** plus an **elevation**.

Each reference plate is identified on the drawings by a text identifier, usually one or two letters or digits (e.g. B or 12).

The **Reference Plate Data** scrollable list shows all currently defined reference plates, each defined in terms of its identification text and the grid line identifiers and elevation which determine its position. The individual settings corresponding to the current list selection are shown by the controls near the bottom the form, ready for editing if necessary.

You can modify the list in any of the following ways:

- Change the identification text and/or position for an existing reference plate definition.
- Add a new reference plate definition to the list.
- Delete an existing reference plate definition from the list.

### Modifying a Reference Plate

To modify an existing reference plate definition:

1. Select the appropriate line in the list.

2. Edit the identification and/or position entries as required.
3. Use the option button to select Replace.

The current list selection will be updated to the new settings.

#### Adding a New Reference Plate

To add a new reference plate definition to the list:

1. Select a line in the list which is adjacent to (before or after, it does not matter which) the position for the new entry.
2. Edit the identification and position entries to the settings required for the new reference plate definition.
3. Use the option button to select **Insert Before** or **Insert After**, relative to the currently selected line, as appropriate.

The newly defined reference plate will be inserted into the list in the specified position and the subsequent list items will be renumbered appropriately.

#### Deleting a Reference Plate

To delete an existing reference plate definition:

1. Select the appropriate line in the list.
2. Use the option button to select **Delete**.

The current list selection will be deleted from the reference plate definitions and the remaining list items will be renumbered appropriately.

**Note:** All defaults are applied automatically as you set them. You can Dismiss the **H&S Ref Plate Data** form when you have finished with it without affecting the current settings. The settings will be saved from the **H&S Batch Macro Generation** form when you save a defaults file or create a batch macro.

### C.2.5 Setting the Title Block Default Data

The title block layout and data fields labels are defined by the **Backing Sheet** setting on the **H&S Library Pointers** form. To specify the data which is entered into the appropriate fields during automatic drawing production, select **Default\_Settings>Title Block Data** from the menu bar on the **H&S Batch Macro Generation** form. A **H&S Title Block Data** form displays, an example of which is shown.

The exact content of the **H&S Title Block Data** form depends on the backing sheet selected.

Enter the text required into the text boxes. Each text box can be toggled on or off. Text switched off will not appear in the title block. If a text box is left blank and switched on, a blank entry will appear on the title block.

If the **Use Title Block Data** button is switched off, no title block data will appear.

**Note:** All defaults are applied as you set them. You can Dismiss the form when you have finished with it without affecting the settings shown. The settings will be saved when you save a defaults file or create a batch macro.

### C.3 Creating and Running Drawing Batch Macros

When you create a batch macro for the automatic production of hanger and support drawings, all formatting options (as defined by the current default settings) and all elements to be drawn (as defined by the current restraint list) are stored as variables in the macro.

To save the current drawing definitions to a macro file, either select **File>Batch>Save Macro** to save them to the file shown by the **Batch Dir/Macro** setting, or select **File>Batch>Save Macro As...** to save them to a file whose name you will specify using the resulting file browser.

When you save the drawing creation commands to a batch macro file, the command lines are checked for validity of the default settings and other batch data. Any errors encountered during the macro creation process are recorded in a form. To view this information after saving the macro, select **File>Batch>Display Verify Errors**.

A batch macro file consists of the commands necessary to create a fully annotated and dimensioned drawing in OUTFITTING DRAFT, using the settings of variables to define the

drawing parameters. Each macro ends with a CALLSUP START command which initiates the drawing production macros. You submit each macro for batch execution in OUTFITTING DRAFT in order to create the corresponding Hangers and Supports drawings.

If you have no standard method for submitting OUTFITTING batch jobs for execution, bring up the **Command Input & Output (Display>Command Line)** form, and then execute the batch macro.

## C.4 Saving the Defaults

To save all of the current default settings to a file, either select **File>Defaults>Save** to overwrite the current defaults file (as shown by the **Defaults** File Name) or select **File>Defaults>Save As** to save them to a file whose name you will specify using the resulting file browser.

To load a new defaults file, select **File>Defaults>Load From** and select the required file using the resulting file browser. The name of the file will be shown in the **Defaults** area.

If you have used the **Default\_Settings>...** menu options to modify any defaults from the settings defined by the current defaults file, you can reset them by reloading the current file. To do so, select **File>Defaults>Load**.

When you load drawing defaults from a file, all settings loaded are checked for validity. Any errors encountered during the loading process are recorded in a form. To view this information after loading, select **File>Defaults>Display Load Errors**.



## D Other Relevant Documentation

This guide introduces the facilities provided by AVEVA OUTFITTING for the creation of Pipe Hangers and Supports and their incorporation into Specifications which make them accessible to other OUTFITTING designers.

### D.1 AVEVA OUTFITTING Introductory Guides

The following guides introduce the principal AVEVA OUTFITTING facilities to new users (this guide forms part of the set):

- Getting Started with OUTFITTING  
Introduces OUTFITTING and related products
- Pipework Design User Guide
- HVAC Design User Guide
- Structural Design Using OUTFITTING User Guide
- Introduction to Templates
- Drawing Production User Guide  
Introduces the range of facilities available in the OUTFITTING DRAFT module.
- Reporting  
Introduces the database reporting utility available from within most AVEVA OUTFITTING applications, including the use of expressions to select relevant data.

### D.2 AVEVA OUTFITTING Reference Manuals

The full AVEVA OUTFITTING documentation set includes a number of reference manuals which give detailed explanations of all the technical concepts involved. These manuals also describe the underlying command syntax which can be used to control AVEVA OUTFITTING directly (thus bypassing the forms and menus interface).

Those relevant to design work include:

- OUTFITTING DESIGN Reference Manual  
Covers concepts and commands for all design disciplines.
- OUTFITTING DRAFT Reference Manual  
Explains the commands for the OUTFITTING 2D drafting facilities.
- Catalogues and Specifications Reference Manual  
Explains how to set up a OUTFITTING Catalogue and create tabulated specifications.

## D.3 General Guides

The following guides are intended for use only by experienced OUTFITTING users who want to write their own applications:

- **Software Customisation Guide**  
Explains how to write your own application macros using PML (AVEVA's Programmable Macro Language) and how to design your own forms and menus interface.
- **Software Customisation Reference Manual**  
Supplements the Customisation Guide. Includes a list of PML 2 Objects, Members and Methods. For Forms and Menus objects, the command syntax relating to the objects is included.

# Index

---

## Numerics

3D view ..... 4:3

## A

Application  
 definition ..... 2:1

## B

Bracing members  
 creating ..... 8:2  
 Building supports ..... 5:12

## C

Check Clearances form ..... 5:12  
 Checking connections ..... 5:9  
 Classification ..... 5:3  
 Clearances ..... 5:12  
 Connecting template members ..... 5:9  
 Connecting template stanchions ..... 5:9  
 Create New Brace Member form ..... 8:2  
 Create Template Members form ..... 5:5  
 Cross-member direction ..... 5:1

## D

Database ..... 4:4  
 Defaults  
 Hanger and Supports ..... 4:3  
 Design Explorer ..... 4:3  
 Direction ..... 5:8  
 Directions ..... 5:1

## F

Frameworks, creating ..... 5:3

## G

Graphical view ..... 4:3

## H

Hanger defaults ..... 4:3  
 Hanger direction ..... 5:5  
 Hanger start ..... 6:1  
 Hangers  
 single, creating ..... 6:1

## J

Joints ..... 5:10

## M

Menu bar ..... 4:2  
 Modify Support Template form ..... 5:9  
 Module  
 definition ..... 2:1  
 Multi-plane supports ..... 7:1

## O

Origin of support ..... 5:1

## P

Position Hanger form ..... 6:1

Position Support Plane form ..... 5:2  
 Principal direction ..... 5:1, 5:8  
 profiles  
     steel ..... 5:10

**R**

Reports ..... 5:12  
 RESTraint.elements ..... 4:4

**S**

Schedules ..... 5:12  
 Set Hanger Configuration form ..... 5:6  
 Special supports ..... 5:8  
 Specifications  
     Hangers ..... 4:3  
     Supports ..... 4:3  
 Stanchion direction ..... 5:1, 5:8  
 Standard supports ..... 5:8  
 Status bar ..... 4:3  
 Steel Profiles form ..... 5:10  
 Storage areas ..... 4:7  
 Subframeworks, creating ..... 5:4  
 Support Configuration form ..... 5:7  
 Support defaults ..... 4:3  
 Support origin ..... 5:1  
 Support plane ..... 5:1  
 Support schedules ..... 5:12  
 Support templates ..... 5:4

**T**

Templates ..... 5:4  
 Title bar ..... 4:2  
 Tool bar ..... 4:3  
 Toolboxes ..... 4:7  
 Two-plane supports ..... 7:1

**V**

View  
     3D graphical ..... 4:3