IRRICAD

User Guide

Developed By
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1 Overview & Installation

1.1 Important Information

Congratulations on purchasing IRRICAD Pro. We offer upgrades from time to time that will be downloadable from our website, www.IRRICAD.com as they come available. We also have a Frequently Asked Questions section that may help to solve a problem or question you may have. However, we are always happy to hear from you.

You are also able to download manufacturer's databases from our website and merge them with your current database or default database. If you wish a database to be customised specifically for your use, contact us and we will inform you of the pricing and time frame.

If you have any requests of what you would like to see in IRRICAD in the future, please let us know. Development for IRRICAD is always on-going and we will be pleased to be able to meet your needs. Every request is prioritised according to ease of programming and benefit to the most users.

Do you know about the IRRICAD Users Forum?

You can…

- Receive up to date announcements from us
- Post questions
- Help answer other people’s questions
- Have your say, by making suggestions for future IRRICAD features
- Receive the “Support FAQs” and “Tips” email notifications as well as other forums of interest to you.
- Register for the forum at http://www.irricad.com/irricad-support/irricad-forum.
- Subscribe to each forum by clicking the “Subscribe Forum” link at the bottom of each forum.

1.1.1 Insurance for your IRRICAD

The hardware key is an integral part of the IRRICAD program and care should be taken to ensure that it is protected from loss or damage. If the key is lost as a result of theft, fire or natural disaster it may be replaced at cost (plus a handling fee) on receipt of an acceptable police or fire department report. Damaged keys may also be replaced for a similar fee upon return to your IRRICAD distributor.

If the key is simply “lost” it does not qualify to be replaced at cost, as this is in effect the same as the IRRICAD licence being lost which could subsequently be used by another party. In this case a new licence would need to purchased and consequently, for your own protection, please consider insuring the key against accidental loss.

1.2 How to Use the Manual

The manual is divided into several sections: Overview & Installation, User Manual, Database Editor Manual, Tutorials, Tool & Command Reference and Technical Reference. The Help can be opened electronically by selecting *Help|Help Topics*.

The Overview & Installation section (this section) explains how to install the program, describes how to use the online help and has comments for new users.

The User Manual describes how to use the various tools, available in IRRICAD, to design irrigation systems. It explains how to layout different system types and includes tips on efficient ways of drawing or changing items.

The Database Editor Manual explains the use of the database editor, how to enter and modify items, merge databases and setup databases so that IRRICAD designs may be completed including the selection of fittings.

The Tutorials section includes tutorials illustrating the design of several types of irrigation system. The aim is to give step-by-step instructions to help to become familiar with IRRICAD. Tutorials are also included to describe the entry of items in to the database, creating custom symbols and printing designs. These tutorials are also available in video format located on the Installation CD. (See Some Comments for New Users, Section 1.4.1.1).

The Tool & Command Reference outlines the function of each menu item and dialog field. It also shows the steps required for the mechanical operation of the tool or command.

The Technical Reference includes information to aid in understanding how IRRICAD works. Information is included about Hazen-Williams C Values (used in pipe friction loss calculations), rules used to select fittings for junctions, IRRICAD program limits, keywords for labels and plot templates, warning messages and technical descriptions of the design methods used in IRRICAD.

The Release Notes can be access by selecting *Help|Release Notes*. This section will describe each new feature in the current release.

How to Use Help, Section 1.4 will give some tips on using the On-line Help.

1.3 INSTALLATION

This chapter contains installation instructions and information about setting up accompanying hardware.

1.3.1 BEFORE INSTALLATION

Before installing and running IRRICAD, please carefully read the following.

Package Contents

The IRRICAD package supplied should contain:

- CD-ROM or flash drive – conatining the IRRICAD program and setup files required to install and use IRRICAD. Electronic versions of the manual are included with the software:
  - User Guide including Overview & Installation, User Manual,Database Editor Manual and Tutorials.
  - Reference Manual including Tool & Command Reference and Technical Reference.
- Hardware Key - for new users only.

Protection System

Please read carefully:

IRRICAD software is supplied with a hardware protection device (HPD or dongle) which should be inserted in the USB port of the computer. The HPD should not interfere with the running of other packages.

This form of protection has been chosen to provide the user with maximum flexibility in program use. It permits the user to transport the package to another machine in the office or to another geographic location. It does, however, make the HPD an integral part of the IRRICAD package and accidental loss or theft of the HPD will mean that IRRICAD cannot be operated.

If the HPD is damaged, return to us an identifiable portion of the HPD and a replacement will be supplied at cost. Accidental loss or theft of the HPD may require the purchase of a replacement at the appropriate discount rate for the total number of IRRICAD programs owned.

Copy and Use Restrictions

Copyright laws protect the software. It is illegal to make copies of the software except for backups. It is illegal to give copies to another person, or to duplicate the software by any other means, including electronic transmission. The software contains trade secrets and the user may not recompile, reverse engineer, disassemble, or otherwise reduce the software to human perceivable form. The user may not modify, adapt, translate, rent, lease, or create derivative works based upon the software or any part of it.

Hardware and Memory Requirements

The following hardware is the minimum recommended for IRRICAD, although less powerful system configurations may be used for smaller jobs.

Computer:	Intel i5 or i7 or equivalent processor, minimum 8GB RAM recommended, and 250+ GB hard disk, monitor and video card capable of 512MB video or better, CD/DVD-ROM drive (optional), USB port.
Operating System:	Windows 8/8.1 or Windows 10.
Printers:	IRRICAD can print plans and reports on any Windows compatible printer.

Color is recommended for plans, although black and white plans can be produced. At least an ANSI B or A3 printer / plotter is desirable, although for small plans an ANSI A / A4 printer may be sufficient.

The printer size required will depend on the size of schemes designed and the size of plan preferred. Large printers have the ability to plot small plans if required.

A scanner is optional. This can be used to scan in scale plans or photographs as required.

1.3.2 SOFTWARE INSTALLATION

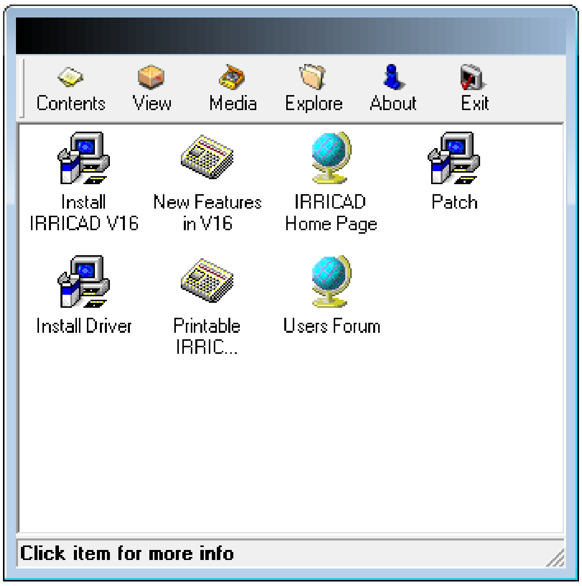


Figure 1-1

1. Log in as an Administrator and open an internet browser (for example Internet Explorer or FireFox) and browse to an external website. This step is required for successful registration of the CAD Engine.
2. Place the CD in the CD-ROM drive. An Autorun executable should automatically show a dialog containing icons, as seen in Figure 1.1. If not, browse the CD using My Computer or Windows Explorer for the “Autorun.exe” located in the Autorun folder. Alternatively download the required installation file from the IRRICAD website and save to your hard-drive..
3. Close all applications that may be running before installing IRRICAD.
4. To begin the installation process double-click on the “Install IRRICAD” icon or downloaded executable. Follow the instructions on the screen to install IRRICAD on the hard drive.
5. The installation procedure can be cancelled at any time, if so it will be necessary to double-click on the “Install IRRICAD” icon or executable file to repeat the installation.
6. Once the installation is complete run IRRICAD by selecting *Start|All Programs|IRRICAD Pro* or by double-clicking on the desktop icon

1.3.2.1 LANGUAGE VERSIONS

IRRICAD can be installed in English, French, Spanish, Portuguese or Hebrew. Select the correct installation file for your required language.

Once installed, the language option may be changed in the *Settings|Language* dialog, in the Report Editor or in the error viewer (*Report|View Errors*).

The User Interface Language can be independently specified in the *Tools|Language* option in the Database Editor.

Plot layouts and report templates are available in English, French, Spanish, Portuguese or Hebrew and are located in appropriate sub-folders of the standard locations (e.g., IRRICAD Pro 16\Symbols\Templates\Spanish, IRRICAD Pro 16\Reports\Spanish).

To enable the use of different layouts or reports (if the language choice was not selected at installation) the path settings can be found in *Settings|Drawing Items - Miscellaneous*. Alternatively the preferred templates and reports can be copied into the standard locations.

If you have installed IRRICAD without selecting your preferred language the steps to change the language are:

In IRRICAD:

1. Select the required language in *Settings|Language.*
2. Set the plot layout path in *Settings|Drawing Items - Miscellaneous* “Plot Layout Path” to point to the required language sub-folder of layouts by clicking the button.
3. Set the report template path in *Settings|Drawing Items Miscellaneous* “Reports Path” to point to the required language sub-folder of reports by clicking the button.

In The Database Editor:

1. Select *Tools|Language* to change the language as required.

1.4 HOW TO USE HELP

Electronic help is a convenient and quick way to look up information whilst using IRRICAD. Help can be viewed on-line in the following ways:

- In any IRRICAD window, press F1 to open the Help Topics
- The Help Topics can also be accessed by selecting *Help Topics* from the *Help* menu in the main IRRICAD screen

Information can then be displayed for performing tasks within IRRICAD, advice on troubleshooting common problems, and technical information about IRRICAD.

The help file can be loaded as WinHelp or HTML Help. For HTML Help, Internet Explorer is required.

1.4.1.1 HTML HELP

This window can be resized as required. Click the maximize button (middle button at the top right of the dialog window) or move the cursor to any edge until the cursor becomes a two-headed arrow and drag the dialog to the required size. The right hand side of the dialog adjusts the text to fit the right hand window.

At the top of the help dialog are icons: Hide, Back, Print, Options.

HIDE / SHOW

If the left hand side of the help dialog, containing the contents, index and search option is visible, clicking Hide will hide the left hand side. If the left hand side is hidden, clicking Show will show the left hand side of the dialog.

There are three ways in which a topic in the On-line Help may be found:

- Contents
- Index
- Search / Find

Contents

If this tab is selected, the manual's content page is displayed. Each heading with a '+' sign can be opened to reveal its sub-headings. The sub-headings can be hidden by clicking on the '-' sign.

Clicking any heading will take the user directly to that section of the manual. The text is displayed on the right hand side of the help window.

Index

Use the Index tab to select an indexed keyword. These words have been selected to aid the user in finding topics. Select a topic and click the Display button.

Search

Use Search to find a topic. Search lists all the places the word is found in the on-line help.

To use Search:

1. Type in the word the user wishes to find. Make the word as specific as possible e.g., type X to find the meaning of this usage code for assemblies.
2. Click List Topics.
3. Select a topic from those listed.
4. Click [Display]. The selected topic will be displayed on the right hand side.

BACK

Back takes the user back to the last topic accessed, whether the user has selected the topic by using Contents, Index or Search or used the yellow arrows at the end of each topic to navigate.

Click Back as many times as required - this function will move back through all the previous selections.

PRINT

Select Print to print any part of the on-line help. A print dialog will appear. Fill in the print dialog accordingly.

OPTIONS

Options include:

- Hide Tabs / Show Tabs (See above)
- Back (See above)
- Forward
- Home
- Stop
- Refresh
- Internet Options
- Print (See above)
- Search Highlight On / Off

Forward

Select *Options|Forward* if have used *Options|Back* and wish to return to the previous document.

Home

Select *Options|Home* if require to connect to our website www.IRRICAD.com

Stop

Select *Options|Stop* to stop searching for topics or loading a page.

Refresh

Select Refresh to reload the current HTML help page

Internet Options

Select *Options|Internet Options* to change the internet options.

Search Highlight On / Off

Toggle the search highlight on or off to highlight the keyword found in the text.

1.5 Some Comments for New Users

All documentation is available in both electronic (on-line) and hard copy manuals.

Overview

It is strongly recommended that the User Manual is read before any designs are attempted. Doing this will provide the user with an overview of how to produce a design using IRRICAD.

Tutorials

Tutorials are intended to guide a new user through the process of designing irrigation systems, and accomplishing other tasks, with IRRICAD. We recommend that the tutorials are completed as a way of becoming familiar with the design process. The tutorials may also be available as a video which can be downloaded from the Irricad website or run directly from the installation CD. To run a video from the CD select the appropriate tutorial video from the Autorun menu (which will appear after the CD is placed in the CD-ROM drive) or alternatively open the “Movie” folder on the CD using Windows Explorer and double click on the required video file.

2 User Manual

Welcome to the User Manual. This manual is designed to help you accomplish many tasks common to the design process. Instead of simply explaining how to use the tools, this manual is intended to help with understanding the design tasks required and which tools should be used to complete them.

2.1 INTRODUCTION

This chapter includes information about design terminology and how to follow the nomenclature used in this manual.

2.1.1 GLOSSARY - DESIGN TERMINOLOGY

Because IRRICAD can be used for the design of any pressurized irrigation system, the following terminology is used:

Block:	An option for laying out an area of equally spaced spraylines (Spray Block / Sprayline Block) or tapes (Tape Block). The spraylines may be connected or unconnected (see below). Immediately after entry, each sprayline or tape becomes an independent item.
Control Valve:	Any device which can be used to control the flow of water to an outlet or group of outlets.
Irrigation Block Entity:	An option for laying out an area of equally spaced spraylines or tapes, with automatic placement of submains, flushing manifolds and control valves. The spraylines may be connected or unconnected (see below). Each block entity is defined as an irrigation zone.
Mainline Pipes:	Pipes used to connect zone control valves to water supplies.
Mainline Outlets:	Outlets on a mainline. Each outlet is treated as a zone and is assumed to also perform the function of a zone control valve. Valve-in-head sprinklers are mainline outlets.
Misc. Hydraulic Items (mainline):	Items such as isolating valves, back flow preventors, air release valves that are connected into or onto a mainline pipe.
Misc. Hydraulic Items (zones):	Items such as isolating valves, backflow preventors, air release valves that are connected into or onto a Zone pipe.
Outlet:	Any device that discharges water from an irrigation system.
Sprayline (connected):	A zone pipeline containing equally spaced outlets, also known as a lateral. A connected

	sprayline is maintained as a single unit.
Sprayline (unconnected):	A method of spacing outlets uniformly along a Zone or Mainline pipe. As soon as the sprayline has been entered it is converted into individual pipes and outlets, i.e., it is not maintained as a single unit.
System Duty:	A situation in the mainline (resulting from the turning on or off of control valves) in which the flows are fixed for a particular time interval. Also known as stations, sets or groups.
Tapes:	A lateral with internal emitters (drippers), commonly called dripline.
Water Supply:	A point of supply for the irrigation system.
Zone:	Items downstream of control valves (including the valves themselves). A zone becomes defined when control valves are entered, and zone pipes or spraylines connected to it, regardless of how or when those spraylines, pipes and outlets were entered.
Zone Outlets:	Outlets within a zone.
Zone Pipes:	Pipes used to connect zone outlets to zone control valves. Also known as submains.

2.1.2 Nomenclature

The following conventions are used in this manual:

- When directed to select a command from a menu, the menu name, menu option and sub menu option (if applicable) will be listed. For example, *Settings|Digitizer|Scale*. This refers to selecting the *Scale* option from the *Digitizer* submenu that is found in the *Settings* menu. The *Settings* menu is found on the menu bar at the top of the IRRICAD window.
- When directed to click on a button in a dialog or message on the screen, the button will be displayed in square brackets; e.g., [Save as Defaults].
- When directed to press a key on the keyboard, the key will be displayed in angle brackets; e.g., <Shift> key
- Any measurements will be given in US units first and the metric unit will be supplied in brackets e.g., **300ft** (**91.5m**).

2.2 BEFORE STARTING A DESIGN

2.2.1 SETTING UP DEFAULTS

Before attempting your own designs, check that the defaults are correct. The *Settings* menu allows specification of personal preferences for:

- Snaps
- Grids
- Layers
- Drawing values
- Units
- Design Details
- Names
- Miscellaneous
- Irrigation Items
- Irrigation - Design Specific
- Company Details
- Client Details

When first starting IRRICAD, select *Settings|Irrigation Items* to change the default values to those that will apply to all designs. These tend to be items that once set up are rarely changed.

Settings|Irrigation - Design Specific can be used to set default values for each design individually. These settings are saved with the design. If these settings are to be the same for all designs, click the [Save As Defaults] button.

Hydraulic, economic and other design parameters can be altered in the *Design|Design Parameters* dialog. These parameters are design specific, but can also be saved as the default for all future designs.

2.2.2 LOADING AND SETTING UP WORKING DATABASES

For each design, IRRICAD requires a database, which contains all the hydraulic items and their hydraulic properties.

The database loaded during a new installation by default is the working (external) database.

Before starting the tutorials the tutorial database (provided with the program) must be selected as the working database. To do this use the [Browse] button in *Settings|Irrigation - Design Specific* and locate **Tutorial**.**mdb** in the IRRICAD\database folder. The IRRICAD\database folder should be opened by default. Click on the **Tutorial**.**mdb** file and click the [Open] button.

To use any other database for a design, select the database in the same fashion. If the selected database is to be retained as the default database, click the [Save As Defaults] button.

2.2.3 Saving and Backing Up Designs

It is very important to backup a design regularly both during the design process and when a design is complete. IRRICAD, like other Windows programs, keeps the design in memory until *File|Save* or *File|Save As* is selected to save the design to disk.

In Version 13+ the Save option for new designs creates a compressed archive file (.dez) containing all the constituent design files except the external database file. To save a design as an older version select *File|Export* and select the appropriate file type. Save the file with an identifying name.

It is a good idea to save the component (external) database with the design files.

Copies of designs can also be backed up using Windows Explorer or My Computer by selecting the dez files and copying them to another folder, a disk, or to a network drive. Repeat to copy the component database, typically located in the Irricad Pro\database folder, to the disk or network drive. Alternatively to save the design directly to a disk as a backup select *File|Save As*, open the drive and folder, then type in a file name and click [Save].

If the system crashes (e.g., a power failure) any changes made to the design since the last *File|Save* will be lost unless "AutoSave" is enabled. This is a setting that, if enabled, causes the design to be periodically saved to the specified folder (see *Settings|Miscellaneous* - the backup folder defaults to IRRICAD\Backup). Note the backup files will be in compressed format. See How to Recover a Back-up Design, Section 2.10.1.3.

2.2.4 USING AUTOCAD COLORS

IRRICAD loads the colors from the file vga.vcpal (located in the IRRICAD folder) or, if no file is found, sets up a default palette of colors. To use an AutoCAD palette instead of the default palette, the following steps should be followed:

1. Find the file vga.vcpal in the IRRICAD folder using Windows Explorer.
2. Rename it to Vcadd.vcpal, for example.
3. In the same folder, find either acadwindows.vcpal or acaddos.vcpal, depending on whether Windows or DOS AutoCAD colors are required, take a copy and rename it to vga.vcpal.

Note that changing the palette will affect all designs; even those created with the old palette will have their colors changed.

2.2.4.1 MAPPING AUTOCAD COLORS

When importing files IRRICAD maps the color from the DWG/DXF file to the IRRICAD screen colors, based upon the mapping selected in the *Import/Export Settings* under the *Settings* menu. When using the default import color map settings this is not necessarily an exact conversion as it maps to the nearest color however, in the majority of circumstances this is fine.

If an AutoCAD palette is in use to preserve the color numbers then ‘Custom’ mappings should be setup as follows:

1. In the Color Import tab of *Import/Export Settings* select the “Use Custom Map” radio button.
2. Select **One to One** from the “Map” dropdown box.
3. Repeat this process on the Color Export tab.

For more information see Import/Export Settings, Section 5.10.7.

2.2.5 Usability Features

2.2.5.1 Mouse

IRRICAD uses the mouse installed with Windows operating systems. Clicking the right mouse button will bring up additional menus of choices for aiding or finishing tasks when using tools.

2.2.5.2 Mouse Wheel

IRRICAD Pro supports the use of 'wheel mouse' devices to both zoom and pan. Three specific functions are allowed, zoom, pan vertically and pan horizontally. Each of these functions can be applied to one of three mouse wheel actions which are: mouse wheel only; mouse wheel with the shift key pressed; and mouse wheel with the control key pressed. In addition dragging with the mouse wheel depressed allows 'dynamic' panning.

Zoom

By default this function is attached to the **Mouse Wheel** action. Rotating the mouse wheel forwards will zoom out while rotating it backwards will zoom in.

Pan Vertically

By default this function is attached to the **Shift + Mouse Wheel** action - mouse wheel with the <Shift> key pressed. Rotating the mouse wheel forwards will move the view of the design up while rotating it backwards will move it down.

Pan Horizontally

By default this function is attached to the **Control + Mouse Wheel** action - mouse wheel with the <Ctrl> key pressed. Rotating the mouse wheel forwards will move the view of the design to the left while rotating it backwards will move it to the right.

Note that if the cursor is on a scroll bar then rotating the mouse wheel pans by moving the scroll bar slider appropriately regardless of whether the shift or control keys are pressed.

2.2.5.3 MOUSE SETTINGS

This section under the *Settings* menu allows the configuration of the wheel mouse and scroll functions.

Zoom

The required mouse wheel action may be selected from the dropdown menu on the right. If the "Reverse" checkbox is enabled then the effect of rotating the mouse wheel is reversed relative to the default effect. The amount of zoom that each mouse wheel 'click' represents is controlled by the "Zoom Factor". This number is the ratio of the new to the old zoom state and must be greater than 1 and less than 10. For example 1.5 will give an increase of 50% when zooming out for each wheel click and a decrease of 1.0/1.5 when zooming in.

Vertical

The required mouse wheel action may be selected from the dropdown menu on the right. If the "Reverse" checkbox is enabled then the effect of rotating the mouse wheel is reversed relative to the default effect.

Horizontal

The required mouse wheel action may be selected from the dropdown menu on the right. If the "Reverse" checkbox is enabled then the effect of rotating the mouse wheel is reversed relative to the default effect.

Show Scroll Bars

When enabled the scroll bars will be visible.

2.2.5.4 GROUPING ITEMS TO DISPLAY – USING LAYERS

IRRICAD automatically groups items in what are called Layers. When selecting items to place on the screen the resulting dialog will normally have the layer as <DEFAULT>. This means that all drawing items will be put into the DRAWING layer, all text is put in the TEXT layer, all pipes are put in the relevant PIPES layer and all outlets in the OUTLETS layer unless specified otherwise.

Everything can be placed on one layer or can be stored in related groups of information on different layers. This is similar to manually drawing different types of information on the overlay sheets commonly used in conventional drafting that can be viewed independently or stacked on top of one another to compose a complete drawing. For example, place a basic plan on layer 1, mainline on layer 2, the electrical system on layer 3, the control valves on layer 4, and so on.

You can create, edit, view, and print any combination of layers together. Objects can be moved from one layer to another. An object can be drawn on any layer and with any properties, or can be set to use properties from the layer itself.

In *Settings|Layers* a series of larger groups with the <DEFAULT> layer specified at the top of the dialog can be seen. Notice that the Zone group is also <DEFAULT>. This means that depending on the item drawn e.g., an outlet, the item will be put in the correct layer e.g., OUTLETS layer. A layer can be selected e.g., TEMPORARY from the dropdown list so that all zone items will be placed in the TEMPORARY layer.

New layers can be created and any created layers can be deleted. The default layers cannot be deleted.

Layers can be turned off (uncheck the check box for that layer in the "Show" column) to hide the items in them. Items can have their drawing properties selected as "By Layer", which means that the item will display the color, line type and line widths as per the layer defined properties. These layer properties can be changed by clicking on the "Color" column to change the color or selecting a new line type and width from the dropdown lists when clicking in the "Line Type" or "Line Width" column.

Items can also be moved from one layer into another. The main reason for doing this would be to turn off some items but have other items remain visible. All visible items are printable. See Changing Layers, Section 2.4.4.3 to see how to do this.

2.2.5.5 Placement Aids

The following placement aids are provided to simplify and speed up some tasks.

- Circular Cursor: *Settings|Drawing Items* – "Circular Cursor"
- Direct Entry: Keyboard
- Connecting Hydraulic Items: *Settings|Snap*
- Grid: *Settings|Grid / Origin*
- Snap to Grid: *Settings|Snap*

- Ortho Mode: *Settings|Drawing Items* – "Ortho"
- Snaps: *Right-click|Snaps*
- Running Snaps: *Settings|Snap*

Circular Cursor Aid

The circular cursor is a tool that can be used to position items a particular distance from an existing item. A radius is specified, at the required distance, and the cursor is used as a visual locator to place the next item.

This tool can be used for all geometric and hydraulic tools.

An example of the use of this tool would be drawing in a block of tapes a set distance from the fence line.

Sizing and Placing Objects Accurately Using Direct Entry

Distances, angles and co-ordinates can be entered directly by using the keyboard. As the characters are typed they are displayed on the left-hand side of the status bar. Pressing the <Enter> key executes the command.

A single number is always a distance; angles require a distance, and co-ordinates are two numbers divided by a comma. E.g.:

Distance	34	<Enter>
Distance & angle	34,<90	<Enter>
Co-ordinates	0,0	<Enter>

This feature can be used for all geometric objects.

To specify a length of a line, radius, side of a rectangle, etc., select the tool and place the first click, using the mouse, on the screen (drawing objects only). Type the length, e.g., **98**ft (**30**m), and press the <Enter> key. Note prior to pressing the <Enter> key the value typed appears in the left-hand corner of the status bar.

To specify the angle of a line, radius, side of a rectangle, etc. the length must be specified. Type in the length, then < and then the angle (e.g., **50,<90** for a line the length of 50ft (m) long at an angle of 90º from the starting point).

To use co-ordinates to place the start and end points of a line, radius, side of a rectangle, etc. , type in the required X and Y co-ordinates for the starting point (e.g., **0,0**) and press the <Enter> key. Once again, note the values typed will appear in the left-hand corner of the status bar. Now type the X and Y co-ordinates of the end point, (e.g., **50,30**) and press the <Enter> key.

<u>Note:</u> *<Num. Lock> may need to be turned off on the keyboard in order to use the decimal point for metric measurements in the direct distance entry.*

Connecting Hydraulic Items

During the management, design, analysis, and fittings selection processes IRRICAD needs to “know” how hydraulic items in the system are connected to each other and subsequently back to control valves or Water supplies. This list of connections is referred to as the “Connectivity” and gives rise to a number of rules and mechanisms that help ensure the correct arrangement of a system.

Pipes, spraylines, and tapes must always directly connect to a point hydraulic item and not another pipe, sprayline or tape. In the cases where a water supply, control valve, outlet or miscellaneous hydraulic item is not present the connection is denoted by a “Junction”, which is typically displayed as a black square symbol. For example, when a pipe line changes direction a junction will exist between the two pipes. Free ends of pipes, spraylines, and tapes are also required to connect to a junction or a point hydraulic item. Junctions are normally inserted automatically by the IRRICAD tools and simply serve as internal nodes for the design process, placeholders for fittings selection, and a location to display information.

Some consequences of this system are:-

- Junctions cannot be deleted individually unless unattached. They will be removed automatically when all connected items are removed.

- Junctions will be removed when point hydraulic objects are connected to them.

- When a point hydraulic item is deleted from a pipe, sprayline, or tape it will be replaced by a junction.

Hydraulic items can only connect to items of the same class (Zone or Mainline). The exception is Control Valves which may connect to both Zone and Mainline pipes.

To assist the user and ensure the correct connectivity the hydraulic entity creation tools, by default, employ a visually based “connect mode” (snap). This method uses a user-defined (in *Settings|Snap*) screen distance to determine how connections are made to items near the point clicked. If the screen distance (i.e. in screen millimeters or inches) between the point clicked, and the nearest hydraulic item, is less than the setting a connection will be made. Additionally clicking on a pipe, sprayline or tape, within the setting distance from the end of the item, will result in the connection being made at the end exactly.

Using this method helps to avoid unwanted small pieces of pipe being created beyond connections and situations where pipes are not quite connected to items that they were intended to be. Note that zooming in before clicking will allow closer (in real terms) connections to be made.

Grid

A grid can be set up to be any spacing desired along the X and Y-axis. Enter a value for the spacing along the “X”-axis (horizontal) and the “Y”-axis (vertical). Enable the “Display Grid Points” if you wish to see the grid points on the screen. If you have an existing item on the screen and you wish grid points to be positioned on this item (or corner of the item) enter the co-ordinates of the item (or corner) into the X and Y fields for “Grid Origin”.

Snap to Grid

Once a grid has been established you have the option to use *Settings|Snap* - “Snap to Grid”. Once “Snap to Grid” is enabled, the cursor is restricted to only moving between grid points.

This is a very useful tool for drawing straight pipelines, positioning sprinklers at a specific spacing (without using the *Sprayline* tool) and for positioning and drawing geometric objects.

Ortho Mode

Often the work in IRRICAD consists of drawing or editing along horizontal and vertical axes. This can be achieved by manually entering coordinates, but it's much quicker to work in “Ortho” mode (see *Settings|Drawing Items* Section 5.10.5.6). “Ortho” settings can be used to constrain point placement so that each point placed is in perfect horizontal or vertical alignment with the previous point. If only a few points are going to be entered orthogonally, hold down the <Ctrl> key while entering the points (if already in “Ortho” mode, using the <Ctrl> key temporarily turns off “Ortho” mode).

Although the default orientation of the orthogonal axes is 0º / 90º, these axes can be rotated to any angle required. This allows you to draw or edit by placing points that are in 90-degree alignment to one another but not on the horizontal and vertical axes. To change the angle of the orthogonal axes, use the "Ortho Angle" setting.

"Ortho Mode" works for both geometric and hydraulic items.

Holding the <Ctrl> key down when in "Ortho Mode" will disengage "Ortho Mode". Holding the <Ctrl> key down when not in "Ortho Mode" will engage "Ortho Mode" using the angle set in the "Ortho Angle" dialog field.

See also:

Draw *Section 5.6*

Accurately Placing Items (Using Snaps)

Perhaps the most important feature of a CAD program is the ability to place or constrain points in relationship to other elements in the drawing. IRRICAD offers a complete set of referencing options called snaps. When a snap option is used while locating a point, the point snaps into position.

Snaps are tools that allow connecting to existing objects on the screen. By right-clicking the mouse after having selected a drawing tool the following snaps are accessed:

- Midpoint
- Endpoint
- Perpendicular
- Percent
- Object
- Intersection
- Tangent
- Closest
- Center
- Quadrant
- Parallel

The ones most likely to be used on a regular basis are *Midpoint*, *Endpoint* and *Perpendicular*. By using the *Endpoint* snap, lines and geometric objects will connect to the endpoint of an existing object. This means that the drawing will be tidy. If trying to connect to the end point of an object by eye, then zoom into this connection it is obvious that the two objects are quite distant. If the *Right-click|Snaps|Endpoint* is used, the two objects are connected. *Right-click|Snaps|Midpoint* allows connecting to the middle of an object. *Right-click|Snaps|Perpendicular* allows connecting to an object at 90º.

For all the snaps, the click must be within a tolerance distance to the object required to snap to.

When one of the snap tools has been invoked, it will only affect the next click placed on the screen. If using the same snap for the subsequent click, it must be selected again, or Running Snaps enabled (*Settings|Snap* – [Running Snaps] Section 5.10.16.2).

When drawing hydraulic items on the screen (including Contours and Spot Heights), the *Right-click|Snap|Place* tool is the same as setting the default snap mode to "Place" (rather than "Connect") but is only active for the next mouse click. Very useful if placing hydraulic items close the existing hydraulic items and not wishing them to connect. Note if *Place* is selected, hydraulic objects will not be connected together. If a hydraulic object is not connected, a warning message will be given during *Design*.

Snaps selected from the *Right-click* menu are one-action only. Enabling *Settings|Snap* - [Running Snaps] (Section 5.10.16.2 will allow selected Snaps to be on indefinitely.

For further information about each of the above snaps, see Snaps, Section 5.1.3.

Running Snaps

Snap tools that are used frequently can be set as running snaps so that they don't have to be selected repeatedly. Running snaps remain activated until turned off in the Running Snaps dialog. If the "Show Preview" option is selected, then when the cursor moves within range of a point for which a running snap is set, an icon for that snap is displayed beside the cursor. Running snaps is available for drawing and hydraulic items. Go to *Settings|Snap* and click the [Running Snaps] button. You can select any or all to be on. Remember to check the "RN Snaps On" check box.

The Snap tools work in much the same way as Connect does. IRRICAD uses a tolerance range. If an item is within this range then IRRICAD assumes you wish to snap / connect to this item. The tolerance range is determined by zoom factor, distance on the screen and world distance.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*

2.2.5.6 How to Find Lengths and Distances

On the Status bar right click on the Info Panel (see Section 5.5.13.1) and select **Length**. If an item was already highlighted, the length will be displayed. Any extra items highlighted will show the cumulative length of all selected items.

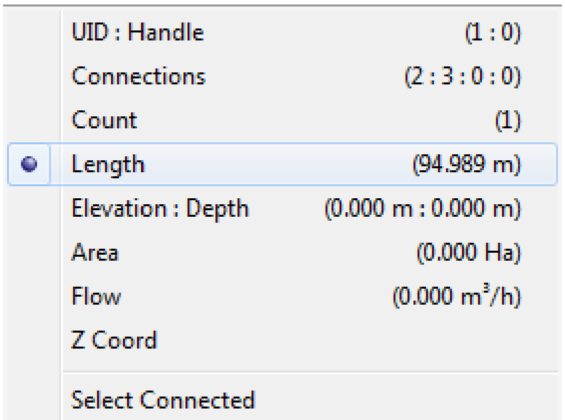


Figure 2-1

Use <F9> to measure the length of an object or the distance between two objects. Hold the cursor over the point to start from and press the <F9> key. Move the cursor to the point to finish at and read the status bar. The distance and angle the cursor has moved since pressing <F9> is displayed.

2.2.5.7 Speeding Up Copy Tools

When preparing a design it is sometimes necessary to replicate existing items on a plan. Copy tools allow this to be accomplished and depending on the tool used, can align and space items as required.

All *Copy* tools have a 'no dialog' shortcut, which repeats the last copy without showing the dialog each time.

For example to speed up *Offset* copy:

1. Draw an arc (for example).
2. Select *Offset* copy, click the arc and enter a fixed offset distance.
3. Copy the arc to the inside.
4. Offset copy is still selected so, HOLD SHIFT and click the new arc.
5. Copy the new arc at the same offset, to the inside.
6. HOLDING SHIFT, keep clicking the new arcs to repeat the copy as many times as required.

Tip: *Be sure to select the* Copy *tool before clicking on the object. If the object is selected before the* Copy *tool is invoked, the tool will only be active for one action.*

2.2.5.8 QUICK TIPS

Default Names

Holding the <Shift> key down when placing a zone valve, mainline outlet or mainline spraylines doesn't show the "Name" dialog but accepts the default name.

Saving To Previous Versions of IRRICAD

Designs can be saved in the format of all previous versions of IRRICAD (to Version 7). See *File|Export* – "Save as type".

Toolbars

Any toolbar docking area can be customized by right-clicking on any icon or toolbar. This is simply a short cut to the *View|Toolbars* option and allows immediate customization.

Symbol Colors

Multiple colored symbols can be used in the databases e.g., for Valves. If a symbol is specified with the "Use symbol color(s)" in the database editor then the symbol will be displayed in IRRICAD using the colors contained in the symbol definition.

2.3 THE DESIGN PROCESS

This chapter looks at the basic design process and the details of the design process.

2.3.1 THE BASIC DESIGN PROCESS

To begin using IRRICAD it is helpful to know the steps that are necessary to produce a design. Although there is no rigidly prescribed way of producing designs (this is a major strength of the program), the following procedure is recommended as a starting point. A basic outline of the design procedure is:

1. Enter design details.

2. Enter background information - place property boundaries, buildings and elevation data on the design.

3. Layout the Irrigation System - position water supplies, outlets, control valves and connect with pipes.

4. Zone Design - hydraulically design and / or analyze from the control valves to the zone outlets.

5. Management - the operating arrangement, specify which control valves run together or individually.

6. Mainline Design - hydraulically design and / or analyze the system from the water supply to the control valves.

7. Costing - select fittings and generate a Bill of Materials and Costs for clients.

8. Printing - print or plot plans and reports.

2.3.2 DETAILS OF THE DESIGN PROCESS

2.3.2.1 DESIGN DETAILS

Select *Settings|Design Headings* and enter the design details as required to specify the design – see Figure 2-2.

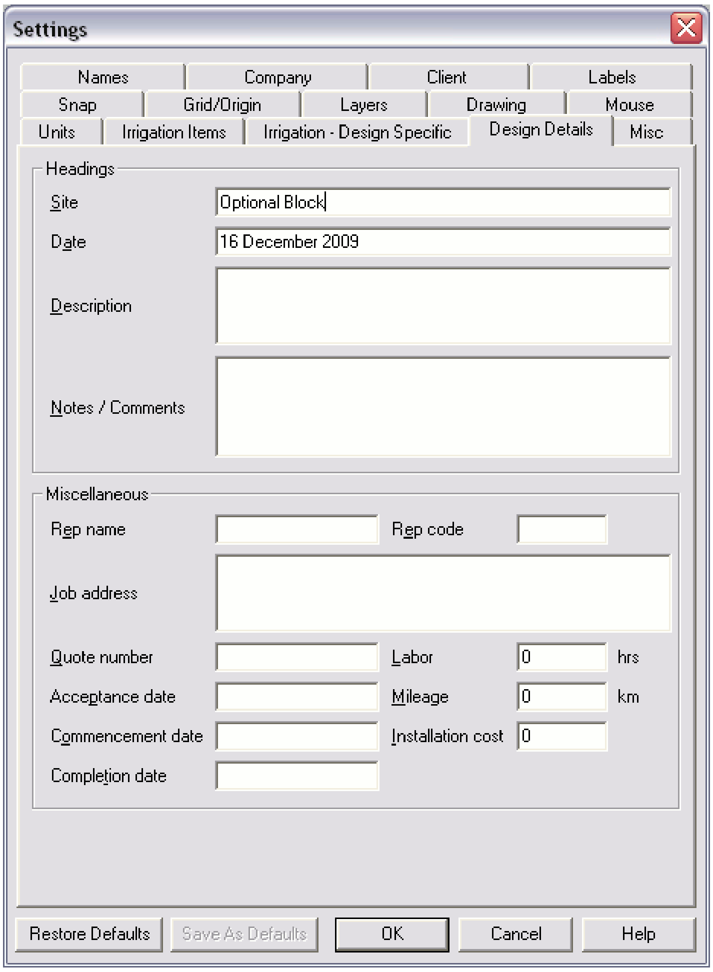


Figure 2-2 - Settings Dialog

2.3.2.2 BACKGROUND INFORMATION

Draw in any property boundaries, buildings present on the site, roads and other topographical features required by using the tools from the *Draw* menu. Use the mouse to draw objects or digitize them from a scaled plan (see Digitizing Plans, Section 4.8). There are many other drawing aids that can be used to assist with this process, for example, Snaps, Snap to Grid, Grid, Circular Cursor, etc.

Elevation data, if applicable, needs to be drawn on or imported into the design. An existing DXF, SHP, CSV or KML/KMZ file containing elevation data can be imported into IRRICAD as can background information in (see Importing a DXF, VCD, DWG, GCD, SHP, MIF, CSV or KML File, Section 2.4.1.1). Some drawing objects can also be converted to elevations at a later stage (see Convert to Elevations, Section 5.12.8). Figure 2-3 shows the contours from an imported DXF file.

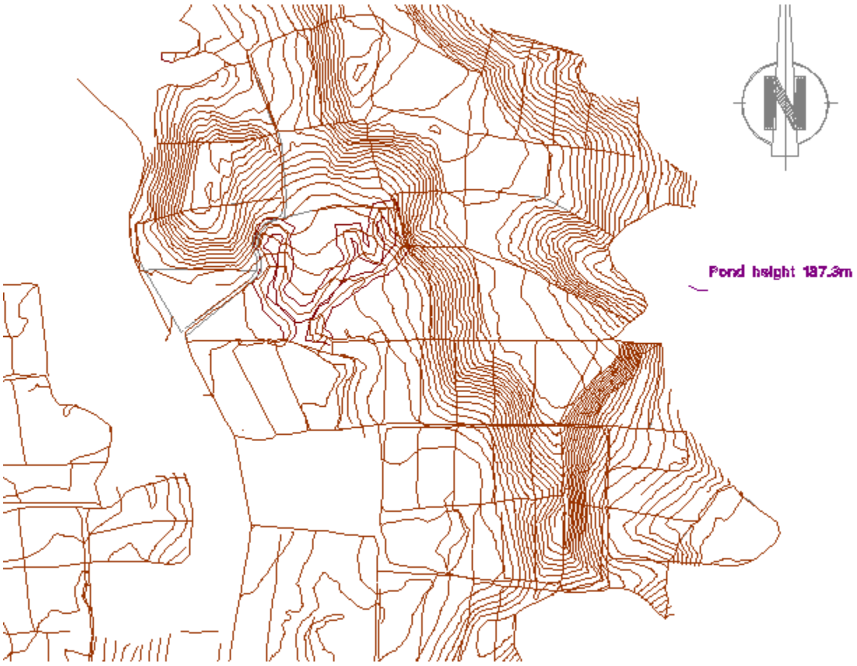


Figure 2-3 - Elevation Data

2.3.2.3 IRRIGATION SYSTEM LAYOUT

The irrigation system can be drawn in any order. However to follow the progression in the explanation below, we have started with the water supply end.

Place a water supply (*Mainline|Water Supply*). Enter any pressures or flows as provided by the water supply. Note that the flows are for your reference only as the outlet demand determines the design flow for any system flow). Select *Mainline|Pipe* and connect it to the water supply. For IRRICAD to size pipes for the system, leave the pipe type as **Computer Selected**. For manual sizing, select specific pipes from the dropdown list and then IRRICAD will analyze the system and report back on system performance. A combination of computer sized and manually entered pipes can be used. Pipe sizes can also be selected with the "Computer Sized" check box enabled so that if the analysis shows a problem then pipe sizes can be computer sized automatically.

Pipe ends will be automatically connected to other hydraulic items, providing that they are within the set snap distance and the default snap mode is "Connect" rather than "Place" (see Default Snap Mode, Section 5.10.16.1).

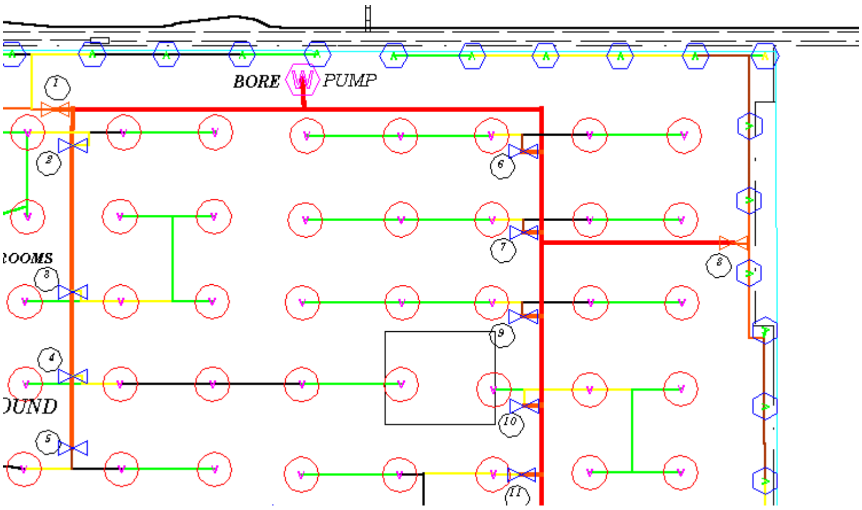


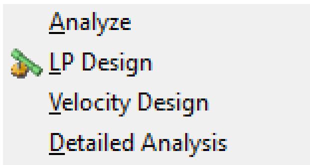
Figure 2-4 - Irrigation System

A control valve is always used to separate a zone from the mainline. Select *Zone|Control Valve* and connect it to the mainline pipe where it will be connecting to a zone pipe. Outlets can be placed individually using *Zone|Outlet*. Connect outlets using *Zone|Pipe*. Add any additional components required (such as backflow preventors, pressure regulating valves, etc.) as Misc. Hydraulic items. See Using Misc. Hydraulic Items, Section 2.4.9. Figure 2-4 shows an irrigation system layout.

Pipes and outlets can be treated as a single object using *Zone|Sprayline* or *Zone|Tape*. Multiple spraylines or tapes can be laid out using *Zone|Spray Block* or *Zone|Tape Block*. Blocks can be laid out with automatic placement of submains, valves, flushing manifolds and flushing valve assemblies by using the Block Entities of *Zone|Spray Irrigation Block* and *Zone|Tape Irrigation Block*.

2.3.2.4 Zone Design

First the zones must be designed. There are four design options available in the *Design|Zone Design command*:-



These options are split into two groups – sizing and designing the pipes or analyzing existing pipe sizes.

Zone Pipe Sizing Options:-

For **Computer Selected** or "Computer Sized" pipes in the design run *Design|Zone Design|LP Design*. If a system contains loops (closed systems), use the *Design|Zone Design|Velocity Design* option.

Zone Analysis Options:-

If you have selected your own pipe sizes, or made any manual changes, run *Design|Zone Design|Analyze*. Once you have initially sized or analysed the system set the valve pressures via *Design|Zone Design Configuration* and run *Zone Design|Detailed Analayis* to finalise the design and report the actual flows based on the actual pressures at each emitter.

Take note of any warning messages that may occur. Some messages are simply warnings to draw your attention, while others terminate the design process and the reported problem must be rectified before proceeding. Check the Error Messages, Section 6.13.3 to help pinpoint the reason for the warning messages.

After successfully running *Zone Design* access the Zone Design reports in *Reports|Zone Design Reports*. Note that any headloss through the valve is reported in the *Zone Design Summary* report and the *Zone Design Full* report.

2.3.2.5 MANAGEMENT

Management is the process of specifying how the system will operate – that is, which control valves will be running at any one time. Before designing or analyzing the mainline IRRICAD needs to know how many valves will be operating at any one time as this will affect the mainline pipe sizes or analysis of the flow in specified pipe sizes.

There are two ways to enter management data for the system:

- Graphically by selecting zones on the design to run at any one time
- By filling in a table

Specify the control valve operating arrangement (management) via the Management options in the *Design* menu – there are four options:-

- *Design|Assign Zones to System Flows* – used to graphically assign the zones that will be operating at the same time.
- *Design|Assign All Zones to One System Flow* – used to populate the management table with all valves on at the same time and thereby giving one system flow.
- *Design|Assign Each Zone to a Unique System Flow* – used to populate the management table with each valve running separately and thereby giving as many system flows as control valves.
- *Design|Other Management Options|Assign System Flows to Zones* – used to manually assign system flows to zones in a tabular format.

The *Assign Zones to System Flows* option enables you to easily and graphically click on the zones that are to run on a given system flow. It works by displaying symbols of all zones and water supplies (when there is more than one) on screen, these symbols can then be selected individually, or in groups, and assigned to a particular system flow. See Assign Zones to System Flows, Section 5.13.9.

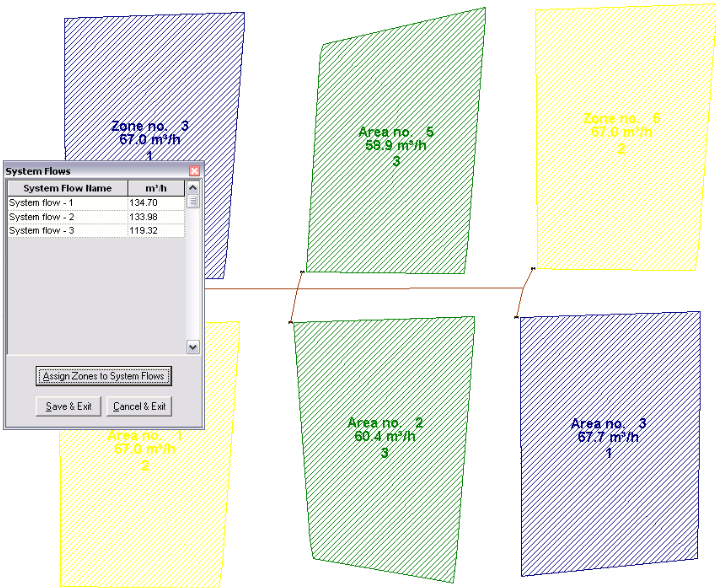


Figure 2-5 - Graphical Management

The *Assign All Zones to One System Flow* and *Assign Each Zone to a Unique System Flow* options are an automated function to fill in the Management table for you. See Assign All Zones to One System Flow, Section 5.13.10 and Assign Each Zone to a Unique System Flow

Management reports can be viewed in the *Reports|Management Reports* menu.

The *Design|Other Management Options|Zone Operating Times* option requires entering operating times for each individual zone in the system. This is best used for small irrigation systems where actual start and stop times for valves are important and need to be reported. Based on the operating times entered, IRRICAD will calculate the resulting flows in the mainline. This option cannot be used for multiple water supplies. See Figure 2-6. See Zone Operating Times Section 5.13.13.2.

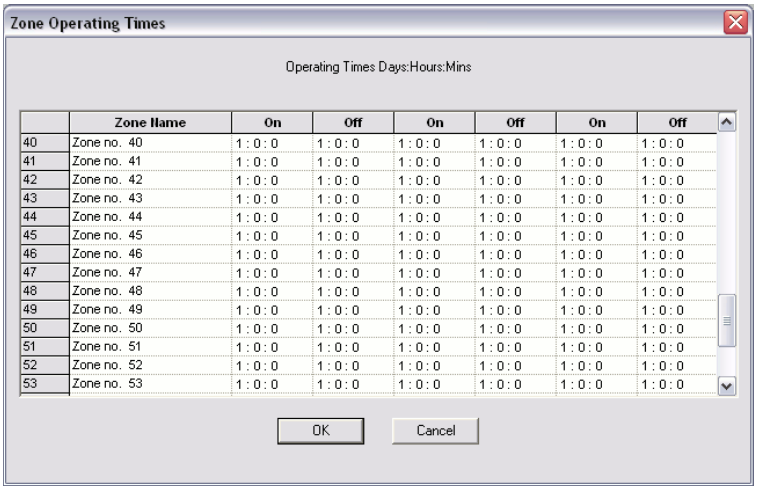


Figure 2-6 - Zone Operating Times

The *Design|Other Management Options|Assign System Flows to Zones* option allows you to choose the number of system flows and their operating times and then to select which of the system flows each zone will operate on. See Figure 2-7. Opening this table will not change any previously set management. See Assign System Flows to Zones Section 5.13.13.3.

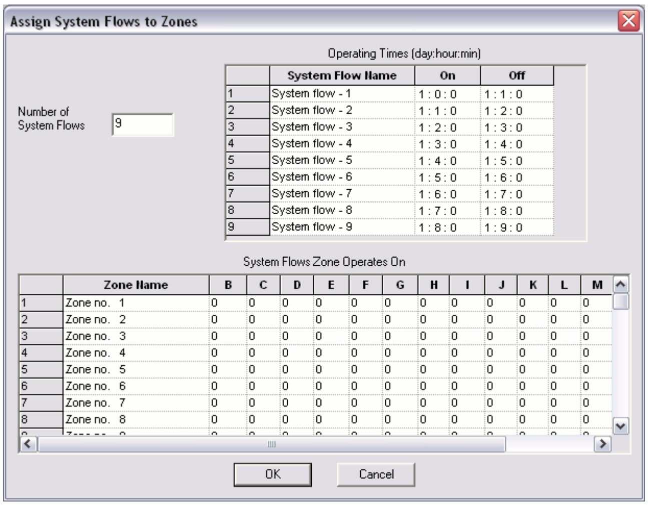


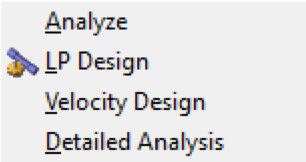
Figure 2-7 - Assign System Flows To Zones

Check all outlets are connected to a valve and all valves are connected to a water supply (*Design|Check Outlet Connectivity*).

2.3.2.6 Mainline Design

The mainline can now be designed or analyzed.

There are four design options available in the *Design|Mainline Design*:-



These options are split into two groups – sizing and designing the pipes or analyzing existing pipe sizes.

Mainline Pipe Sizing Options:-

For **Computer Selected** or "Computer Sized" pipes in the design run *Design|Mainline Design|LP Design* unless the design is a looped system or has more than one water supply. In this case use the *Design|Mainline Design|Mainline Velocity Design* option.

Mainline Analysis Options:-

If pipe sizes have been allocated run the *Design|Mainline Design|Analyze* option. Once you have initially sized or analyzed the system if the system contains mainline outlets set the water pressures on the water supply symbol and run the *Design|Mainline Design|Detailed Analayis* option. This will finalise the design and report the actual flows based on the actual pressures at each mainline emitter.

After successfully running Mainline Design access the reports in the *Reports|Mainline Design Reports* menu.

2.3.2.7 Fitting Selection and System Costing

After successfully designing the system IRRICAD can automatically select fittings for the design by selecting *Design|Computer Selection of Fittings*. IRRICAD will look at each pipe or component junction in the design and select suitable fittings from the database.

The Bill of Materials (BOM) or Costing reports, accessed via the *Reports|Costing/BOM Reports* menu, can be viewed to determine if IRRICAD was able to successfully select all the fittings required. If any problems are found, these can be corrected by adjusting the database and re-running *Computer Selection of Fittings* or manually by double-clicking on the junction or hydraulic point object and clicking the [Show Fittings] button to access the Add, Replace or Delete options.

2.3.2.8 PRINTING AND PLOTTING

To print a report first display the report in a viewer window. Click the print icon, or select *File|Print* in this window.

Predefined plotting layouts can be placed on the plan by selecting *Draw|Plot Layout*. These layouts can be moved or altered. Then the final plan can be printed by selecting *File|Print*.

See also:

Enhancing the Presentation of Plans	*Section 2.7*
Producing Reports	*Section 2.8.1*
How to Print a Plan	*Section 2.8.2*

2.4 ENTERING INFORMATION INTO IRRICAD

This chapter looks at entering a scale plan, entering hydraulic items, changing items on the screen, allowing for elevation changes and using the different types of hydraulic objects in the design.

2.4.1 ENTERING A SCALE PLAN

There are four ways to enter information from a scale plan into IRRICAD:

- By importing a DXF, VCD, DWG, GCD, SHP, MIF, CSV or KML/KMZ file.
- By importing an image file.
- By using the mouse or keyboard.
- By using a digitizer.

2.4.1.1 IMPORTING A DXF, VCD, DWG, GCD, SHP, MIF, CSV OR KML FILE

Plans that have been created in other CAD packages can be exported as a file type that IRRICAD can read (up to Autocad 2013). IRRICAD is able to import DXF, VCD, DWG, GCD, SHP, MIF, CSV, and KML/KMZ files. Note that to import contours complete with height data a DXF file, SHP file, or CSV, TXT, XYZ file that contains Z values (vertex - not attributes) will be required. The contour layers will need to be specified. (See Import Contours, Section 5.3.6. Use *File|Import Contours* and select the name(s) of the contour layer(s). If a file is imported without elevations, the Change tool can be used on contours with incorrect height data or the *Convert to Elevations* tool can be used on points, lines, polylines and curves (see Section 5.12.8).

If a file has been acquired in archived form (.zip file), the file will need to be unzipped before IRRICAD can import it. Files can be extracted from archives using a utility program (e.g., WinZip, PkZip or 7zip). Windows XP and higher have inbuilt access to zip archives.

In many cases a DXF or DWG file will be supplied without knowing the units used when the file was exported (note this does not apply to VCD or GCD files). *Settings|Units* has a field labeled "Importing". Select the units in which the file was exported as (e.g., m or ft). If this selection is incorrect, the scale of the imported items will also be incorrect.

To check the scale, find an object in the design of known length in world units (e.g., ft, m). Place the cursor at one end of the object. Press the <F9> key to zero the distance on the status bar. Move the cursor to the other end of the object and look at the 'd =' value on the status bar. If the length of the line is incorrect, start a new design and change the importing units accordingly. If the file was originally imported in **m**, and the length of the object is 3.28 times too long, select **ft**. Start a new design and select *File|Import* or *File|Import Contours* to re-import the file.

Fonts have been mapped so that most fonts can be displayed in a like font or mapped to something sensible when a DWG file is imported.

Notes on Internal Offset/Scale

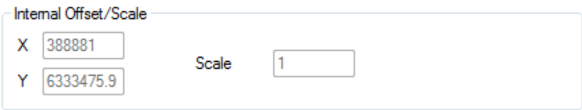


Figure 5-8

When very large coordinates exist in an imported plan IRRICAD attemps to set an internal origin (viewed in the "Internal Offset" in *Settings|Grid/Origin/GIS*) to reduce the magnitude of internal coordinates. This ensures that the seed tools operate correctly, items are selected accurately and accurate flows are reported for all tapes.

Addtionally the internal resolution may be set ("Scale" in *Settings|Grid/Origin/GIS*) depending on the range of coordinates spanned by the items on the plan. If the range is large the scale will be set to 20. Note that running *Compress* will recalculate the required scale.

When importing files via *File|Import* or *File|Import Contours* the below message will appear if the span of coordinates is too large to be accommodated by altering the scale:-

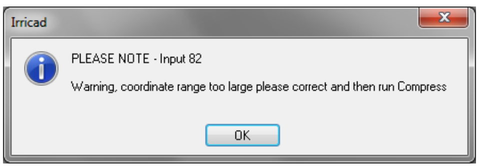


Figure 5-9

In this case:-

1. Turn on all imported layers.
2. Zoom into the plan and using *Modify|Select|Window* draw a window around the plan.
3. Use *Modify|Invert Selection* to de-select the plan and select the far-off items.
4. Press the [Delete] key or use *Modify|Delete*.
5. Run *File|Compress*.

Notes on Importing SHP Files

ESRI SHP files can now be imported directly into IRRICAD. This facility works for both normal *Import* and *Import Contours*.

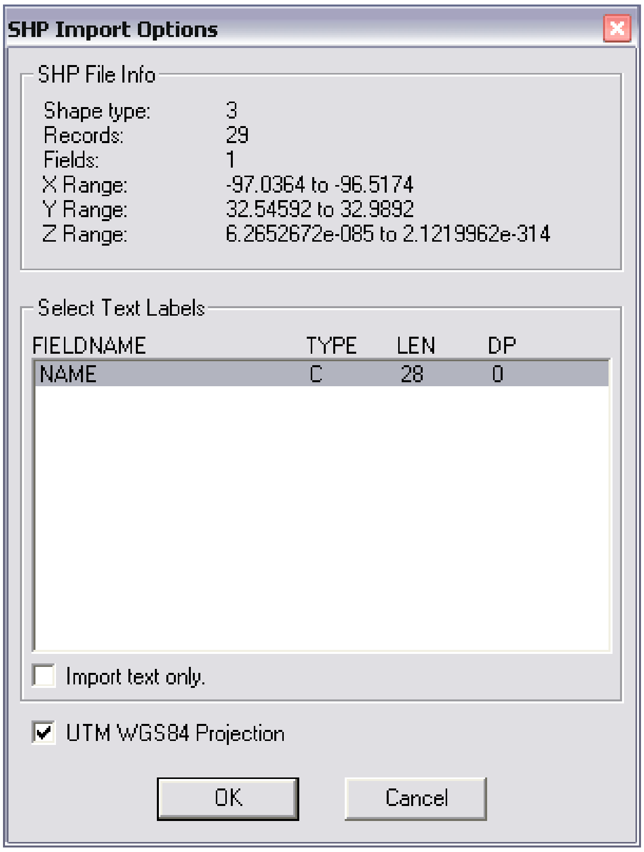


Figure 2-10

Text labels are created from the SHP file fields selected in the import dialog list box. If more than one field is selected, the text is 'stacked' in the label. If the "Import text only" box is checked, only the selected fields will be imported as text (use this feature if multiple fields are required as separate labels).

When importing contour / elevation information from an SHP file, you must select the field which contains the elevation data from the import dialog list box (see example below).

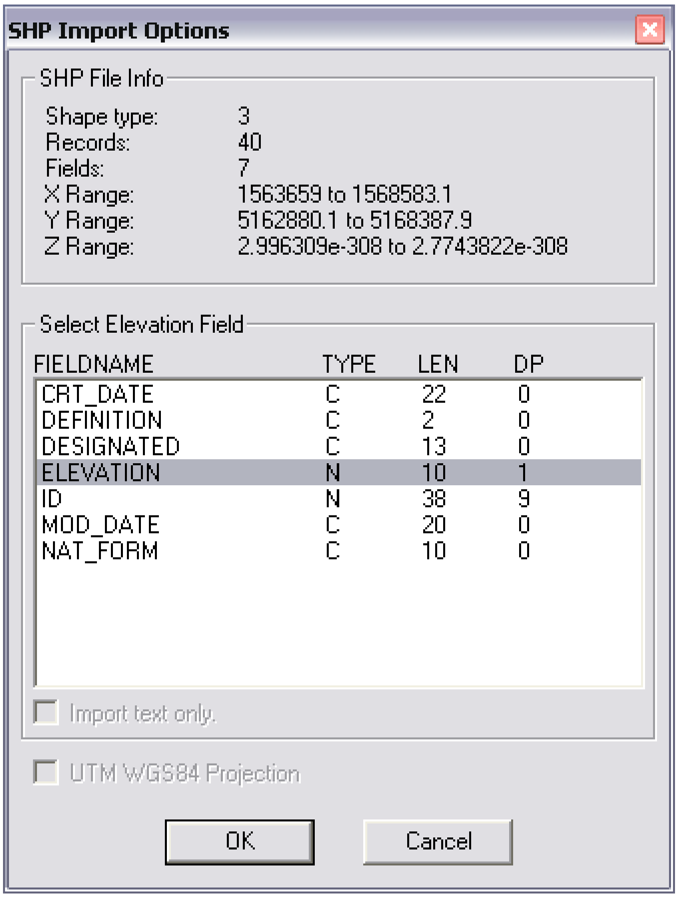


Figure 2-11

In both SHP importation modes, projected data (latitudes and longitudes) is accepted if the "UTM WGS84 Projection" has been used.

SHP File Layer Attribute Naming

ESRI Shape files typically contain information which specifies the layer an object is contained in. In order for IRRICAD to assign objects to the correct layer the 'attribute', or field name, containing this information must be specified. Typically the attribute containing the layers is “Layer”, however in the event this is not the case you can specify the fieldname containing the layers as shown below.

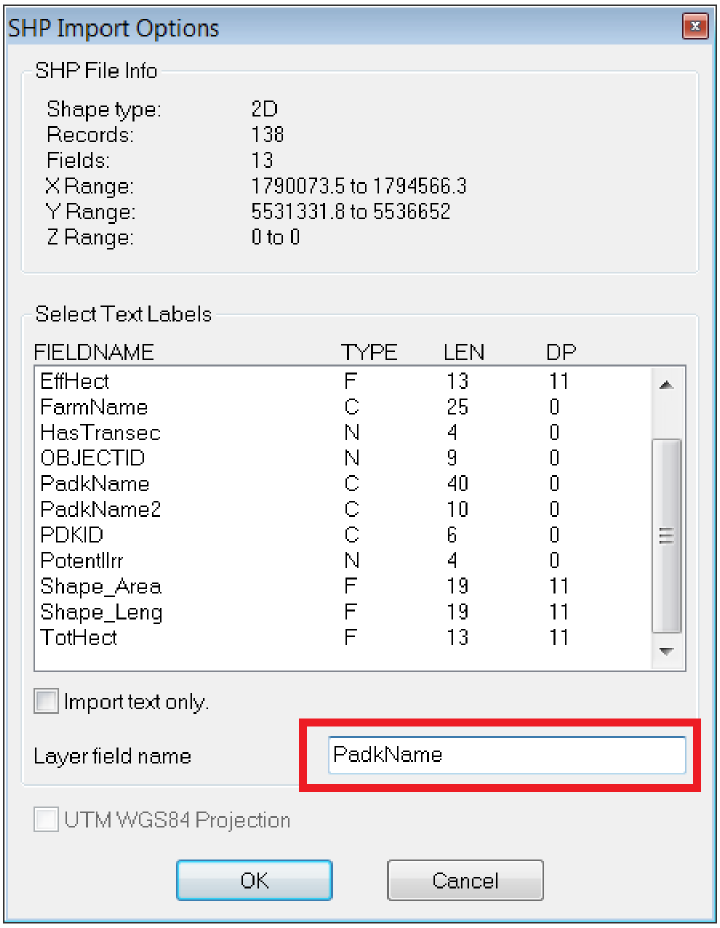


Figure 2-12

NOTES ON IMPORTING CSV FILES

Drawing and Contour data from CSV files can be imported into IRRICAD.

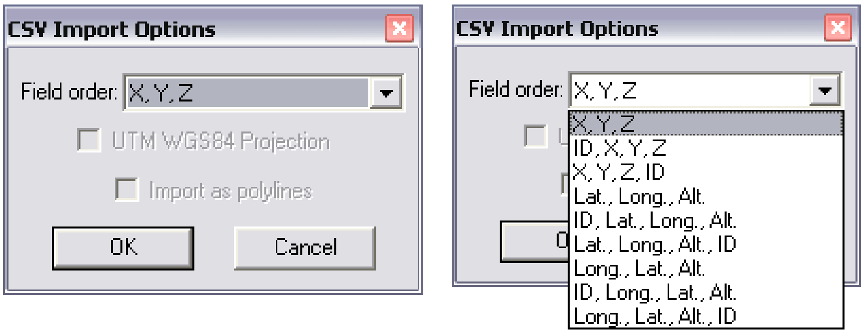


Figure 2-13

The data columns in the file must be arranged in one of the supported orders (see above). An ID column allows CSV data to be interpreted as polylines (all points with the same ID form part of the same polyline). You may uncheck "Import as polylines" to import polyline data as individual points.

Again, latitudes and longitudes are supported using the "UTM WGS84 Projection" only.

To import elevation data as contours an ID column ***must*** be included. The correct option is solely determined by the field order in each individual file. If receiving files from the same surveyor, once the correct field order is found, it should not change.

See also:

Import — *Section 5.3.5*
Import Contours — *Section 5.3.6*

2.4.1.2 GIS OPTIONS

In order to perform geo-referencing and geo-locating functions IRRICAD must be able to translate between geographical (latitudes / longitudes) and planar (X, Y) coordinates. There are many ways to represent both types of coordinates and IRRICAD uses two of the most common. When representing geographic coordinates internally IRRICAD uses the

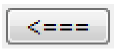
Universal **T**ransverse **M**ercator (UTM) system. When interpreting latitudes and longitudes, IRRICAD assumes that they use the **W**orld **G**eodetic **S**ystem (1984) (WGS84) reference frame.

UTM divides the northern and southern hemispheres of the Earth into 60 zones and uses a two-dimensional Cartesian coordinate system within each zone. This means that a UTM coordinate pair is NOT a unique position on the globe, unlike a latitude and longitude. To fully specify a UTM position on the globe, one must know to which UTM zone it refers.

Conversion Utility - Why you would convert from WGS84 coordinates to UTM:-

This option located in *Settings|Grid/Origin/GIS* is useful if adding a small amount of information in to the IRRICAD design. For example a feature was not previously located on the GPS survey and now you wish to add it.

From the hand-help GPS unit enter the latitude and longitude in decimal degrees under WGS84. Click the bottom arrow:



IRRICAD converts the latitudes and longitudes to a coordinate position on the plan. Using *Go To Coords* you can now place the feature at the correct location.

Note: *Larger amounts of data can be converted from WGS84 to UTM by using the existing* Import *option to import data from a text file (e.g., CSV).*

2.4.1.3 IMPORTING ELEVATION DATA

To import contours and/or spot heights complete with elevation data a DXF, SHP, CSV/TXT/XYZ, or KML/KMZ file that contains Z values (vertex - not attribute) will be required. The elevation layers will need to be specified. (See Import Contours, Section 5.3.6. Use *File|Import Contours* and select the name(s) of the elevation layer(s).

If a file is imported without elevations (they are set to 0) the Change tool can be used to correct the height data or the *Tools|Convert to Elevations*) command can be used to create elevations from points, lines, polylines and curves (see Section 5.12.8).

Contours and Spot Heights can be labeled via *Settings|Labels* tab and the *Tools|Create Labels* command.

2.4.1.4 Calculating Contours From Spot Heights

To create contours from spot heights use *Tools|Calculate Contours*.

Notes on Calculated Contours

Calculated contours (secondary elevations) are simply a visual representation of the underlying primary elevation data (for example imported spot heights and contours). If for some reason the spot heights have been removed (this is not recommended), and only the calculated contours remain, it is not possible to recalculate the DEM if design changes are required. In this situation in order to assign an elevation to newly added hydraulic items, or include additional elevation data, primary elevations are required.

To Change Calculated Contours in to Primary Elevations:-

1. Draw a contour on the plan using *Draw|Contour*.
2. Select (highlight) all contours.
3. Select *Modify|Change Type* and click on the contour just drawn. Click [OK].
4. In the Change/Match dialog uncheck all items in the "Match" column and enable "Change" **Primary / Secondary Elevation**. Click [OK].

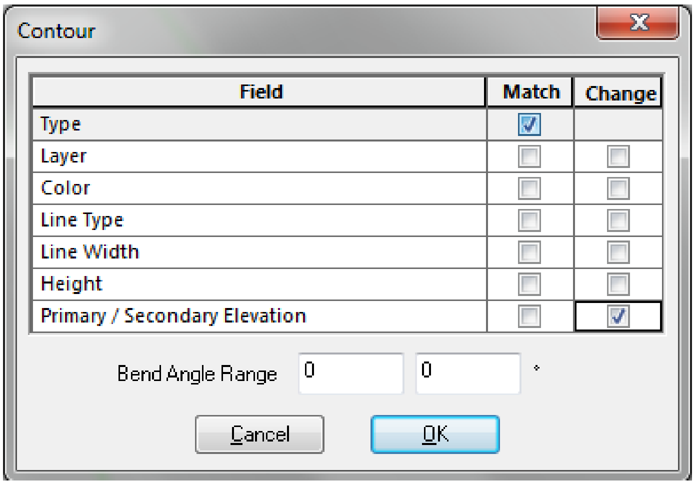


Figure 2-14

2.4.1.5 IMPORTING FROM GOOGLE EARTH

Images and elevation data may be imported directly from Google Earth by selecting *Import from Google Earth* from the *File* menu (see Section 5.3.8). The image and elevation data will be automatically geo-located in the IRRICAD design.

System requirements for the Google Earth feature are:-

- Microsoft .NET framework Version 4.5 installed (if this is already installed it will be visible in Control Panel - Programs and Features).

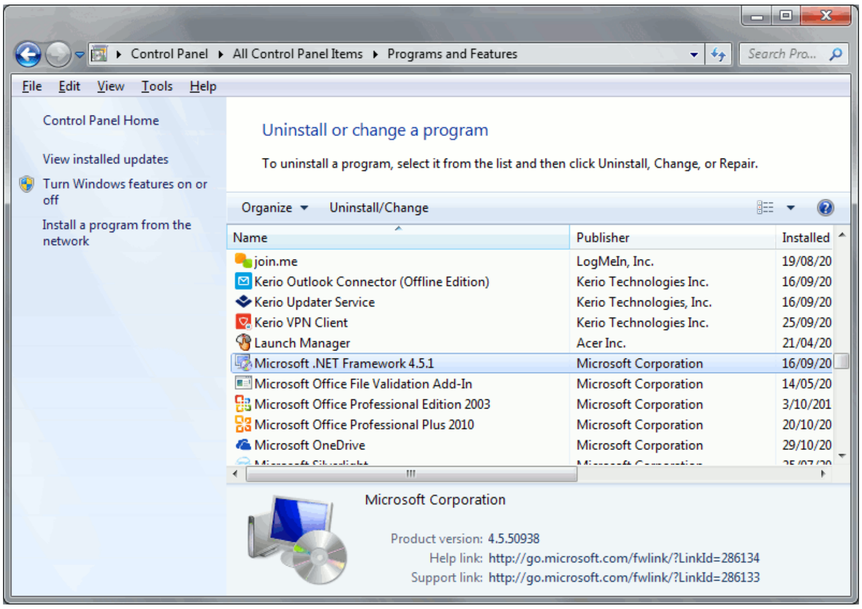


Figure 2-15

To update .NET go to http://go.microsoft.com/fwlink/?LinkID=324519

Notes:

By default the resulting image will appear to be slightly rotated. This is because a rectangle defined by latitude and longitude is not rectangular in UTM and therefore for accuracy it needs to be rectified. This is especially necessary if data placed in relation to the image in IRRICAD is then exported back to Google Earth. There is an option in the utility to turn off the rectification, but it has little to recommend it other than 'looking nicer'.

Each spot height is determined at a latitude/longitude point, and is subsequently converted to UTM. As such, they are all spatially independent and don't require rectification. Note that they come from an interpolation in the Google Earth Plugin, known to be of low accuracy, and elevations generated from these will be subject to further interpolation/smoothing by IRRICAD, so they should not be used as the basis of any rigorous solutions.

Always double-check dimensions using known world lengths of existing objects, for example, fence lines. Satellite imagery may overlap photos and cause quoting or installation inaccuracies.

2.4.1.6 Importing an Image

Aerial photographs of an area can be scanned and saved in one of several image file formats (BMP, JPG, GIF, TIF, WMF, PCX or PNG - for an explanation of the merits and features of the various image formats see the Export Images – Image Types, Section 5.3.11.1). Images may also be acquired from online mapping sources, such as Google Earth. These images can be imported directly in to IRRICAD via *File|Import from Google Earth.* See Section 5.3.8.

There are three check boxes along the bottom of the dialog whose functions are described below:

Image Path

If this box is enabled then the current folder is retained and the next time *Import Image* is selected the folder will default to this location.

Use Relative Path

When an Image is imported into IRRICAD a link to the image file is inserted into the design rather than embedding the entire image. When "Use Relative Path" is checked the link (i.e., folder path) will be relative to the location of the IRRICAD design. This feature is very useful if the design is shifted to another computer, drive or folder. As long as the image file is located in the same place relative to the design then the link will be intact and the image will be displayed. Note "Use Relative Path" cannot be used for an 'Untitled' design, if it is, a warning message will be displayed.

Embed

Images may be embedded in the design. This means that if the design is sent to another computer, the separate image does not have to be sent with it – the image is saved in the design itself.

Lock Ratio

If this item is checked, the bitmap rectangle will be constrained to the aspect ratio (height/width) of the original image during placement. If unchecked then the image can be drawn so that it may be distorted compared to the original.

Once the Image file has been selected (by clicking the [Open] button) the image can be placed on the screen using the mouse or keyboard entry. The lower-left corner is located first (with a left mouse click or keyboard coordinates), a rectangle is then drawn out (when using the mouse the left button should NOT be depressed during this stage) and then the upper-right corner is placed (note, if the corners are not specified in lower-left – upper-right order, the image will be flipped horizontally and/or vertically).

Before importing, the world size of the photograph needs to be known e.g., the image is 1.5 x 2ft (m) and correlates to a world distance of 3500 x 6000ft (m). *Modify|Scale Image* can be used to resize the image after importing. Direct distance entry can also be used to specify the coordinates of the top left corner and bottom right corner of the image when importing (see Using the Mouse and Keyboard, Section 2.4.1.7).

2.4.1.7 Using the Mouse and Keyboard

The mouse can be used to draw lines or other drawing objects on the screen. The status bar will display the length of the line before the second click. The status bar value d = measures from each click used to place each point of a drawing and hydraulic tool. To measure a distance or length of an object already on the screen right-click on the Info Panel of the Status Bar (Section 5.5.13.1) and select **Length** and then select any existing item on the screen. Or place the cursor at one end of the object. Press the <F9> key to zero the distance on the status bar. Move the cursor to the other end of the object and look at the d = value on the status bar (note this method is less accurate as it relies on the placement of the cursor).

Direct Distance Entry

The keyboard can be used to specify lengths, coordinates and angles of drawing tools. To specify a length of a line, radius, side of a rectangle, etc., select the tool and place the first click, using the mouse, on the screen (drawing objects only). Type the length, e.g., **30** (ft, m) and press the <Enter> key. Note prior to pressing the <Enter> key the value type appears in the left-hand corner of the status bar.

To specify the angle of a line, radius, side of a rectangle, etc. a length must also be specified. Type in the length, then <, then the angle (e.g., **50,<90** for a line the length of 50ft (m) long at an angle of 90º from the starting point).

To use coordinates to place the start and end points of a line, radius, side of a rectangle, etc., type in the required X and Y coordinates for the starting point (e.g., **0,0**) and press the <Enter> key. Once again, note the values type will appear in the left-hand corner of the status bar. Now type the X and Y coordinates of the end point (e.g., **50,30**) and press the <Enter> key.

See also:

Draw *Section 5.6*

2.4.1.8 Summary

- If importing a file:
  - Select the "Importing" units for the file
  - Check the scale once the file is imported.
- If importing an image:
  - Coordinates can be used to specify the world size of the image
  - Scale the image after importing.
- If using the mouse or keyboard
  - Use lengths, coordinates and angles to enter data
  - Direct distance entry cannot be used for entering hydraulic items.
  - If *Scale* is to be used, ensure the whole plan fits within the tablet's active area and the scale is known.

2.4.2 ENTERING HYDRAULIC ITEMS

Hydraulic items are those which have hydraulic or irrigation significance in the design. These items are required for any design and analysis to take place.

Hydraulic items in IRRICAD are divided into two types - those upstream of a control valve, named Mainline items, and those downstream of a control valve, named Zone items.

Select the database to use for the design in *Settings|Irrigation - Design Specific*. Click the [Browse] button if you wish to change the currently selected database. If you wish to have a database for a specific manufacturer, please visit our website www.IRRICAD.com. Databases are downloadable and can be merged with existing databases if required. (See Merge (Databases), Section 3.3.5).

Hydraulic items can be either connected to existing items, or placed near existing items without connecting. Zone and mainline items can only be connected via a control valve. Select "Connect" or "Place" in *Settings|Snap*. If are in "Connect" mode, but would like to place one or two objects without them connecting to existing items, select *Right-click|Snaps|Place* for a single action only or right-click on the Snap Panel on the Status Bar (see Section 5.5.13.2) and select **Place** (see Figure 2-16). See Connecting and Placing Hydraulic Items, Section 2.4.2.2 for more information.

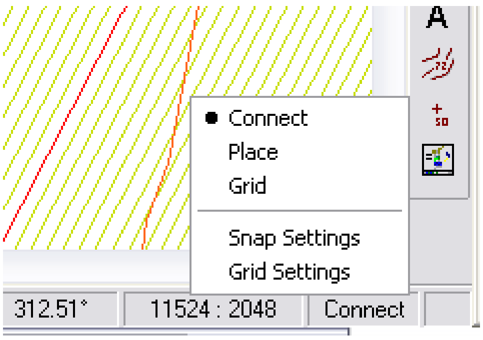


Figure 2-16 - Default Snap Settings

Any items not connected to a control valve will not be included in the design and analysis process. Note that if a control valve or mainline outlet is not connected to the water supply, *Mainline Design* will terminate.

Pipes require a junction at points where they connect to other pipes. However, where pipes connect to point objects such as valves, outlets and water supplies the junction symbol will disappear when connected. If a junction symbol is visible in this situation, the item is not connected to the pipe.

Electrical items, though having no hydraulic significance, can be placed in the design from the *Electrical* menu. Electrical items cannot be designed to a specification. IRRICAD will not size the wire. Any electrical items entered are for reporting (quantities required) and visual purposes only.

See also:

IRRICAD Database Editor Manual	*Section 3*
Pipes & Pipe Sizing	*Section 2.4.7*

2.4.2.1 ITEM SELECTION

In order to select a hydraulic item for use in a design, it must first have been entered into the component database using the Database Editor.

Select the required tool from the *Zone* or *Mainline* menu, e.g., *Outlet*, *Pipe*, etc. Select the component to use from the dropdown list. For items to be present in the list, they must first be entered in the database and enabled for use (have a usage code entered into the "Usage" field for the item). The items in the selection list are ordered according to the order specified for the type of item (see Default Database Order, Section 3.13.1).

When the tool is selected, a dialog box appears. Select the item you wish to use in the design. Pipes can be **Computer Selected** which allows IRRICAD to size pipes according to the system requirements. For other items, e.g., outlets, tapes and spraylines, a summary of the hydraulic data is present in the dialog to help select the correct item.

The characteristics of each hydraulic item are found in the database.

If an operating pressure is entered for an outlet which is outside the operating range of the item, a warning message will be given before closing the dialog. There are recommended and absolute limits in

IRRICAD. Exceeding a recommended limit will give a warning message, but this can be over-ridden by clicking the [Continue] or [Yes] button. Absolute limits cannot be broken and data exceeding these limits must be changed before the dialog may be closed.

Items can be placed at a depth to indicate they are installed below ground and will require fittings to account for the change in depth. See Entering Items at Different Levels, Section 2.4.2.3.

An orientation can be specified to rotate the symbol of the item as required. The orientation does not have any hydraulic significance and is visual only.

Highlighted items can be changed individually or globally (many like items at one time) if required, by using *Modify|Change* for an individual item or *Modify|Change Type* for more than one item. See Making Changes to the Design or Drawing, Section **2.4.4**.

See also:

IRRICAD Database Editor Manual	*Section 3*
Making Changes to the Design or Drawing	*Section **2.4.4***

2.4.2.2 Connecting and Placing Hydraulic Items

In order for a system to be designed and analyzed, hydraulic items must be connected in some way to a control valve (Zone) or water supply (Mainline). Items can either be connected to other hydraulic items, or placed on the screen. Note that even though it may be visually in the same position, an item *placed* on the screen is not considered to be physically *connected* to other hydraulic items. Such items will therefore not be included in any analysis process.

In *Settings|Snap*, the default snap mode options are:

- Connect
- Place
- Snap to Grid

There are two ways to check if all hydraulic items have been connected:

1. *Design|Check Outlet Connectivity* - Checks to make sure all outlets are connected to a control valve (if a control valve is present) and that all control valves are connected to a water supply (Mainline Outlets must be connected to a water supply).

2. *Modify|Move* - If *Modify|Move* is used on an object, the connecting rubberbands will be seen. A rubberband will appear to all items connected to the selected object as well as a rubberband to show the movement of the selected object. (Select *Right-click|Restart* to disengage *Move* or press the <Esc> key).

Junctions will be seen where pipes end and are joined together. However, if a junction is visible where an outlet, control valve, miscellaneous hydraulic item or water supply is connected to a pipe, then the item is NOT connected to the system. If the point item is correctly connected, the junction will be invisible.

Connect

To enable items to be connected to each other the cursor must be in "Connect" mode (*Settings|Snap*). When "Connect" has been selected all hydraulic items will be connected together, providing that the mouse click on the screen is within the "Tolerance" range. If the mouse click is outside this range then the item will be simply placed, as when in "Place" mode, as IRRICAD assumes that you do not wish to connect to an existing item.

The tolerance range is indicated by a "Snap Tolerance" in inches or mm (or the specified "Paper" units selected in *Settings|Units*) on the screen, and the "Min Tolerance" and "Max Tolerance" as world units (the specified "Distance" units selected in *Settings|Units*). If a point is clicked on the screen when the zoom is a long way out, 2mm on the screen can cover quite a large distance in world units. If the zoom is a long way in, 2mm on the screen covers a very small world distance and care may need to be taken to click as close as possible to the existing item so the items are connected. The "Max Tolerance" is the maximum distance that you can click and have IRRICAD connect this item to an existing item. If the click is outside this maximum distance, the item will be placed.

Select *Right-click|Snaps|Place* to place the next point when in "Connect" mode. The next point will be placed but not connected to any nearby items.

Place

When "Place" has been selected in *Settings|Snap*, no items will be connected, they will just be placed on the screen where you click the mouse, even if the mouse is clicked over an existing item. *Zone|Cut Pipe* will work as when in "Connect".

Snap to Grid

"Snap to Grid" is an option to have the cursor move only between grid points on the screen. These grid points can be visible or invisible. The size of the grid can be altered in *Settings|Grid/Origin/GIS*.

When "Snap to Grid" mode is selected in *Settings|Snap*, hydraulic items will not always connect. This may is due to an item not being precisely on a grid point. *Zone|Cut Pipe* will work as when in "Connect".

Rules for Connecting Items

IRRICAD uses these rules for placing and connecting various hydraulic items in a design:

- Mainline pipes and mainline spraylines will not directly connect to zone pipes or zone spraylines. Only control valves can connect to both mainline and zone pipes.
- Zone items can only connect to other zone items.
- Mainline items can only connect to other mainline items
- Be careful when in "Snap to Grid" mode that outlets connect to pipes and pipe ends.
- If a junction can be seen where point objects such as water supply, control valves or outlets connect to pipes or pipe ends, they are not connected. Move the item until the junction disappears upon connection.

See also:

Snap Panel	*Section 5.5.13.2*
Default Snap Mode	*Section 5.10.16.1*
Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*

2.4.2.3 Entering Items at Different Levels

During installation, pipes and valves may be placed at different levels in the ground or above ground. With items at different levels, fittings and risers are required to resolve the differences in depths. If these depths are entered for each item in the design, IRRICAD can select the fittings required between the levels and add these fittings to the bill of materials for the design.

"Depths" allow applying specific depths to items in IRRICAD. Entering depths is optional; they can be left at **0** in the dialog if you do not wish to use this utility. All depths entered are measured from ground level. If the item is under the ground e.g., 24" (600mm), type in **24** (**600**). If the item is 24" (600mm) above the ground, type in **-24** (**-600**).

If a depth is specified for an item, IRRICAD uses this depth to calculate pressure differences resulting from the depths and the required fittings to connect items at different depths.

Where pipes are specified at different depths, IRRICAD will automatically select a riser pipe during *Design|Computer Selection of Fittings*. The type of pipe and size can be controlled by the settings in the riser table (see Riser Selection Rules, Section 5.13.16). These rules apply to all hydraulic items (except outlets) at different depths.

Riser Selection Rules

Where pipes, valves or miscellaneous hydraulic items with different depths meet at a junction, IRRICAD will assume that the diameter of the vertical riser pipe is equal to the diameter of the largest pipe or valve at the higher of the two depths being connected. IRRICAD will also assume that the type of material for the riser pipe is the same as the largest item at the lower of the two depths.

In *Design|Riser Selection Rules* the table provides the means to specify a diameter or pipe type other than that assumed by IRRICAD.

For each combination of two depths in the design, "Depth 1" is the higher depth and "Depth 2" is the lower of the two depths relative to ground level. For example, if mainline pipes are at a 2 foot depth and zone pipes at a 20" depth, enter "Depth 1" as **20** and "Depth 2" as **24** (check the units you have specified for depths and enter accordingly). If a valve is at 18" height above ground level and the mainline is at 2 foot depth, enter "Depth 1" as **-18** and "Depth 2" as **24**. Repeat entries can be entered for all combinations of depths where components join at different levels.

Note: *If two depths are identified by IRRICAD as requiring a riser connection and that depth combination is not specified in the*

Riser Selection Rule table, the default rules for riser size and type will be used.

In the "Riser" column, select **Rule** or **User**.

Rule: Gives the choice of specifying the size and type of riser to be the same as the larger pipe or valve at the higher or at the lower of the depths.

User: Allows selection of a pipe to be used for risers between the two depths. The list of pipes is found in the "Riser Description" column.

If Rule has been selected:

In the "Size" column, select **Top** or **Bottom**.

Top: Sets the pipe diameter to the largest pipe or valve at the higher level ("Depth 1").

Bottom: Sets the pipe diameter to the same as the largest pipe or valve at the lower level ("Depth 2").

In the "Type" column select **Top** or **Bottom**.

Top: Sets the pipe type to the largest pipe or valve at the higher level ("Depth 1").

Bottom: Sets the pipe type to the same as the largest pipe or valve at the lower level ("Depth 2").

If User has been selected:

Choose the riser from the dropdown list in the "Riser Description" column. Note that it may be necessary to click on this column in order for the list to appear.

<u>Notes</u>:

Where a "Type" is specified for a pipe that is not in the pipe database and able to be selected, IRRICAD will be unable to find a riser and will report this in the list of fittings for the junction.

*Where **Top** is selected for the "Type" and the object of largest size is a valve (which does not have a pipe type), it automatically changes to **Bottom** for that connection.*

2.4.2.4 SUMMARY

- Items to be used must first be in the current working database and enabled.
- Pipes can be Computer Selected.
- Use "Connect" mode to physically connect items to the system.
- Depths are measured from ground level.
- A depth above ground (e.g., for a valve) is given as a negative (-) value.

2.4.3 CONVERTING DRAWING ITEMS INTO HYDRAULIC ENTITIES

All hydraulic and electrical items can be created from relevant drawing items. Table 1-1 describes this behaviour. The first column indicates the type of hydraulic or electrical item, the second the type of drawing item that maybe be used as a source, and the third indicates whether the original item is converted or copied during the process.

Table 2-1 - Item Conversion

Item Type	Create From	Convert Or Copy
Control Valve	Point, Symbol, Circle	Convert
Outlet	Point, Symbol, Circle	Convert
Misc. Hydraulic	Point, Symbol, Circle	Convert
Pump	Point, Symbol, Circle	Convert
Light	Point, Symbol, Circle	Convert
Electrical Controller	Point, Symbol, Circle	Convert
Misc. Electrical	Point, Symbol, Circle	Convert
Pipe	Line, Polyline	Convert
Sprayline	Line, Polyline	Convert
Wire	Line, Polyline	Convert
Tape	Line, Polyline, Bezier, Continuous Bezier, Spline	Convert
Irrigated Area	Rectangle, Polyline, Polygon, Bezier,	Copy

	Continuous Bezier, Spline	
Tape Irrigation Block	Rectangle, Polyline, Polygon, Bezier, Continuous Bezier, Spline	Copy
Spray Irrigation Block	Rectangle, Polyline, Polygon, Bezier, Continuous Bezier, Spline	Copy

To convert geometric items into hydraulic items:

1. Select the geometric item to convert i.e., the block boundary, using *Select Object* or similar.
2. Now select the relevant hydraulic tool i.e., *Zone|Spray Irrigation Block*.
3. Click [OK] on the message asking to convert the selected item.

The selected item will be converted into the actioned hydraulic entity.

Note*: Water supplies cannot be converted from existing geometric items.*

2.4.3.1 Converting Lines and Points to Pipe and Outlets

For the pipe, outlets, or control valves to be connected after converting, convert the pipe first and then the point objects. In this way the system will connect as required, unless the point objects are not close enough to the line being converted into pipe.

1. Select the point objects to convert i.e. into outlets, control valves, misc. hydraulic items or water supplies, using *Select Object* or similar
2. Now select the relevant hydraulic tool i.e. *Zone|Outlet*
3. Click [OK] on the message asking to convert the selected item
4. Now select the line objects to convert into pipes, using *Select Object* or similar
5. Now select the relevant hydraulic tool i.e *Zone|Cut Pipe*
6. Click [OK] on the message asking to convert the selected item.

Note: If the point objects are not connected to the pipe after conversion, use the tools Connect Outlets for zone and mainline pipes or Connect Valves to connect valves to mainline pipes.

Tip: Convert symbols into outlets before converting lines into pipes and use the Cut Pipe tools, which will assist in connecting to outlets not quite directly in-line with the pipe.

2.4.4 MAKING CHANGES TO THE DESIGN OR DRAWING

Once items have been entered into the design, it may be necessary to change one or more properties of single or multiple items. To change one item, select *Modify|Change*. To edit several items at once, select *Modify|Change Type*. Use the *Selection Filter*, available in the *Modify* menu to aid in selecting the correct item(s) prior to selecting the *Change* tools.

Changing Individual Items

To change a single object use *Modify|Change*. The dialog for that item will allow the editing of any available characteristic. It may be helpful to zoom in to the object you wish to change before clicking on it, to avoid selecting the wrong item.

The *Change* tool is also available in *Right-click|Modify*.

When in *Select Object* mode, double clicking on an item will also bring up the *Change* dialog.

Drawing Objects and Elevations

For drawing objects the common drawing properties are:

- Layer
- Color
- Line type
- Line width

These properties can be edited by selecting from a dropdown list. In the case of editing the color, select from the resulting palette dialog. The item can also be specified "By Layer" meaning the item will have the color, line width and line type as specified for the layer the item is on, in *Settings|Layers*.

Other object properties are specific to the item. For example the radius of a circle may be edited by over-typing the current radius of the circle, likewise the length of a line.

Hydraulic Items

The drawing properties available for editing in the hydraulic dialogs are:

- Layer
- Line width (pipes, tapes and wires)
- Color, symbol (water supplies and junctions)
- Color, line type, line width (areas)
- Scope

The initial values of the drawing properties in the dialogs are based on the defaults specified in *Settings|Irrigation Items* and *Settings|Irrigation - Design Specific*, which are editable.

The line width determines how thick or thin the line appears on the screen and printed plan. Line widths on the screen may differ from those on the plan depending on the screen resolution. Line widths for specific objects e.g., mainline pipes, zone pipes, can be set and saved as defaults in *Settings|Irrigation - Design Specific*. For example, zone pipes may be changed to a default "Line Width" of 2.

Other properties such as orientation and depth may be edited by over-typing the existing value. The "Computer Sized" option for pipes and spraylines can be checked or unchecked to turn computer sizing on or off respectively. Fittings can be edited by clicking the [Show Fittings] button on the dialog.

All other drawing properties for hydraulic items, e.g., color, symbol and line type, are specified in the database, as outlined in the IRRICAD Database Editor Manual, Section 3. These properties can only be edited in the database.

<u>Note:</u> *If multiple items are selected and the Change tool is invoked, the hydraulic items cannot be changed to another of its kind e.g., will not be able to change a 3" (80mm) pipe for a 2" (50mm) pipe as this field will not be present in the dialog. Use Change Type for multiple selections.*

2.4.4.1 SPECIFYING GROUPS OF ITEMS TO CHANGE OR DELETE

It is often necessary to change or delete a group of objects. To be able to specify what characteristics the objects must possess in order to belong to the group is important. The way in which IRRICAD allows this is using the *Selection Filter* (see Selecting Specific Items – Filtering The Selection, Section **2.4.4.2**), or the "Match / Change" dialog present in *Change Type* and *Delete Type* commands.

To use *Change Type*, click on an object representative of those you wish to change. Only those selected will be eligible for the change. Edit the object properties in the dialog as described above in Making Changes to The Design or Drawing, Section 2.4.4. When the [OK] button is clicked a "Match / Change" dialog appears. This dialog allows you to specify match characteristics, which must be the same in the objects being changed, and also allows the specification of which properties are to be changed.

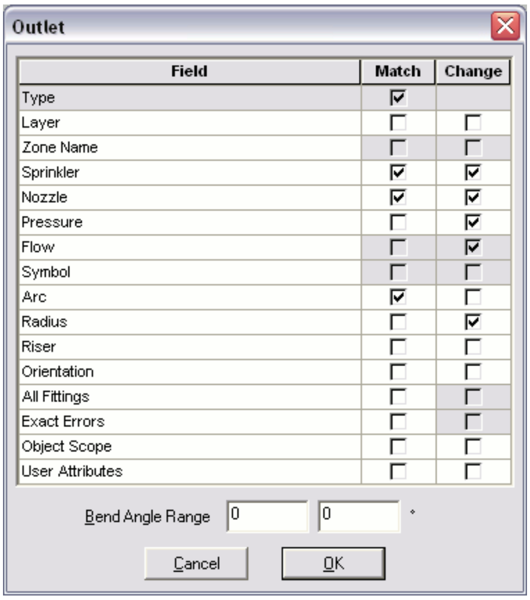


Figure 2-17 - Change/Match Outlet

If an item in the "Match" column is enabled, then all items to be changed must have this characteristic matched e.g., line width. If an item in the

"Change" column is enabled, then all selected items which match on the match criteria (e.g., layer) will have the change imposed.

If the representative item has a new pipe or sprinkler selected during this function then all the selected items that match the criteria can be globally changed to the pipe or sprinkler chosen. See Figure 2-17 for an example of changing existing sprinklers to a different sprinkler.

The representative item had a new sprinkler selected and therefore a new nozzle selected. To apply these changes to all sprinklers selected, regardless of their current sprinkler or nozzle uncheck **Sprinkler** and **Nozzle** in the left-hand "Match" column. Items that have different sprinklers or nozzles than the representative item will still change. If the arc has changed and you wish all items to conform to the new criteria, uncheck **Arc** in the left-hand "Match" column. When all criteria for changing and matching have been entered, upon clicking [OK], IRRICAD will proceed to find all selected items which match the "Match" criteria and change these items to the criteria specified in the "Change" column. IRRICAD will display the number of items matched (i.e., the number of items changed) on the status bar. This also provides a means of checking that the expected number of items have been changed.

The *Change Type* tool is also available from *Right-click|Modify*.

When using *Change Type* the process is:

1. Select all the objects to be changed or select the whole design.
2. Select *Modify|Change Type*.
3. Click on one item that is representative of the items to be changed.
4. Edit the dialog for the changes. The dialog that appears will differ depending on the type of object selected. Click [OK].
5. The "Match / Change" dialog appears. It displays a default based on the changes made in the previous dialog. Make changes to the "Match / Change" dialog. If unsure, accept the default. Click [OK].

The number of items that matched the "Match" criteria and were therefore changed will be displayed in the status bar.

<u>Note:</u> *Only those items that are selected (highlighted) are eligible for the change.*

Remember that the initial dialog that appears will depend on the type of representative object selected. For example, if an outlet has been selected as the representative object, the *Outlet* dialog will appear.

When using *Delete Type* the process is:

1. Select all the objects to be deleted or select the whole design.
2. Select *Modify|Delete Type*.
3. Click on one item that is representative of the items to be deleted.
4. The "Match / Change" dialog appears. It displays a default based on the type of the representative object. Make changes to the "Match / Change" dialog. If unsure, accept the default. Click [OK].

The number of items that matched the "Match" criteria and were therefore deleted will be displayed in the status bar.

Note: *Only those items that are selected (highlighted) are eligible for the deletion.*

The principles behind the "Match / Change" dialog are:

- Select the criteria the objects must match on e.g., all pipes or the pipe selected (a 2" pipe for example).
- Select the characteristics to change, based on the changes made to the representative item.
- Only the objects that match on all selected criteria can make the changes specified.

Example:
If it is required to make all pipes non-computer sized i.e., to uncheck the "Computer Sized" check box so that IRRICAD cannot reselect a new pipe size during the design process, do the following:

1. Select all pipes or select the whole design using *Modify|Select|All* or *Modify|Select|Window*.
2. Select *Modify|Change Type*.
3. Click on a representative pipe.
4. Edit the pipe properties - in this case uncheck the "Computer Sized" check box. Click [OK].
5. Check the "Match / Change" dialog. Since all pipes, regardless of the size, must be changed, uncheck the "Match" Pipe.. Make sure the "Change" Computer Sized is checked. Click [OK].

All pipes (except **Computer Selected**, i.e., have no current size) will have the "Computer Sized" check box unchecked and will retain their size during the design process.

When changing items like text it is important to know what the "Match" column implies. If it is required to change all text to a new font regardless of the current size of the font make sure "Match" **Text** is unchecked so that all text, regardless of what the text says, will be changed. Uncheck "Match" **Height** so that all sized text will change to the new font. If there is more than one current font in the design and you require all text to change to the new font uncheck "Match" **Font**.

The section Changing and Fixing Many Fittings Errors in One Go, Section 2.6.8.2 has an example of how to fix a common fittings error at many places in the design in one action. The principles to remember here are issues involving **All Fittings** and **Exact Errors** in the "Match / Change" dialog. If **All Fittings** are checked in the "Match" column, then only those items that are the same item and have exactly the same fittings, no more and no less, as the representative item selected, will be eligible for the change. If **Exact Errors** is checked in the "Match" column, then only those items that are the same item and have exactly the same errors (as seen in the [Show Fittings] dialog), no more and no less, as the representative item selected, will be eligible for the change. The Bend Angle Range will broaden the **Exact Errors** option. If the **Exact Errors** and **All Fittings** are different then the change will not apply.

See also:

Selecting Specific Items – Filtering The Selection *Section 2.4.4.2*
Changing Layers *Section 2.4.4.3*
Changing and Fixing Many Fittings Errors in One Go Section 2.6.8.2

2.4.4.2 SELECTING SPECIFIC ITEMS – FILTERING THE SELECTION

The *Selection Filter* makes it easier to select a specific item or type of item. This tool is particularly useful if the item has many close neighbors on the plan. *Selection Filter* is found in the *Modify* menu.

"Layer", "Color", "Line Type" and "Line Width" can be chosen from the drop down lists or left as **<ALL>**. "Type" describes the type of item selection should be limited to e.g., **Rectangle**, **Water Supply**, **Wetted**

Radii, etc. "Group" is specified as **Drawing**, **Electrical** or **Hydraulic**. Select the combination that best suits the filtering required.

Note: If the Selection Filter is set to exclude Zone Pipes, then the Zone|Cut Pipe tool will not connect to any zone pipes.

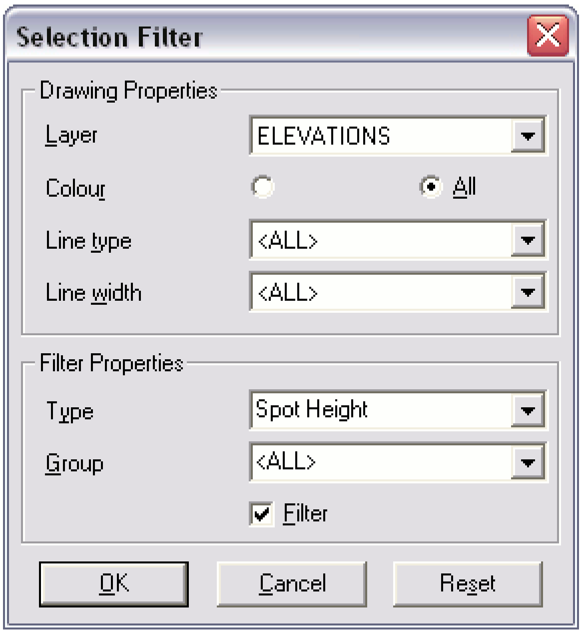


Figure 2-18 - Selection Filter

Return to *Modify|Selection Filter* and uncheck the "Filter" box when the action is completed.

*Tips: When the Filter is turned on, subsequent selection operations capture only those objects meeting all of the filter criteria. For example, set the filter to screen for **Red Circles** of "Line Type" **3**, "Line Width" **4**, and "Layer" **DRAWING**. If you turn the Filter off, then use the window selection tool, all objects completely enclosed within the window are selected. However, if you turn the Filter on, then only red circles of line type 3, width 4, and layer DRAWING are selected, even though other objects were completely enclosed within the selection window.*

The set of criteria defined by a filter can include only one entry for each property or entity type. For example, you cannot select for red and green circles at the same time. However, you can build the selection set by making multiple passes with the selection tools, and changing the filter criteria between each pass.

Changing the filter does not alter any previous selections. However, the filter can be used to selectively remove objects from the selection set if pressing <Ctrl> as the desired selection tool is used. If <Ctrl> is pressed and the filter is on, then only objects meeting the filter criteria are de-selected.

A short cut to Modify|Selection Filter is on the Status bar in the Selection Filter Panel:

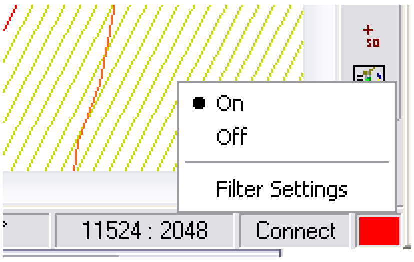


Figure 2-19 - Selection Filter Status

Note: *Until turned on, the filter will have no effect on selection or de-selection operations. It can be turned on or off, or re-configured as often as needed during a selection operation to build up the selection set before performing an editing function.*

2.4.4.3 Changing Layers

Layers can be used to differentiate objects or to specify the drawing properties for a group of items. Turn layers off or on to display different sets of items as required. When an item is selected for input the layer is <DEFAULT> - meaning the item will be put into its default layer for its type. For example, a rectangle's default layer is DRAWING. A zone pipe's layer is ZONE_PIPES. A different layer can be selected when creating or editing the item.

Items can be moved from one layer to another by using *Change* or *Change Type*.

If a large group of items is to be moved, for example, moving all spot heights from the ELEVATIONS layer in order to be able to turn off the display of spot heights and still retain the display of contours, the selection filter can be used. In Figure 2-19 **ELEVATIONS** has been selected as the “Layer”, **Spot Height** as the “Type”. Using a selection tool, all spot heights are selected. Use *Change Type* to change the layer to one other than **ELEVATIONS**. The “Change” **Layer** check box in the “Match / Change” dialog needs to be checked in order for the change in layer to apply to all spot heights. Both the “Change” and “Match” check boxes for **Height** should be unchecked, as the elevation data of any of the existing spot heights is not to be changed. Now all selected spot heights will be present on the new layer. This layer can be turned off or on (*Settings|Layers*) or modified as required.

See also:

Layer Bar *Section 5.5.14*

2.4.4.4 Creating Staged Developments - Globally Changing the Scope

A "Scope" flag is available in the hydraulic item dialogs. This allows for 'BOM only' items which are included in BOM / Costing reports but not included in hydraulic design. You may also specify 'Design Only' items, which are treated normally in the design process but do not feature in the BOM / Costing reports (can be used to specify existing irrigation equipment). Hydraulic items can be set to:

- Design + BOM
- Design Only
- BOM Only

This is a very useful tool for staged developments. The existing stage can be set to **Design Only** – meaning those materials will not appear in the BOM/Costing reports.

Changing the “Scope” for all selected hydraulic items can be achieved in one step:

1. Select all hydraulic items to be changed e.g., by using a *Modify|Select* option.

2. Select *Modify|Change* – DO NOT use *Change Type*.
3. Change the "Scope" to that which is required.
4. Click [OK].

2.4.4.5 SUMMARY

- For a single item use *Change.*
- For more than one item use *Change Type*, except when editing the drawing properties or scope of hydraulic objects, in which case use *Change.*
- To delete a group of items in one action, use *Delete Type.*
- *Change Type* and *Delete Type* only work on selected items.
- *Selection Filter* is an aid to help select the correct item(s).

See also:

Irrigation Items	Section *5.10.9*
Irrigation - Design Specific	Section *5.10.8*
Drawing Items	Section *5.10.5*

2.4.5 ALLOWING FOR ELEVATION CHANGES

Elevation data describes the topography of the area for which an irrigation system is being designed. Elevation data differs from other background data, in that it has hydraulic significance. It is therefore important to include all relevant elevation data in the design. IRRICAD uses this data to calculate the correct pressure losses and gains due to elevation changes. To include these changes in IRRICAD Design and Analysis, elevation changes need to be entered manually (i.e., drawn on the screen) or imported from a file. Elevations can be defined as contours - lines of elevation, or spot heights - points of elevation.

It is important to make sure that the elevation data spans the whole hydraulic design. If hydraulic items are outside the contours or spot heights, IRRICAD will issue a warning and assume a height for these items, based on the closest data. Both contours and spot heights can be used together in a design. If available, place spot heights on items that are known to be at a specific elevation to ensure the correct elevation is given to that point. IRRICAD interpolates between the closest points of data to determine the elevation of an item in the design.

The Change tool (*Modify|Change*) can be used to change any contour or spot height's elevation data. After adding or making changes to contours or spot heights select Interpolate Elevations, Section 5.13.4 to ensure that the changes are used. *Interpolate Elevations* after adding additional hydraulic items to the design, if it has been previously analyzed.

IRRICAD uses 3-D lengths for the bill of materials for a design, using the elevation changes to calculate the additional length of pipe or wire.

2.4.5.1 Getting Elevation Changes into IRRICAD

Contours and spot heights may be placed on the screen by the mouse using *Draw|Contour* or *Draw|Spot Height*. Geometric items can also be converted to elevations at a later date (Convert to Elevations, Section 5.12.8).

Elevations may be imported from a DXF, SHP or KML/KMZ file (see Importing a DXF, VCD, DWG, GCD, SHP, MIF, CSV or KML File, Section 2.4.1.1). Initially the full file may be imported so as to determine the name of the layer or layers that any elevation data may be on. Import the file using *File|Import*. Using the *Change* tool or a *Selection* tool together with *Object Info*, click on any objects that look like contour lines or spot heights. Once the name of the layer or layers is determined, select *File|Import Contours* to import these lines or points as elevation data. Select the layers that contain the elevation data - more than one can be selected by holding down the <Ctrl> key. All items in these layers will be placed on the ELEVATIONS layer in IRRICAD. All items imported in to the ELEVATIONS layer will be visually displayed as the color, line type and line width designated for contours and spot heights in *Settings|Irrigation Items*.

See also:

Contour	*Section 5.6.18*
Entering a Scale Plan	*Section 2.4.1*
Spot Height	*Section 5.6.19*

2.4.5.2 Elevations Along Pipes or Laterals (Uneven Contours)

IRRICAD assumes a constant slope between pipe junctions when selecting pipe sizes. However during the analysis stage, after sizes have been selected, the elevation at individual emitters is taken into account.

See also:

Hydraulic Gradeline	Section 5.14.10

2.4.5.3 Summary

- Draw, digitize or import elevation data.
- Interpolate Elevations if re-designing after inserting new hydraulic items or elevations.

2.4.6 Outlets & Risers (Outlet Connectors)

An outlet can be any type of device that discharges water under pressure. Examples include pop-up sprinklers, drip emitters, big guns, travelling irrigators, micro-sprinklers or mini-sprinklers or simple demand points. All outlets must have been previously entered in the Outlet group of the database and enabled for use (see Irrigation Components - Details of Individual Groups, Section 3.8) before they can be selected for use in a design.

Outlets can be entered into a design as Zone or Mainline outlets by selecting *Zone|Outlet* or *Mainline|Outlet* and connecting them downstream or upstream of a control valve, respectively. Outlets can be spaced at regular intervals by entering them as spraylines, where pipes and outlets are selected at the same time, or as blocks. Blocks are a tool to enter evenly spaced spraylines of pipes and sprinklers.

Zone outlets must be connected to zone pipes, and mainline outlets (valve-in-head outlets) to mainline pipes. Attempting to connect a zone outlet to a mainline pipe or vice versa will result in the outlet being placed on the pipe and not connected to it.

By default, outlets (excluding connected spraylines) are created with wetted radii. There are a number of outlet types such as drippers where wetted radii may not be appropriate. In this case, select *Settings|Irrigation - Design Specific* and uncheck the "Create Wetted Radii" box before selecting and placing the outlet(s). If the wetted radii are created, the wetted radii layer can be toggled on and off by selecting *View|Wetted Radii*.

Placing Evenly Spaced Outlets Using Spraylines

Connected spraylines (where the pipe and outlets are treated as a single entity) may be created with or without outlet symbols. Often, it is not appropriate to create symbols for items such as drippers due to the large number required. If you wish to see the outlets (and wetted radii), select

Settings|Irrigation - Design Specific and check the "Create Sprayline Outlets" box before placing the sprayline(s). If the spraylines have already been placed without outlet symbols, select *Tools|Create Sprayline Outlets* and click on the sprayline. Alternatively, select *Tools|Create Wetted Radii* and click on the sprayline. This will create both outlet symbols and wetted radii in one action. Note that the SL_WETTED_RADII layer must be on (*Settings|Layers*) for the wetted radii to be visible on connected spraylines. A shortcut is available to toggle sprayline outlets on and off in *View|Sprayline Outlets*. If Unconnected spraylines are used, the outlets are treated as when an outlet is placed using *Zone|Outlet* or *Mainline|Outlet*.

If created, sprayline outlets or sprayline wetted radii may be turned off. The SL_WETTED_RADII layer can be turned on or off in *Settings|Layers*. The SPRAYLINE_OUTLETS layer can be turned on or off by selecting *View|Sprayline Outlets*, or in *Settings|Layers*.

<u>Note:</u> *The Wetted Radii option in the View menu will turn on and off the wetted radii on outlets that are not in connected spraylines.*

The Right-click menu has a Layers option for quick access to turn a layer on or off.

If the "Connected" check box is unchecked then once placed the pipes and sprinklers become individual entities.

The spacing between sprinklers can be set in the *Zone|Sprayline* dialog. In the [Options] dialog the spacing can be Fixed ("Fixed" check box enabled) for the spacing of the outlets to be exactly as specified along the length of pipe of drawn. If the "Fixed" check box is unchecked, the spacing of the outlets will be such that outlets are placed at the start and end of the pipe and the spacing of outlets adjusted between with the spacing entered as a guide.

See also:

Create Wetted Radii — *Section 5.12.4*
Create Sprayline Outlets — *Section 5.12.5*
Arc Types and Nozzle Properties — *Section 2.4.6.1*
Create Sprayline Outlets Setting — *Section 5.10.8.2*
Create Wetted Radii Setting — *Section 5.10.8.2*
Working with Uniformly Spaced Outlets on a Pipe — *Section 2.4.10*

2.4.6.1 Arc Types and Nozzle Properties

In IRRICAD, any type of sprinkler, big gun, travelling irrigator or dripper is given an outlet body and a nozzle, even if the outlet does not physically have nozzles e.g., a dripper, or if the outlet has many nozzles e.g., a travelling irrigator. The outlet body contains the description of the outlet, the arc type, price and some default values - those most commonly used when the outlet is selected. When an outlet is selected from the dropdown list, the default nozzle for that sprinkler (as specified in the database, normally the most commonly used) is initially selected. The required nozzle can be selected from the dropdown list. Other default values can also be changed depending on the arc type of the outlet.

The nozzle part of an outlet can be the actual nozzles supplied with an outlet body, or simply hold the technical data for the outlet, such as a dripper's hydraulic characteristics. Nozzles contain the minimum and maximum recommended pressures from the manufacturer, and parameters to calculate the flow and radius at a given pressure.

Outlets are specified as having one of four different nozzle types: **Demand Point**, fixed arc with fixed flow (**Fixed**), variable arc with constant flow (**Variable**), or variable arc with matched flow (**Matched**). The type of outlet and the technical data in the Nozzle component group of the database determines how a nozzle's flow and radius responds to pressure and arc changes.

Pressure, flow, radius and intensity change when one of these fields is changed, e.g.,

For any sprinkler type (excluding demand points):

- If the pressure is changed, the flow, radius and intensity are recalculated.
- If the flow is changed, the pressure, radius and intensity are recalculated.
- If the radius is changed, only the intensity will be recalculated.

For variable sprinklers:

- If the arc is changed the intensity will be re-calculated.
- The arc can be changed to the required angle, e.g., 180º, 90º, etc. Changing the arc of a variable sprinkler maintains the flow and therefore will increase the intensity as the arc decreases.

For matched sprinklers:

- If the arc is changed, the flow is re-calculated.
- Any changes made in data fields regarding nozzle pressure, flow rate or arc will produce the appropriate wetted radius. A radius can also be entered manually when it is to be manually set at installation. It will remain at the user-defined value until further changes are made to one of the other fields; the radius will then revert to the value predicted by the manufacturer's data.
- For variable or matched sprinklers, the arc can be changed to the required angle, e.g., 180º, 90º, etc. Changing the arc of a matched sprinkler will maintain the same intensity by altering the flow.

Note: *When entering outlet and nozzle data in the database it is necessary to know whether an outlet is **Fixed**, **Matched** or **Variable**. If the outlet is **Fixed** the arc cannot be changed. If the outlet is **Variable**, then the flow does not change as the arc changes i.e., the same flow is emitted regardless of the arc selected upon placement. However, for **Matched** outlets, IRRICAD assumes that the data input is for 360º. If the arc is changed, the flow is matched and is decreased accordingly. Therefore if 180º is entered as the arc, the outlet will output half the flow. If the said outlet is indeed **Matched**, then when inputting the data into the database enter the data for 360º so that when the arc is changed it will achieve the correct flow according to the manufacturers data.*

Demand Points, where pressures and flows are manually specified, and therefore do not have a pressure vs flow relationship, are particularly useful for quick mainline or large turf designs. Where the flow and pressure requirements at a point are known but a specific type of outlet is not wanted, or you wish to replace a large group of outlets with one item, use a demand point. These are useful when used as a hydrant with a required pressure and flow at the hydrant, or at a control valve to replace all items downstream from the valve. Demand points do not contain an associated nozzle.

See also:

Entering Hydraulic Items	*Section 2.4.2*
Nominal Pressures	*Section 2.6.3.1*
Using Mainline Outlets	*Section 2.5.11*

2.4.6.2 Risers (Outlet Connectors)

Outlet connectors (risers, stake and tube assemblies, etc.) are used to connect outlets to pipes. An outlet connector does not need to be selected, but if there are differences in height between the pipes and outlets or significant pressure loss in the connector, or there is a requirement to include a specific riser in the bill of materials, an outlet connector should be selected.

Select the required outlet connector from the dropdown list. Risers are selected in the *Outlet*, *Block* or *Sprayline* dialogs.

Sprinklers are always assumed to be at ground level. If they are not at ground level, an outlet connector must be selected - with the appropriate height previously entered in the "Height" field (in the database) to ensure that IRRICAD uses that height in the pressure calculations at the sprinkler. Note the height entered into the database is the height above ground, not the length of the outlet connector from a buried submain to the height of the outlet. For subsurface outlets (e.g., subsurface dripline) the height above ground will be negative (-ve).

A riser may not be required in the field, e.g., a wheel line system where the sprinklers are connected straight into the sprayline, or sprinklers on an above-ground lateral. However, an outlet connector is still required with the correct height gain, but no pressure loss and no cost. The connector and corresponding fittings can also be edited out of the reports if required. The alternative is to ignore selecting the riser if the height difference is small.

Another option for compensating for the height gain is to allow for it in the sprinkler hydraulic characteristics. When using the *Curve Fit* utility to calculate the constant and index values before inserting a sprinkler into the database, decrease the pressure by an amount equivalent to the height of the sprinkler. For example, if the sprinkler is 1ft (1m) above the ground decrease the pressures inserted into the *Curve Fit* utility by 0.434 psi (1m). Label this sprinkler carefully, so it is not mistaken for a normal sprinkler that has not had compensation for a height difference. Note that for every foot above the ground, the pressure needs to decrease by 0.434 psi if using US units. If using metric units, the pressure decreases by 1m for every meter above the ground.

2.4.6.3 SUMMARY

- Connect zone outlets to zone pipes and mainline outlets to mainline pipes.
- Use spraylines for placing evenly spaced outlets.
- Outlets consist of an outlet body and an associated nozzle or nozzles.
- Select an outlet connector to raise the outlet above the ground if required.

2.4.7 PIPES & PIPE SIZING

Pipes in IRRICAD are any Zone or Mainline pipes used in a design, excluding tapes (driplines) and connected spraylines (laterals). Pipes can be selected from the *Zone* or *Mainline* menu. A control valve must be placed at the connecting junction between zone and mainline pipes, and can be selected from both the *Zone* and *Mainline* menu.

Pipes are represented as lines with designated properties of color, width and type. Pipe colors and line types are specified in the database for each individual pipe. Pipe widths can be specified in *Settings|Irrigation - Design Specific* and saved as the default setting for pipe widths if you wish to continue to use these settings for each design.

Note: *If pipes are already placed on the design and the pipe width setting in Settings|Irrigation - Design Specific is then changed, the pipe widths on the screen do not change for existing pipes. Use Change or Change Type to modify existing pipes.*

If you are unsure whether pipes are connected to each other, or to another hydraulic item, select the junction and then *Modify|Move*. If connected, everything will move with the junction. Selecting *Right-click|Restart* or pressing the <Esc> key will return the junction to its original placement.

2.4.7.1 COMPUTER SIZING

If you require IRRICAD to size a pipe or sprayline, then ensure that **Computer Selected** is chosen in the "Item" field. Even if a pipe size has been specified, if the "Computer Sized" check box in the dialog is enabled, the pipes will be resized by IRRICAD when running *LP Design* or *Velocity Design*. If IRRICAD is not allowed to change the sizes, turn off “Computer Sized” by leaving the box unchecked when selecting pipe sizes, or unchecking the box at a later date. This can be achieved globally over all existing pipes if required by using *Change Type*. Highlight all the pipes for which you wish to have “Computer Sized” switched off, and select *Modify|Change Type*. Click on a representative pipe and uncheck the “Computer Sized” box. Click [OK]. In the “Match / Change” dialog uncheck all “Match” check boxes as we want all selected pipes to change regardless of other properties, and check the **Computer Sized** in the “Change” column.

When running *Design* options (such as *LP Design* or *Velocity Design*) any pipes that have the “Computer Sized” box checked will be re-sized regardless of whether or not they have been previously sized.

If *Analyse* or *Detailed Analysis* is selected and the design contains pipes that have not been sized either manually or by IRRICAD an error message will be issued.

All pipes (other than connected laterals) are given one size between junctions. In a long straight mainline, for example, add extra permanent junctions to the mainline if you require LP sizing to consider using different sizes. *Velocity Design* will retain the same size wherever the flow in the pipes is the same. Elevations are only interpolated at pipe junctions. To increase the number of interpolations, place permanent junctions on the pipeline.

See also:

Connecting and Placing Hydraulic Items	Section *2.4.2.2*
Design	Section *2.6.3*
Item Selection	Section *2.4.2.1*
Outlets & Risers (Outlet Connectors)	Section *2.4.6*

2.4.7.2 USING CUT PIPE

Cut Pipe is a useful tool for connecting a pipe to many existing pipes (*Zone|Cut Pipe*). It can be computer sized or manually selected. It is primarily used to enter a submain pipe for connecting a block of laterals to a control valve or to connect a row of outlets without clicking to connect to each one. *Zone|Cut Pipe* connects to all zone items it crosses and *Mainline|Cut Pipe* connects to all mainline items it crosses. When placed near to the end of a pipe or a series of pipes it will connect to the ends.

In some cases *Cut Pipe* may connect to an item you do not wish it to connect to or it may not connect to items it is placed close to. To help *Cut Pipe* in connecting to items it crosses or comes within a small distance of an item tolerances are specified in *Settings|Snap*.

Cut Pipe Tolerance: The distance, in mm or inches on the screen, over which *Cut Pipe* will connect to the pipes or zone items it crosses, or to the end of pipes / laterals. In this case, if the "Cut Pipe Tolerance" is 2mm, but in the design have laterals 1mm apart, then only every second lateral will be connected to the submain.

Cut Pipe Length Factor: This factor is used along with the "Cut Pipe Tolerance" to determine if the cut pipe is close enough to the ends of laterals to be connected to them. This factor is used as a proportion of the total length of the cut pipe and is not related to the Zoom State. The greater of the "Cut Pipe Length Factor" multiplied by the total length of the *Cut Pipe* or the world value (meters or feet on the ground) of the "Cut Pipe Tolerance" is used to determine if the ends of laterals are close enough to snap to.

When using *Cut Pipe* to connect to many laterals laid out on a design, or for connecting outlets, a utility called "Flow Check" can be used to ensure that a specified maximum zone flow will not be exceeded. In *Settings|Irrigation Items* the maximum zone flow can be specified. When connecting the *Cut Pipe* the status bar will display the flow currently connected and the Maximum flow. If the Maximum flow is exceeded, a warning message displays the amount of flow connected if accepted. If the last connection is not accepted, *Cut Pipe* rubberbands back to the last click placed.

If the submain is moved after inserting the *Cut Pipe*, the quick way is to use *Modify|Select|Lasso* to select all the sections of the submain. Move the submain where required and the connected pipes and outlets will move also. *Select Lasso* can also be used and to delete the submain and re-enter it where required. Junctions created by *Cut Pipe* previously will not be deleted but will be removed during the design process.

See also:

Entering Items at Different Levels *Section 2.4.2.3*
Working with Junctions *Section 2.4.14*

Cut Pipe	*Section 5.7.4*

2.4.7.3 Summary

- Pipes are given a color and line type in the database.
- Use the **Computer Selected** option to have IRRICAD size pipes or use a combination of "Computer Sized" and manually selected pipes.
- A control valve must be placed between zone and mainline pipes.
- Use "Flow Check" to help with breaking a layout into groups of outlets for a control valve.
- Draw *Cut Pipe* across all laterals, zone pipes or zone outlets as required.

2.4.8 Entering Control Valves

Control Valves define groups of outlets running at the same time. Items downstream from the control valve are Zone items, items upstream from the control valve are Mainline items. Consequently control valves are the only items that can be placed between mainline and zone pipes. When a control valve is required in the design, select *Control Valve* from the *Zone* or *Mainline* menu. IRRICAD checks if the chosen valve is within the manufacturer specifications during *Zone Design* but does not make the choice of valve. As with any hydraulic item, the hydraulic characteristics of control valves are stored in the Database.

When placing a control valve, a unique zone name is required to be able to identify each valve and zone and to avoid confusion in the design process. The default naming of zone names is specified in *Settings|Names*. The default name and numbering system can be changed if required. The zone name can be entered each time the zone name dialog appears after connecting a valve. Alternatively, after selecting a *Control Valve* to use in the design, select *Right-click|Default Name* before placing any control valves. The zone name can be edited for the following control valves until another tool is selected. The *Change* tool can also be used to change the zone name and numbering for individual control valves once they are placed.

Specify a pressure at the control valve if required in *Design|Zone Design Configuration*. If a pressure is not entered, IRRICAD calculates the pressure at the control valve. Note that a pressure needs to be specified to use *Detailed Analysis*.

See also:

Connecting and Placing Hydraulic Items	*Section 2.4.2.2*
Item Selection	*Section 2.4.2.1*
Zone Design Summary Report	*Section 5.14.12.2*
Making Changes to the Design or Drawing	*Section 2.4.4*
Names	*Section 5.10.15*

2.4.9 USING MISC. HYDRAULIC ITEMS

Misc. Hydraulic items can be valves, pressure regulating valves, air release valves, headwork losses, rising column losses, well drawdown losses or any item that needs to be included in the design due to their hydraulic character and performance or for fittings selection. These characteristics are stored in the Other Hydraulics component group of the database. They can be selected from the *Zone* or *Mainline* menu. *Misc. Hydraulic* items must not be connected to a 3-pipe junction as IRRICAD needs to know which two pipes it physically spans, enabling it to know which way the water is flowing through the item. This also aids in solving fitting selection.

Pressure Reducing Valves (PRVs) are unique in that they require a threshold of pressure before they can regulate or burn up pressure. If the actual pressure is below this threshold, the PRV will not work as designed. This threshold is determined by the headloss equation in the database. PRVs can be placed on Zone or Mainline pipes but must not be placed in looped sections, although they can be used in designs containing loops. PRVs should always be in branched sections of pipeline to avoid IRRICAD becoming confused as to which way the water is going through them. As with Misc. Hydraulic items in general, PRVs should be placed in-line, not at 3-way pipe junctions.

When using a PRV in a design select *Misc. Hydraulic* from the *Zone* or *Mainline* menu. The dialog that appears is similar to that for other Misc. Hydraulic items with the exception that a downstream pressure is required. This pressure will be maintained (provided the upstream pressure is enough for the PRV to work) during pipe sizing (*LP* or *Velocity Design*) and hydraulic analysis of the system.

See also:

Connecting and Placing Hydraulic Items	*Section 2.4.2.2*
Item Selection	*Section 2.4.2.1*
Other Hydraulics	*Section 3.8.4*

Making Changes to the Design or Drawing	*Section 2.4.4*
Using Pumps in Design	*Section 2.4.13*

2.4.10 Working with Uniformly Spaced Outlets on a Pipe

Spraylines are used to place pipe and outlets at a defined spacing in one action. Spraylines can be defined as "Connected" or "Unconnected".

Connected - This indicates that the sprayline will be treated as a single item with emitters on it. Connected spraylines should only be used in situations where there is more than 10 emitters per lateral due to the high number of emitters and pipe segments. This method is very accurate if there are over 30 emitters present. These may sound like tapes (driplines) but there are some major differences between tapes and connected spraylines. Tapes have many emitters at a low flow, the flow is not constant during analysis, and the small emitters are embedded in the internal wall of the tape. Connected spraylines tend to have higher flows than tapes and the flow remains relatively constant during analysis.

Unconnected - This indicates that once placed the sprayline will be individual pipes and outlets. If non-pressure-compensating emitters are used, then this method is more accurate than the "Connected" option as elevation data is calculated for each segment between emitters, depending on what sort of system is being designed.

Spraylines are selected from the *Zone* or *Mainline* menu, depending on what sort of system is being designed. A *Mainline Sprayline* is always unconnected - separate pipes and outlets once placed with each outlet being treated as a separate zone. Spraylines can be computer sized.

When connected spraylines are specified as "Computer Sized", the maximum number of sizes for each sprayline segment can be specified in *Zone Design Configuration*. The number can be between **1** and **3** with the default as one size per lateral.

The spacing can be specified between outlets. If the lateral (*Block* tools only) or outlet spacing entered is greater than 120% of the radius value a warning message will appear in the case of having entered a wrong number. This is a warning only and can be ignored.

The “Offset” in *Block* tools only is a percentage of the outlet spacing. If the “Offset” is entered as 50% the first outlet is placed at the start of the first sprayline and the first outlet on the second lateral is placed at half the outlet spacing down the lateral, giving a triangular outlet spacing within the block. For single spraylines, the “Offset” is specified in the distance units (ft, m, etc.) from the start of the sprayline.

The “Fixed Spacing” option indicates whether the outlet spacing is fixed as determined by the “Outlet Spacing” field, or adjusted to fit between the start and end of the sprayline segment (see Figure 2-20). If the check box is enabled, the outlet spacing will be maintained along the pipe. If the box is unchecked, the outlet spacing will be adjusted by IRRICAD to ensure that an outlet is placed at each end of the sprayline and that those between will be equally spaced. IRRICAD will space the outlets as near as possible to the value entered in the spacing field.

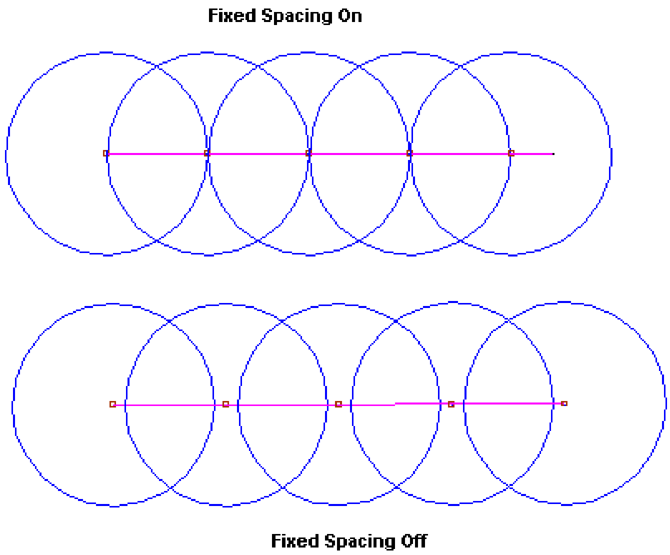


Figure 2-20 - Fixed Space Outlets

Zone|Spray Block or *Zone|Spray Irrigation Block* are usually used to place multiple spraylines in a design. *Zone|Sprayline* can be used to add extra spraylines, or to replace ones accidentally deleted.

See also:

Outlets & Risers (Outlet Connectors)	*Section 2.4.6*

Nominal Pressures	*Section 2.6.3.1*
Connecting and Placing Hydraulic Items	*Section 2.4.2.2*
Item Selection	*Section 2.4.2.1*
Making Changes to the Design or Drawing	*Section 2.4.4*

2.4.11 ENTERING DRIPLINES IN A DESIGN

Driplines (called Tapes in IRRICAD) are defined as any pipes with integral emitters at a relatively small spacing. These may sound like connected spraylines but there are some major differences between tapes and connected spraylines. Tapes have many emitters at a low flow, the flow is not constant during analysis and the small emitters are embedded in the internal wall of the tape. Connected spraylines tend to have higher flows than tapes and the flow remains relatively constant during analysis.

The value for the inlet pressure in the dialog when entering a tape is the pressure to be achieved at the start of the tape. A "Zone Pressure Tolerance" is entered into the Database Editor as a percentage deviation above and below the specified inlet pressure. If the allowable deviation above is 10% and below is 10%, the total pressure tolerance is 20%. If any tape "Inlet Pressure" is outside the tolerance range a warning message will be given during *Design*.

"Regulated" tapes are those where pressure regulation (e.g., PRVs, spaghetti tube) will be used to control the pressure at the tape inlet. "Submain Min Pressure" is the minimum pressure required in the submain for the pressure-regulated tapes. The difference between the submain and tape inlet pressures provides a differential pressure in which the pressure regulators must operate. In the non-regulated case (box is unchecked) then the "Submain Min Pressure" field is dimmed since it is not appropriate. Note tapes that have pressure-compensating emitters are not normally regulated at the tape inlet.

Tapes can be analyzed using one of two calculation methods. The "Iteration" method is selected if the check box is enabled, if it is not checked then the Tape Factor method is used. Note that the "Iteration" method should be used. The Tape Factor method is only available for compatibility with very old designs.

Tapes are normally entered using *Zone|Tape Irrigation Block* or *Zone|Tape Block* rather than single tapes at a time (*Zone|Tape*). Blocks created by *Zone|Tape Irrigation Block* can be subivided via *Irricad*

Tools|Sudivide, however in the case of *Tape Block* sections between zones can be removed using *Irricad Tools|Cut Lasso*.

Tapes cannot be computer-sized. Tapes cannot be telescoped nor have junctions. If tapes have been drawn with telescoping sizes or junctions, a warning message will appear during *Zone Design*. However, tapes can be designed with a flushing main – see How To Simulate Tapes, Section 2.9.2. Note Tape Irrigation Blocks with an automated manifold can be designed under irrigation conditions as the flushing manifold has a "Scope" of **BOM ONLY** and is not included in the design process. Flushing calculations can be performed on tapes and tape blocks with or without a flushing manifold. See Flushing Calculations, Section 2.6.5.

Tapes can be drawn with bends by enabling the "User Defined" check box for "Lateral Direction" (*Tape Block* tool only) and the "Polyline" check box which is made available when "User Defined" is checked. After drawing the block lasso, specify the direction of the tapes with bends. Select *Right-click|Done* when finished drawing the lateral direction as in Figure 2-21.

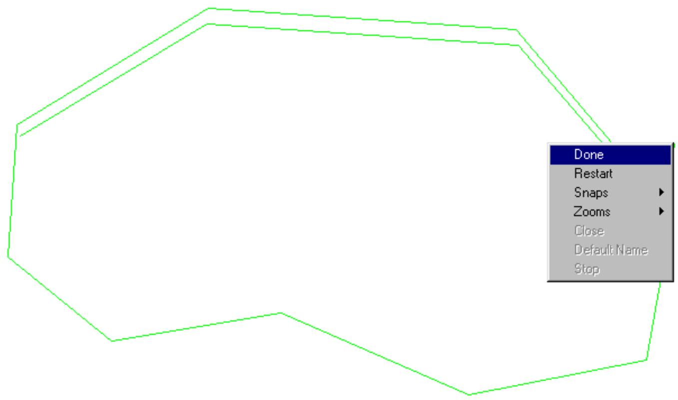


Figure 2-21 - Bent Tape Lateral

See also:

Connecting and Placing Hydraulic Items	*Section 2.4.2.2*
Item Selection	*Section 2.4.2.1*
Making Changes to the Design or Drawing	*Section 2.4.4*
Scope	*Section 2.5.4.3*

Flushing Calculations	*Section 2.6.5*
How To Simulate Tapes	*Section 2.9.2*
Detailed Analysis of Tapes Under Flushing	*Section 2.9.3*
Modeling Multiple Driplines as a Single Line	*Section 2.9.4*
Tapes	*Section 3.8.2*

2.4.12 USING WATER SUPPLIES

Water Supplies are used in the design as a point of supply for the irrigation system. A water supply may be a mains supply, pond, pumping station, tap etc. Water Supplies are mainline items and must be placed upstream from the control valves. IRRICAD does not permit a water supply to be connected directly to a zone pipe. A water supply can only have one pipe connected directly to it (i.e., it must not be placed in-line on a pipe) and must feed into the irrigation system from a branch.

Where only one water supply is specified per system it is not necessary to enter flow information or pressure information. IRRICAD will calculate the required duty for the system if the "Calculate Pressure?" check box is enabled. Where more than one water supply is used to supply the same system it is necessary to specify the pressure information in all water supplies. Operating times can be specified for each water supply (*Design|Other Management Options|Water Supply Times*), or you can simply designate each water supply to supply specific system flows (*Design|Assign Zones to System Flows* options).

"Design flow" is the flow available from the water supply that ideally should not be exceeded for the design. Where the valve operating sequence results in a water supply that exceeds this value, a warning will be given but design will still proceed. If a "Design flow" is entered, a "Max flow" must also be entered, however a "Max flow" may be specified without a "Design flow". The "Max flow" is the flow that can not be exceeded under any circumstances. IRRICAD will prevent design from continuing if a control valve operating sequence that results in a water supply flow demand greater than this value is encountered. The "Design flow" should allow for possible flow reductions (e.g., those which may occur during summer) or any other factors that make it desirable to design the system for a lower flow. There may be circumstances where the "Design flow" requirement is exceeded, and with acceptance, this may be done provided the "Max flow" is not exceeded. Flows entered here have no effect in the design calculations; they are only used in Management. The outlets determine the resulting flow in the system.

The “Design head” is the pressure available from the water supply (i.e., a pump, height above ground, etc.) that ideally should not be exceeded for the design. This pressure, if specified, is used in the calculation of mainline pressures. If a “Design head” is entered, a “Max head” must also be entered which cannot be exceeded, but a “Max head” may be specified without a “Design head”.

When more than one water supply is used to supply the same system, the flow each water source supplies is very sensitive to the pressure entered. Changing the pressure at each water supply has a significant effect on the flow provided. In some circumstances, particularly in highly looped situations, the mainline analysis of designs with a number of water supplies *operating at the same time* results in outflows or inflows being wrongly assigned to a small number of pipe junctions, or pressure losses through some pipes which are incorrect. Sometimes these inconsistencies are so small that they have virtually no effect on the final results. At other times this is not so. Some potential problems are trapped and screen messages are displayed. However, there may be occasions where this does not occur and so users should always check the *Mainline Design Full* report before proceeding.

At least the pressures must be entered when more than one water supply is used in a design to supply the same system. If more than one water supply exists in the design, but they are feeding separate systems the assigning of system flows to water supplies in *Design|Assign Zones to System Flows* options determines which water supply feeds which valves.

For a gravity system, where there is no starting pressure, uncheck the “Calculate Pressure?” check box and ensure the “Design head” is **0**. If the water supply is a tank, dam or weir with a water level height above the ground, enter the height as the Design pressure.

Water supply pressures are required before selecting *Design|Mainline Design|Detailed Analysis*. To enter or change pressures (and flows) in an existing water supply, select *Modify|Change* and click on the water supply symbol. Enter or edit the water supply details as required.

Tip: *If a junction symbol can be seen where the pipe meets the water supply, the water supply is not connected to the system. Move the water supply until the junction disappears (connects to the pipe end).*

For pumped systems, there are several ways to indicate the "Design head" at the water supply. If a pump is not intended to be entered on the design, the "Design head" can be set as the pressure that the pump will supply at the required flow (e.g., 60ft) as determined by the manufacturers data for the pump model. If a pump is to be placed in the design, the "Design head" then becomes the height of the water level in a tank or well. If the water level is below ground, type in a negative number e.g., -3ft for a water level 3ft down a well.

See also:

Pumps	*Section 3.8.10*
Using Pumps in Design	*Section **2.4.13***
Assign Zones to System Flows	*Section 5.13.9*
Assign All Zones to One System Flow	*Section 5.13.10*
Assign Each Zone to a Unique System Flow	*Section 5.13.11*
Selecting a Management Practice	*Section 2.6.1*

2.4.13 Using Pumps in Design

Pumps can be placed on the design as either main supply pumps or booster pumps by selecting *Mainline|Pump*. The pumps available from the dropdown list in the dialog have been previously entered and enabled for use in the database.

Main supply pumps are connected after the water supply on the Mainline pipe before feeding into the system. It is usual to connect the main pump quite close to the water supply. If the water supply static water level is below ground level this should be entered in the water supply dialog as a negative "Design head" (e.g., -30ft for a water level 30ft down a well). The resulting pressure in the pipe between the water supply and the pump will be negative. Screen messages will occur to this effect however, they can safely be ignored after checking that the only negative pressures are in the pipe between the water supply and the pump.

Ensure that all pumps are connected within a pipeline, not at a 3-pipe junction.

When connecting a pump to the design, other factors may need to be taken into consideration. Headworks, rising column losses, and well drawdown may need to be accounted for. These items are usually placed on the mainline downstream from the pump as *Mainline|Misc. Hydraulic* items (even though some of them may physically be upstream of the pump). Each of the losses is calculated using the appropriate constant, index and intercept from the database, these values having been previously calculated using the *Curve Fit* utility in the Database Editor.

Pumps can be used in looped systems as long as they are placed in branched sections of the design only (see Figure 2-22). If a system is looped, no more than ten pumps can be used in that design.

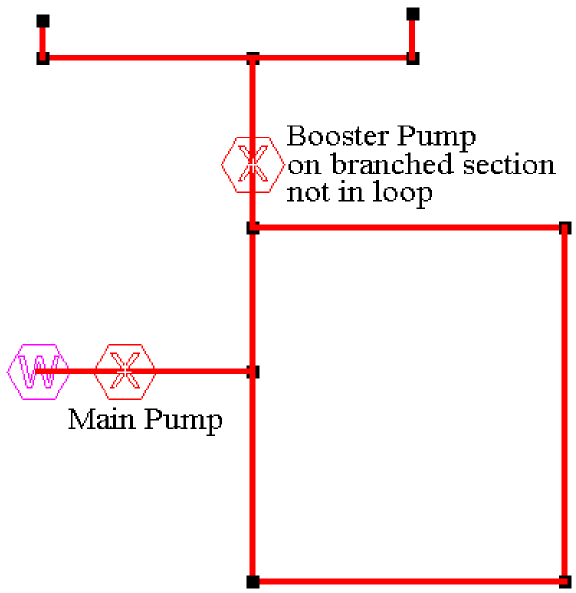


Figure 2-22 - Pumps in Looped System

If two of the same pump are to be placed in parallel, enter this as two water supplies side by side each with a pump attached, as pumps cannot be entered in loops. Alternatively, in the Database Editor create and enter a pump that will model the increase in flow and represent the two pumps as one. If two of the same pump model are being used in parallel the flow doubles, if used in series the pressure doubles. Before entering the manufacturer's data for the pressure / flow relationship into the *Curve Fit* double the flow (if in parallel) or the pressure (if in series). For example, if the pump curve shows the pump produces 120gpm at 60ft (120m^3/h at 60m), and you require one pump to emulate two pumps in parallel, enter the pressure as **60ft** (**60m**) in the *Curve Fit* utility and the flow as **240gph** (**240m^3/h**). At least three sets of data are required for the curve fit utility. The A, B and C factors will be calculated and manually entered into the database for this new pump.

Pumps operate based on the required flow of a control valve or Mainline outlet or series of valves and Mainline outlets (system flows). The pressure supplied by a pump is the pressure the pump can produce when providing the required flow for the system (i.e., based on the pump curve) at any one point in time.

See also:

Other Hydraulics	*Section 3.8.4*
Pumps	*Section 3.8.10*
Using a Pump in a Design	*Section 2.9.6*
Using Pumps in Parallel	*Section 2.9.6.1*
Pumps in Series	*Section 2.9.6.2*

2.4.14 Working with Junctions

Pipes require a junction as pipes need to connect to a point object such as a junction, an outlet, a valve, or water supply.

Sometimes it is beneficial to place a junction in a design e.g., to specify where a change in pipe size should take place when using computer sizing. Elevations are only reported at junctions, so it may be desirable to place extra permanent junctions on very long pipe lines. Redundant junctions (i.e., those on a straight piece of pipe) are removed during design. If a junction is designated as Permanent (i.e., enable the "Permanent" check box in the *Pipe*, *Sprayline*, *Cut Pipe*, *Junction* or *Tools|Cut Lasso* dialog) it will not be removed during the design process.

There are three ways to place junctions in a design:

- Cut Pipe
- Cut Lasso
- Junction

Zone|Cut Pipe will connect junctions where the pipe cuts other pipes. The resulting pipe can then be deleted. When selecting *Cut Pipe* enable the "Permanent" check box to avoid the junctions being removed during the design process. This method would be used when there are several pipes requiring junctions, particularly if the required junctions need to be in a straight line.

Tools|Cut Lasso will connect junctions where the lasso cuts pipes. By selecting "Cut Only" and enabling the "Permanent" option a line of permanent junctions can be created, e.g., for elevation reporting.

Connect a junction where required on the pipe by selecting *Junction* from the *Zone* or *Mainline* menu, and enabling the "Permanent" check box. This ensures that the junction will remain throughout design and analysis and, in the case of computer sizing, the pipes each side of the junction will be sized individually.

To check that items are connected together select the junction and then select *Modify|Move*. If all items move with the junction they are connected. Alternatively, select a single hydraulic item and then select *Modify|Select|Connected* (or press <Shift>+<Ctrl>+C). This adds directly connected items to the selection, highlighting them in the selection color. If items are not highlighted as expected there is a problem with the connection.

If a junction can be seen where a pipe connects to other point objects (outlets, valves, water supplies, etc) then the item is probably not connected. Junctions should only be seen where pipes connect to each other or where pipes start or end.

The orientation of the junction symbol is purely visual; e.g., an 'orientated' square is a diamond shape.

See also:

Pipes & Pipe Sizing	*Section 2.4.7*
Cut Lasso	*Section 5.12.1*
Using Cut Pipe	*Section 2.4.7.2*

2.4.15 Defining Areas with Water Requirements

Irrigation Areas are useful in cases where the amount of water to be applied to an area and the required run time for the operation are important. Irrigation Areas (*Zone|Area*) are used to specify a group of controlled outlets or define sections of the design that have the same water requirements. These Areas are defined by placing a boundary around the required section. They are also used to automatically orientate and adjust the arcs of sprinklers within the *Area*. Any outlets that are placed within the *Area* are assumed to contribute to the *Area*.

The results of the area can be seen in the *Management Reports|Zone Flow Report* and *Water Requirements* report. In the *Management Reports* the *Zone Flow Report* will indicate the operation time required to to apply the amount of water specified in the *Area* dialog. The actual precipitation and the maximum precipitation (as entered in the *Area* dialog) is reported here also. The *Water Requirements* report shows the depth and volume of water applied over the Irrigation Area. The applied amount of water is based on the run time specified in Management (the *Assign Zones to System Flows* or *Zone Operating Times* dialogs), not on the operation time calculated in the *Zone Flow Report*. Adjust the run time in Management to the operation time calculated to see the applied amount of water during the calculated operation time.

Irrigation Areas must be closed before being used for calculating water requirements or specifying arcs. It is possible to connect on to a partially completed *Area* and then complete it. Individual *Areas* may enclose several zones, however an individual zone cannot span more than one *Area*. *Areas* may fully enclose other *Areas* but may not overlap them. The outlets within the inner small *Area* are assumed to contribute only to the small *Area* not the larger *Area* it is within. The small *Area* is not considered to be contributing to the large *Area*.

Areas are also used by IRRICAD to correctly orientate the arcs of part circle sprinklers. If *Areas* are not used it may be necessary to orientate the arcs manually. When an *Area* is placed initially the "Set Arc Orientation Using Area" check box controls whether arcs of outlets already existing within the *Area* are adjusted. Any emitters entered after the *Area* is closed, will automatically have the appropriate arcs selected (if variable or matched) and orientated.

The name of the *Area* can be changed manually in the name edit field, when placing an *Area* or can be set to a new default name in *Settings|Names* before drawing the *Area*.

See also:

Aligning Arcs with Boundaries	*Section 2.5.2*
Names	*Section 5.10.15*
Area	*Section 5.7.7*

2.5 Helping with Design Layout

This chapter looks at different types of designs and how to draw these in IRRICAD quickly and efficiently. It will outline the tools to use and point out the key issues for each design type.

2.5.1 Analyzing Existing Systems

IRRICAD is not only useful for designing new irrigation systems, but is also used for analyzing existing systems. To check the performance of the system analyze it to determine if:

- All outlets are operating within the required range.
- The pipe sizes are adequate.
- The well / pump is producing enough flow / pressure.
- There is a requirement to extend an existing system.

For a proposed extension the existing system may also require analyzing. Therefore enter the existing system in to IRRICAD in order to analyze the system and / or design the extension. Note that the existing materials can have their "Scope" changed to **Design Only** to ensure these existing items do not appear in the *Costing / BOM Reports* (see Making Changes to the Design or Drawing, Section 2.4.4. Alternatively, only selected items will appear in the *Costing / BOM Reports*.

To enter an existing system into IRRICAD all the details of the system to be analyzed will be required. This includes:

- Pipe types, sizes and lengths.
- Control valve descriptions.
- Outlet / irrigator descriptions.
- Working pressure at the outlets / irrigators.
- Water supply output and any restrictions.
- Pump curves for the existing pumps.
- Well details if applicable, well depth, drawdown, rising column details.
- Elevation data.

Before starting to draw the design, check all the existing hydraulic components are present in the database. Add any missing pipes or components with their hydraulic characteristics using the Database

Editor (see IRRICAD Database Editor Manual, Section 3). Once the items are available in the database, enter the existing system on the screen. When everything on the screen mirrors the existing system, proceed to connect the extension or proposed items to the design if required.

Enter the management data - use either *Design|Assign Zones to System Flows....* or *Design|Other Management Options|Zone Operating Times*. If many system flows are present, select up to ten (guideline only) system flows which may be the worse case scenarios. These are system flows containing zones that might be the ones that will prove to be over pressure, or under pressure. The pressure at the control valves can be set for existing zones in *Design|Zone Design Configuration* (see Section 5.13.7). Water supply pressures can be entered when placing the water supply in the design. The pressures used here can be entered to reflect a pump or a well with a pump attached (see Using Water Supplies, Section 2.4.12).

If the proposed system has **Computer Selected** pipe, run *LP Design* or *Velocity Design* to size the pipe. Before doing this, make sure that all existing pipe sizes have the "Computer Sized" check box unchecked. If this was not done when entering the pipe, select all the existing pipes and use *Modify|Change Type* to uncheck the "Computer Sized" check box for all sized pipe (see Specifying Groups of Items to Change or Delete, Section 2.4.4.1). If the water supply data has been entered run *Design|Mainline Design|Detailed Analysis* and view the reports (*Reports|Design Reports|*...).

Where the *Analyse* option is used, IRRICAD uses the nominal pressures and flows for the items in the system such as would be done in manual design calculations. When *Detailed Analysis* is used, IRRICAD requires a starting pressure, (set a "D/S Valve Pressure" pressure in *Design|Zone Design Configuration* for *Zone Design* or in the Water Supply "Design head" for *Mainline Design*). The starting pressure enables IRRICAD to be able to use a series of iterations (small calculations) to find the actual resulting flows in the system such as would be found in the field. This means that the *Analyse* option tends to be conservative in its answers and the *Detailed Analysis* option is more accurate and closer to the real field situation.

See also:

The Basic Design Process	*Section 2.3.1*
IRRICAD Database Editor Manual	*Section 3*

Entering Information into IRRICAD	*Section 2.4*
Pipe Sizing - LP Design Option	*Section 2.6.3.3*
Management & Designing the System	*Section 2.6*
Using Pumps in Design	*Section 2.4.13*

2.5.2 ALIGNING ARCS WITH BOUNDARIES

To align sprinkler arcs with the boundaries of the area to be irrigated can be a very time consuming operation to do manually. The wetted radius arc of part-circle outlets can be automatically aligned with a boundary by using Irrigation Areas. Any outlets inserted after the Irrigation Area has been placed will automatically be orientated. Make sure that before an outlet is selected, the "Create Wetted Radii" option is enabled in *Settings|Irrigation - Design Specific*.

Select *Zone|Area* to draw an Irrigation Area just outside the boundary of the area to be irrigated. If the outlets have already been drawn in the design enable the "Set Arc Orientation Using Area" check box. If the outlets have yet to drawn this box does not need to be enabled, as all arcs will automatically be aligned within the *Area*. When **Variable** arc or **Matched** outlets are placed within the *Area* the arcs will be automatically aligned with the Area boundary. If the outlets are **Matched**, the nozzle flow will be adjusted in proportion to the arc.

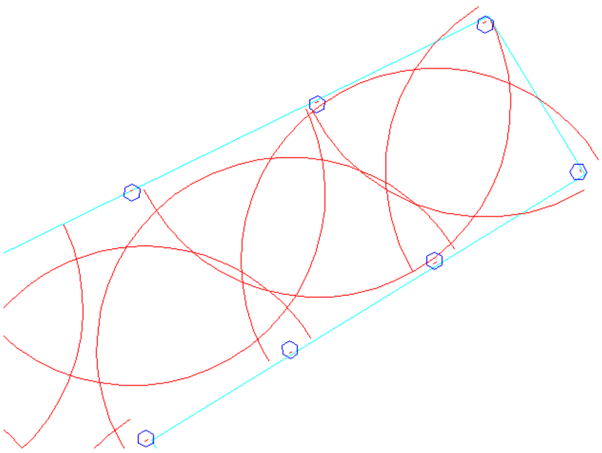


Figure 2-23 - Aligning Spray Arcs

Sprinklers, which are just inside the *Area* boundary, will have their arcs adjusted and oriented according to the *Area* boundary line. The intersection of the arc with the *Area* boundary, at a distance of half of the radius of throw of the sprinkler (not the full radius) is used to determine the arc. This means that sprinklers can over-spray corners and still maintain the correct arc (see Figure 2-23). When placing the sprinklers, arcs should be set to approximately the desired value if automatic arc orientation is to be used.

Arcs can also be manually rotated, globally or individually, by using *Modify|Rotate*. Select the arc or arcs to be rotated. Select *Modify|Rotate* and select an origin to rotate around. As the mouse moves the angle (a) will change on the status bar showing the angle of rotation from 0º. Click to place when the required angle of rotation is reached. *Modify|Change* can also be used on individual arcs to reset the "Start Angle" and / or the "Included Angle".

2.5.2.1 Outlet and Wetted Radii Arc Orientation

When an outlet is used in a design the symbol or wetted radius may not be drawn at the required orientation. The orientation can be changed as follows:

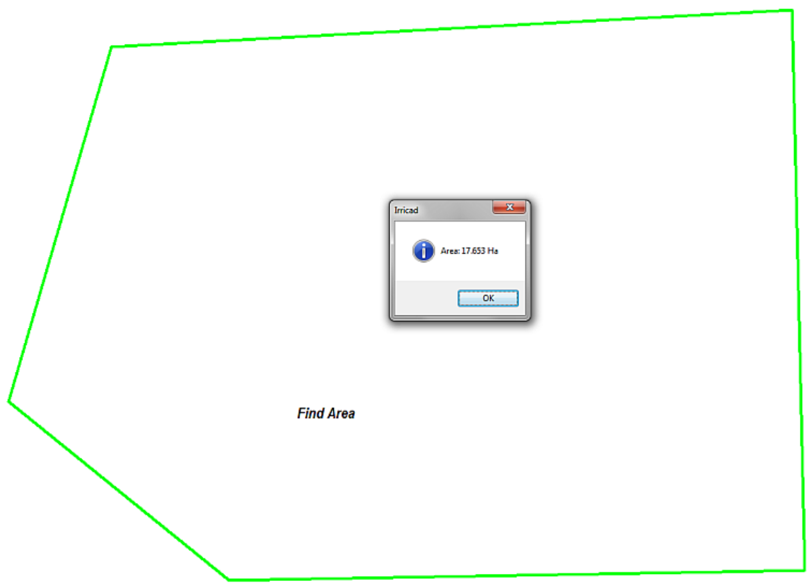
- Symbols can be rotated by using *Modify|Rotate* (see the angle of rotation from the starting point on the status bar) or by bringing up the *Outlet* dialog (using the *Change* or *Change Type* tools). Edit the current orientation of the symbol. This will alter the symbol orientation, by the figure entered, from the horizontal plane. If the arc or orientation of the outlet is changed, it will remain fixed at the new value.
- Arcs can be edited using the *Change* tool and clicking on the individual wetted radius. The drawing properties dialog allows the "Start Angle" (where the arc starts from) and the "Included Angle" (how big the arc is) to be edited. This allows for better positioning and a higher standard of presentation on the printed design.

See also:

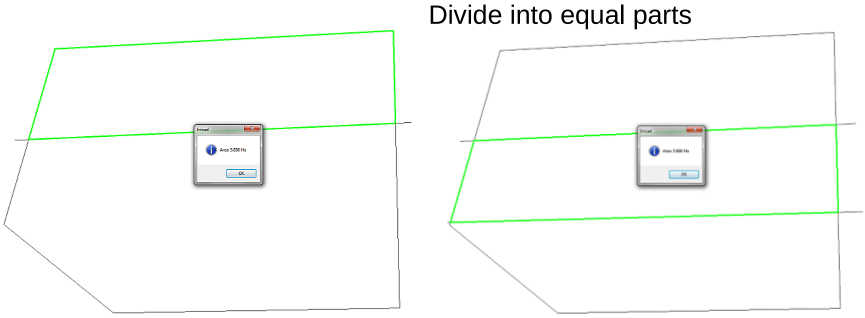
Defining Areas with Water Requirements	*Section 2.4.15*
Irrigation - Design Specific	*Section 5.10.8*
Area	*Section 5.7.7*
Rotate	*Section 5.11.13*
Specifying Groups of Items to Change or Delete	*Section 2.4.4.1*

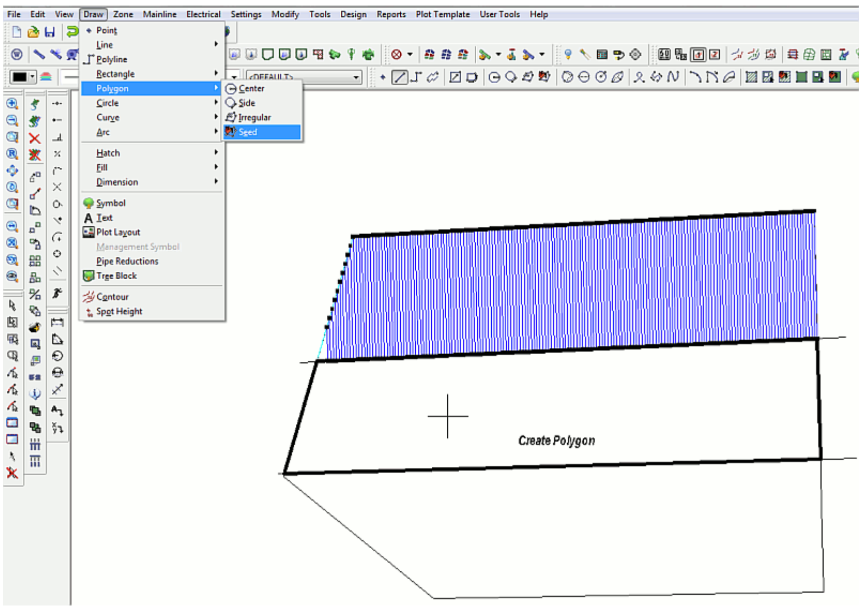
2.5.3 USING SHOW AREA TOOL TO MANUALLY SUBDIVIDE A REGION

1. Select *Tools|Show Area* and click inside the existing field boundary, or polygon, to check the total area of the field. Divide by the number of areas required to determine the target size of each subdivision.
2. Draw a construction line defining one of the sub-areas.
3. Using *Tools|Show Area* click inside the region defined by the field boundary and the construction line to check the area.
4. Move the construction line as a whole, or move points, as required.
5. Check the size again using *Tools|Show Area*.
6. Repeat steps 4 and 5 until correct area sizes are reached.
7. When the goal is reached convert this defined region to a polygon using *Draw|Polygon|Seed*, which can be used to create a block entity and subsequently subdivided further.
8. Repeat the process to form the other areas required for the main field subdivision.



Divide into equal parts





2.5.4 Blocks with Automatic Submains and Valve Placements

Block Entities retain the drawn boundary of the block tools as an Irrigation Area and ‘group’ the laterals contained by them. They also facilitate the automatic placement of submains, creation of block labels, and simplify the process of changing the type, spacing etc. of laterals.

Blocks of Tapes or blocks of Spraylines to be treated in this way can be created by selecting *Tape Irrigation Blocks* or *Spray Irrigation Blocks* from the *Zone* menu.

Most of the fields in these dialogs are self-explanatory. The fields in the Laterals tab have exactly the same function as those in the *Tape Block* or *Spray Block* tool dialogs. Similarly those on the Area tab are identical to those on the *Area* tool dialog.

2.5.4.1 LATERALS TAB

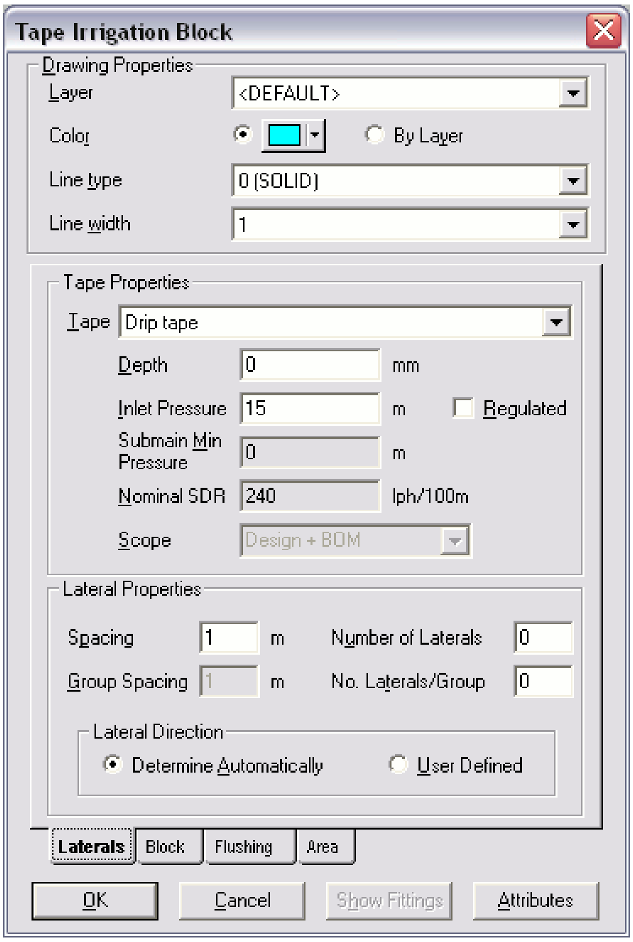


Figure 2-24 - Block Lateral Tab

No. Laterals/Group

If greater than zero the number of laterals in each group. If this field is set at zero then the "Group Spacing" field will be disabled and all laterals will be spaced identically.

Group Spacing

The spacing between groups of laterals (which will be spaced at the lateral spacing).

2.5.4.2 Block Tab

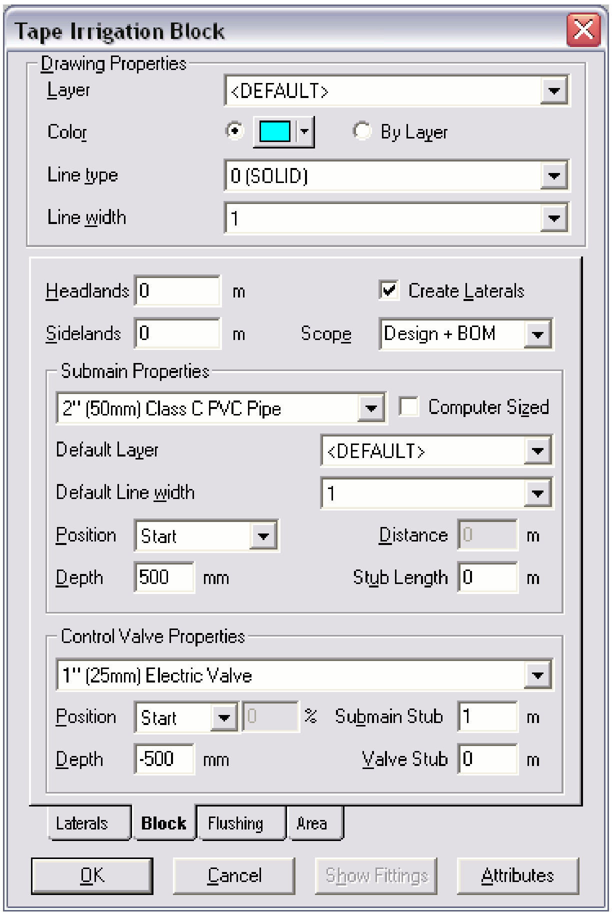


Figure 2-25 - Block Tab

Headlands

The distance between the drawn block boundary and the start and end of the laterals.

Sidelands

The distance between the drawn block boundary and the edges of the first and last laterals. Note that if the angle between the boundary and an edge lateral is greater than 30 degrees then the "Headland" value is used.

Create Laterals

If enabled laterals are created for the block.

Submain Position

Submains may be automatically placed and connected when the block is created. The options for the submain position are:-

Manual:	The submain will not be automatically positioned. Use the *Cut Pipe* tool to do this after the block has been created.
Start:	The submain will be positioned on the starting point of the laterals. Note this point is the one that corresponds to the point on the first lateral that is closest to the first point of the lateral direction line (the first point of the block boundary in the case of the automatic lateral direction option).
End:	The submain will be positioned on the end point of the laterals.
Center:	The submain will be positioned at the mid-point of all laterals.
Set Distance:	The submain will be positioned at the distance, specified in the "Distance" field, down the laterals. When the block is created a direction for submains is specified by selecting a side of the block polygon. The closest end of the lateral closest to this direction line determines where the distance is measured from. IRRICAD can also allow any line to be used when specifying the submain direction (i.e., not just block boundaries).

Default Submain Fields

These fields allow the properties of the submain to be set in exactly the same way as for the pipe or cut-pipe tool. Note that the individual submain segments, in a block, can subsequently be altered in the normal way with the change/change type tools.

Automatic Valve Positioning

Control Valves may be automatically connected when a block is created, similarly to submains. Note that this option is not available if the submain is manually placed. The options for the valve position are as follows:-

Manual:	The valve is not automatically placed.
Start:	The valve is connected to the start of the submain. The start of the submain is on the first lateral which is defined as the lateral closest to the line that defines the lateral direction.
End:	The valve is connected to the end of the submain.
Centre:	The valve is connected in-line halfway between the middle two laterals. When there are an odd number of laterals then the valve will be connected between the middle and preceding lateral.
Percentage:	Control valve placement in block entities can now be entered as a percentage distance along the submain. Choose Percent from the Control Valve “Position” combo and enter the required value. The valve will be positioned between the two laterals closest to the given fraction along the submain (i.e., the more laterals, the more accurate the positioning).

The appropriate valve can be selected from the drop-down and the depth, specified, if required.

When a block entity is created with the control valve automatically placed, the Zone Name assigned to the valve will be defined by the

“Name” field on the Area tab. The valve will be placed in the CONTROL_VALVES layer.

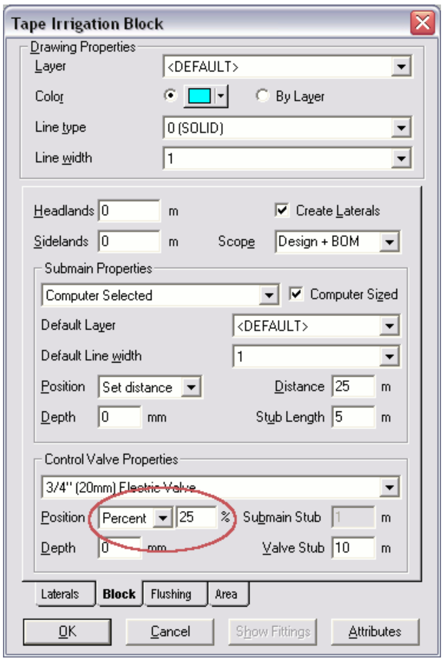


Figure 2-26 - Block Valve Placement Percentage

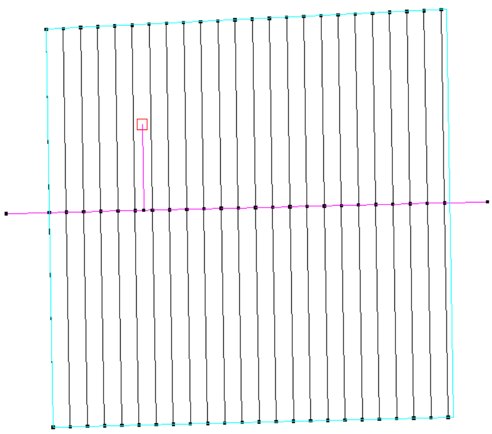


Figure 2-27 - Block With Valve At 25%

The Submain Stub

If the block valve is to be positioned manually, centrally, or at an 'internal' percentage (i.e., not 0% or 100%), this stub is the length of pipe at both ends of the submain, outside of the first and last lateral.

If the valve is positioned at the start or end of the submain, this stub is the length of pipe outside of the lateral at the 'non-valve' end of the submain.

The Valve Submain Stub

If the valve is positioned at the start or end of the submain, this stub is the length of pipe outside of the lateral at the 'valve' end of the submain.

If the block valve is to be positioned manually, centrally, or at an 'internal' percentage, this stub is unavailable.

The Valve Stub

This stub is the length of pipe between the submain and the valve. The pipe is placed in a direction parallel to the block laterals and toward the shortest lateral nearest the valve (this is generally toward the nearest block boundary in the lateral direction).

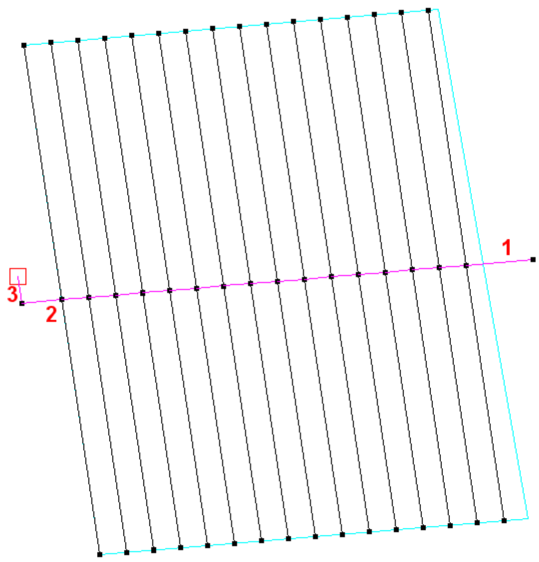


Figure 2-28 - Stub Lengths On Block

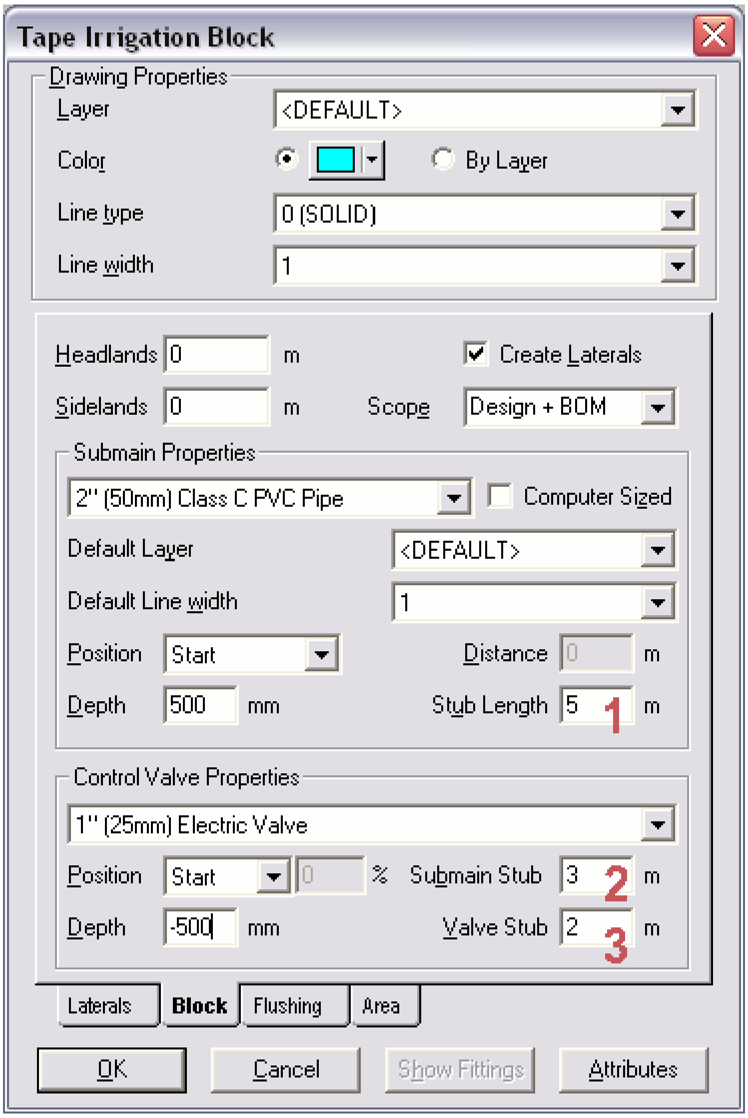


Figure 2-29 - Stub Lengths

2.5.4.3 FLUSHING TAB

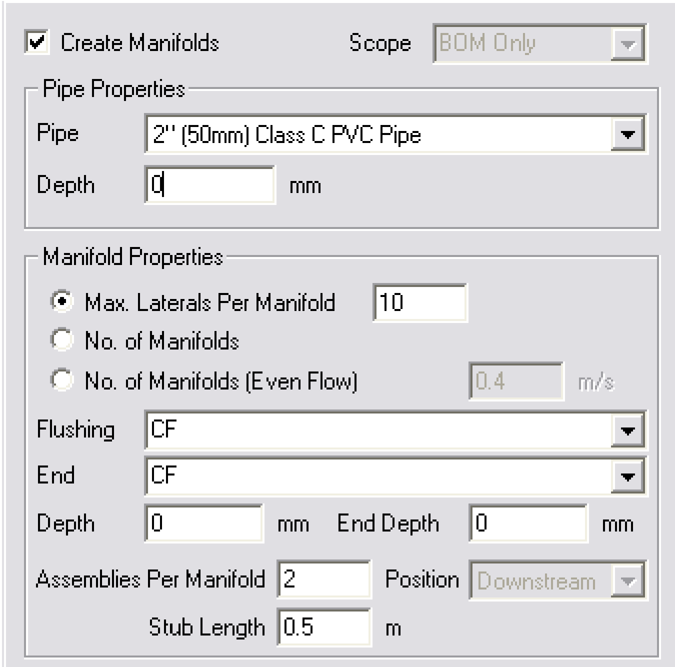


Figure 2-30 - Block Flushing Tab

This tab allows flushing manifolds to be automatically created. Since the manifolds cannot currently be ‘designed’ you must specify the pipe type. The manifold arrangement may be specified in a number of ways:

Max Laterals Per Manifold:	The manifold(s) are connected in even groups of up to the specified number of laterals.
No. of Manifolds:	The laterals are connected in even numbers to the specified number of manifolds (the number of laterals is evenly divided by the number of manifolds).
No. of Manifolds (Even Flow):	In this mode you must specify both a number of manifolds and a target outlet velocity. This velocity is used to calculate the outlet flow per lateral and this is combined with the nominal irrigation (emitter) flow. Laterals are connected to the manifolds such that the flow is evenly distributed to each manifold. Please note that

this velocity is used purely to balance the manifold flows, it does not guarantee that the specified outlet flow will be achieved and it is not a design parameter.

You may also specify one or two types of assembly that will be automatically attached to the manifold. If only one assembly per manifold is required, you must specify its location - upstream, downstream or centre. If two assemblies per manifold are required, the 'flushing' assembly is placed at one end of the manifold and the 'end' assembly is placed at the other. If more than two assemblies per manifold are specified then the assemblies are placed on the ends as above, and the required number of 'flushing' assemblies are placed at even intervals along the manifold.

A stub length may also be specified and it is applied to the ends of each manifold, prior to the assembly.

Scope

The "Scope" option is set to **BOM Only** and cannot be edited in this section. This is because zones containing Tapes within loops cannot be analyzed or designed and *LP Design* cannot be used for zones containing loops (and if included in the design process, flushing manifolds would inherently create this situation). In addition it would not be normal practice to design flushing manifolds under irrigation conditions.

For *Spray Irrigation Blocks* the flushing manifold pipes can be selected, once the block has been created and designed, and the "Scope" changed to **Design Only** or **Design + BOM** by using the *Change Type* tool. The flushing manifolds can then be analyzed if required.

2.5.4.4 INTERACTION WITH OTHER TOOLS

Most IRRICAD Edit/Change modifying tools can be applied to these 'Block Entities' - e.g., *Change*, *Change Type* (used to change multiple items at once), *Delete*, *Delete Type*, *Move*, *Copy*.

Notes:

Laterals within a block can be changed, as well as the line thickness and layer, by using Modify|Change on the block boundary to get the Irrigation Block dialog up.

Laterals within a block cannot be moved or deleted individually.

Manual sub-mains should be located using the Cut Pipe tool since this tool 'knows' to 'attach' the sub-main to the block. Ideally the Cut Pipe tool should also be used for all sub-main pipes in the block (not just the ones that 'cut' the laterals).

Blocks can be broken up into individual entities using the Explode tool.

2.5.4.5 DESIGNING WITH BLOCK ENTITIES

Once blocks have been placed they are treated in exactly the same way as blocks that have been constructed via *Tape*, *Sprayline*, *Tape Block* or *Spray Block*. Control valves should be attached to the sub-mains and then the design process followed as normal. Similarly for all other modules of IRRICAD.

2.5.5 SUBDIVIDING BLOCK ENTITIES

Before creating block entities regions can be manually subdivided and then made into block entities, which can then be further subdivided. The manual process is explained in Using Show Area Tool to Manually Subdivide a Region, Section 2.5.5.

Because block entities can not be manually adjusted, the Subdivide tool must be used to break the 'parent' block into smaller sub-blocks. This may be required due to the water supply limitations, plant type, soil type or simply different water requirements.

The *Subdivision* tool is selected from the *Tools* menu. The tool can be selected before the block (use <Alt> when selecting the block by clicking on any block item), or the block selected before actioning the tool.

Subdivision is separated into partitioning a block in the direction of the laterals, known as 'slicing', and splitting the laterals lengthwise or 'cutting' (normally perpendicular to the lateral direction). Blocks may be subdivided by either slicing or cutting or both.

When the subdivision dialog has been closed and the cut direction specified, a preview of the subdivision is displayed (Figure 2-32) and a dialog listing the proposed sub-areas is shown. The "Sub Areas" dialog can be moved (by clicking and dragging the title bar) allowing parts of the preview that are obscured to be viewed. If large areas are being subdivided opening the *Birds Eye View* (from the *View* menu) before starting the subdivision, will give access to the zoom tools which can be used to view the preview. Zoom tools can be selected by right clicking in the BEV or a new zoom window can be created by clicking and dragging with the left mouse button. For more information on the *Birds Eye View* see Section 5.5.11.

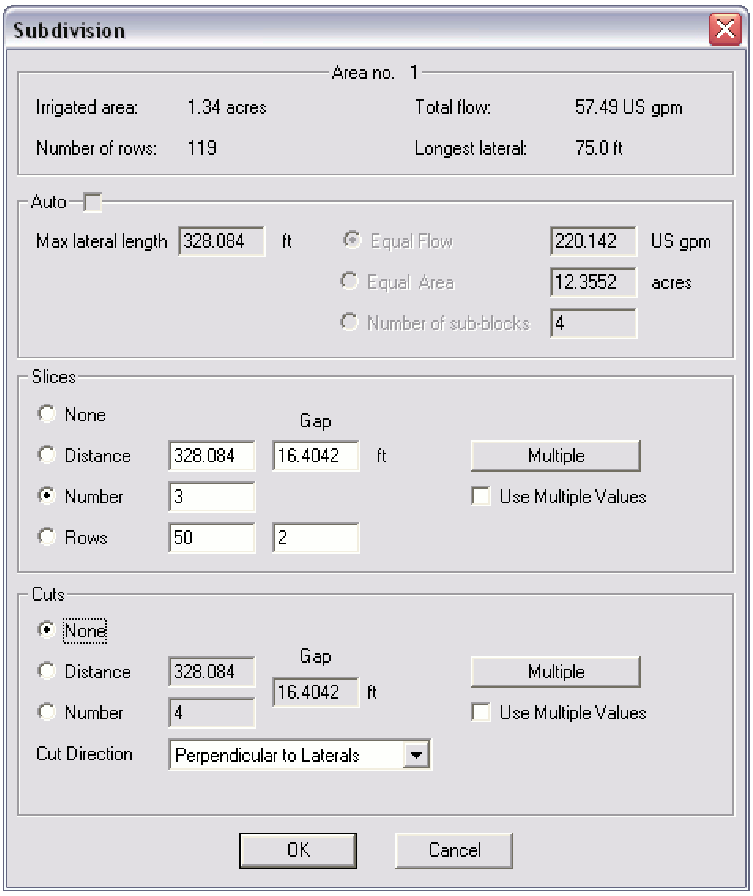


Figure 2-31 – Subdivide Dialog

Clicking the [Accept/View Changes] button with nothing specified in the "Join Sub-Areas" table will cause the preview dialog to close and the block will then be subdivided into the specified sub- areas. Clicking [Cancel] will return to the "Subdivision" dialog.

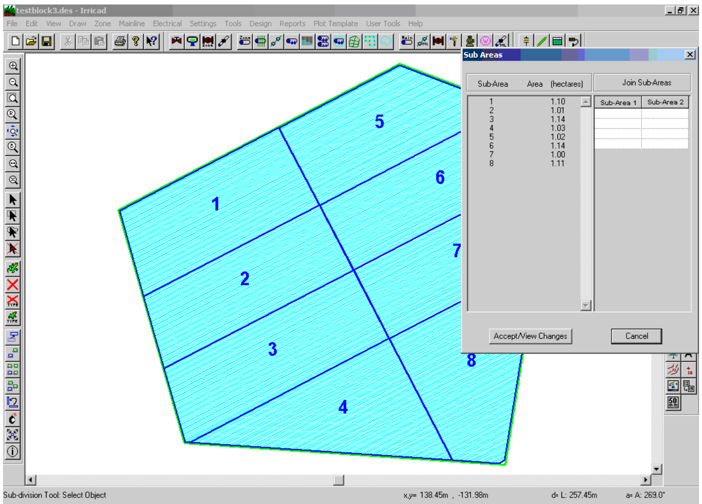


Figure 2-32

2.5.5.1 COMBINING SUB-AREAS

Sub-areas may be combined during the preview phase by entering pairs of sub-area identification numbers into the "Join Sub-Areas" table. Each pair of sub-areas will be joined together to form a new larger sub-area.

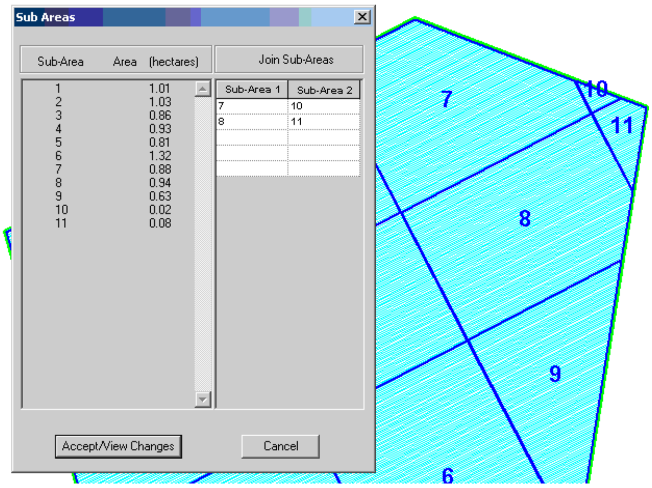


Figure 2-33

When there are entries in this table clicking [Accept/View Changes] will cause the preview to be updated and the dialog redisplayed. An example of is illustrated in Figure 2-34 below.

This process can be repeated and will in effect allow more than two areas to be joined together. After clicking [Accept/View Changes] areas 7 and 10 and areas 8 and 11 are combined.

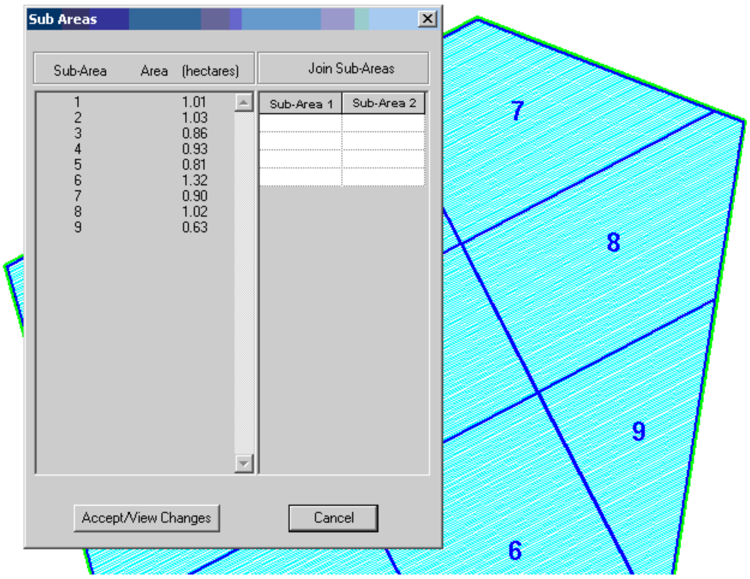


Figure 2-34

2.5.5.2 Subdivision Tool Notes

Submain Position

Sub-blocks created by the subdivision process will have the same submain position as the parent Block. This can be altered using the *Change* or *Change Type* tools. Laterals for sub-blocks are always created regardless of the setting for the parent block.

Re-subdivision

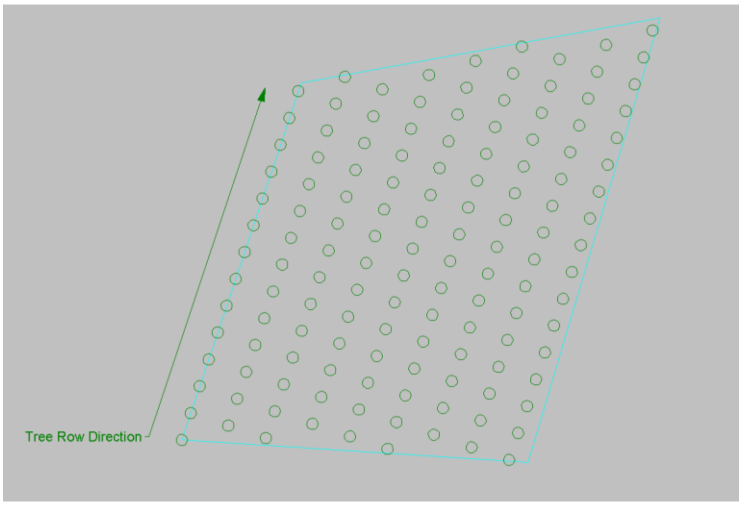
Blocks may be re-subdivided, when this happens any existing sub-blocks are removed when [OK] is selected. Subsequently cancelling from the operation will not restore the original sub-blocks.

Subdividing Sub-Blocks

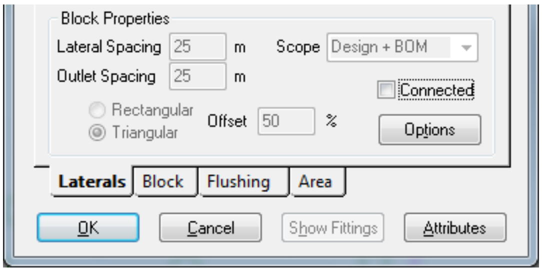
Any IRRICAD Block Entity can be subdivided. This means that blocks that are the result of subdivision can be further subdivided themselves. A useful application of this feature is where an irregular block needs to be subdivided into a number of equal areas and it is not critical that the cuts all line up. The block can be sliced without any cuts and then the resulting sub-blocks cut individually (without any slices).

2.5.6 How To Position Block Outlets Using Trees

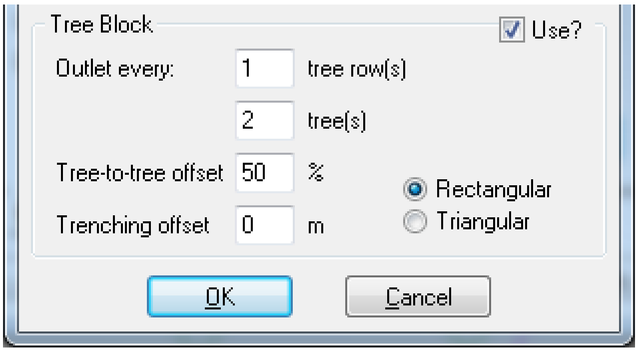
1. Draw a tree block, noting the tree row direction.



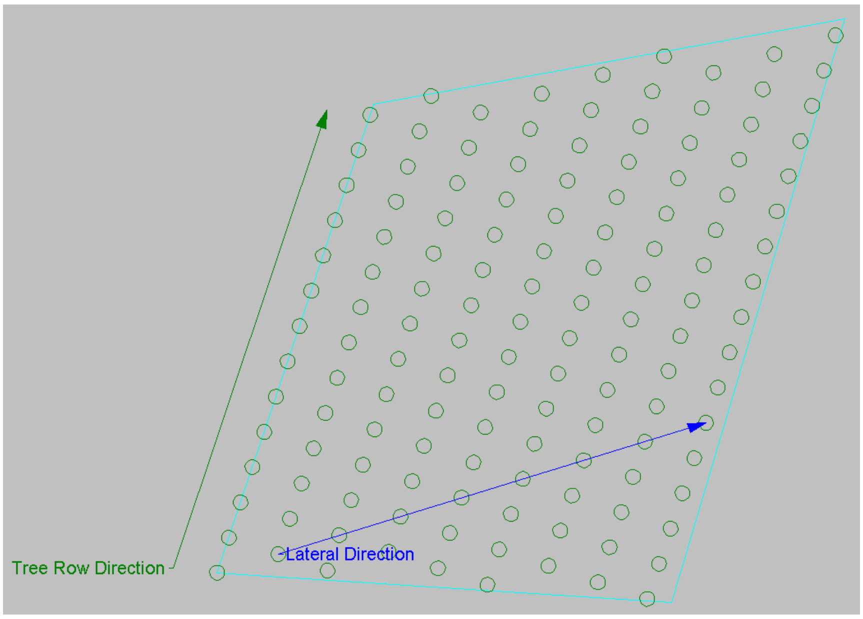
2. Select the tree block, then click *Spray Irrigation Block* ( ).
3. With the block in 'Use Trees' mode, the spacing parameters are unavailable. These values will be calculated from the tree spacing.



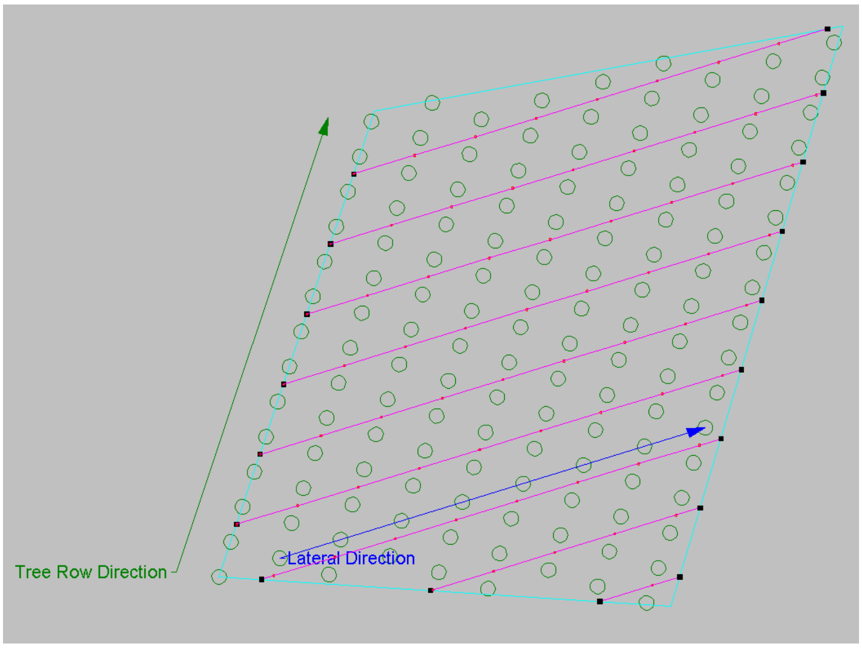
4. If your tree block is significantly irregular, an unconnected block may be the best option.
5. Click the [Options] button to access the 'Use Trees' settings.



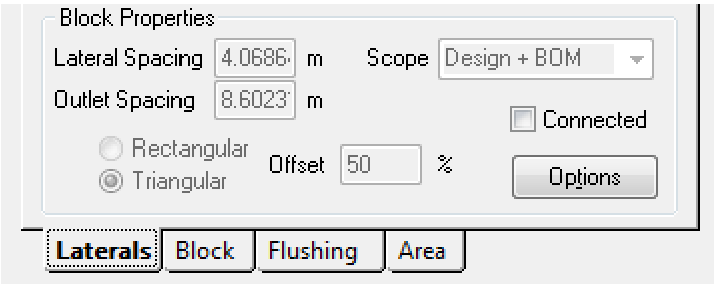
6. Choose an outlet arrangement, with reference to the tree rows, and then click [OK]. Click [OK] on the main block dialog too.
7. You will then be prompted to specify the lateral direction. This should be parallel to a line of trees, though obviously it need not be parallel to the actual tree row direction. Use the trees as anchor points to specify the direction.



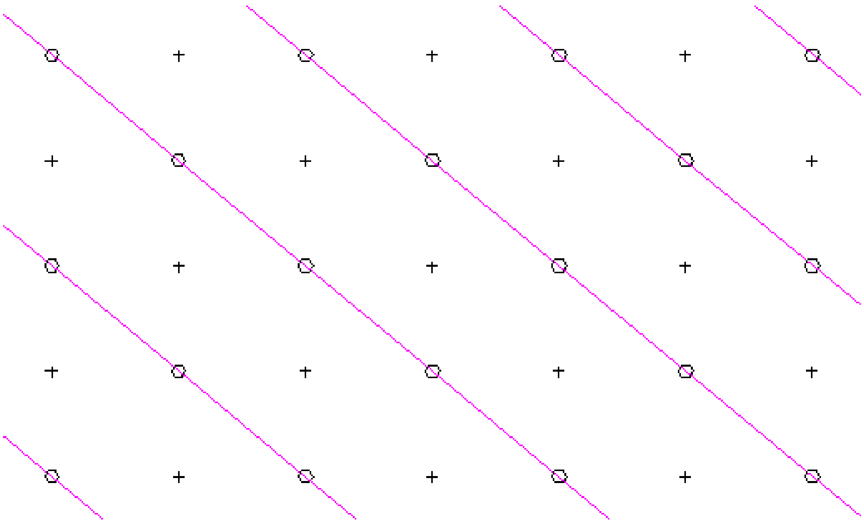
8. Next you will be prompted to specify the reference emitter position – click between rows at the approximate height of the required outlet. Once this is specified, IRRICAD will calculate the remaining outlet positions using the pattern entered in Step 6.



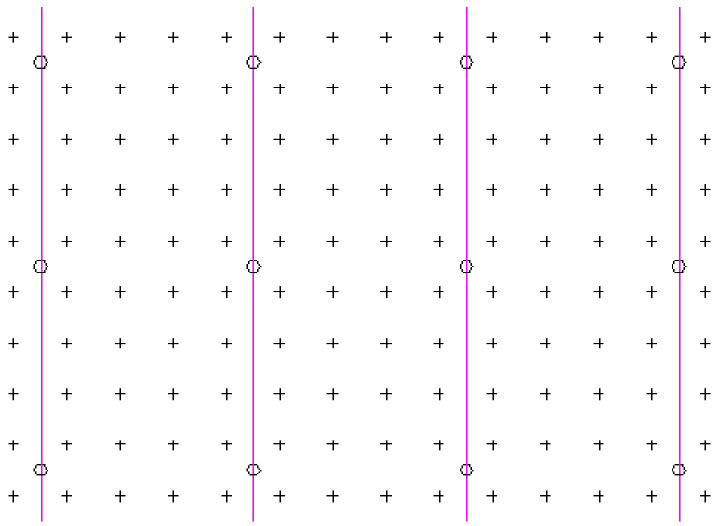
9. The lateral and outlet spacings for the block have now been calculated.



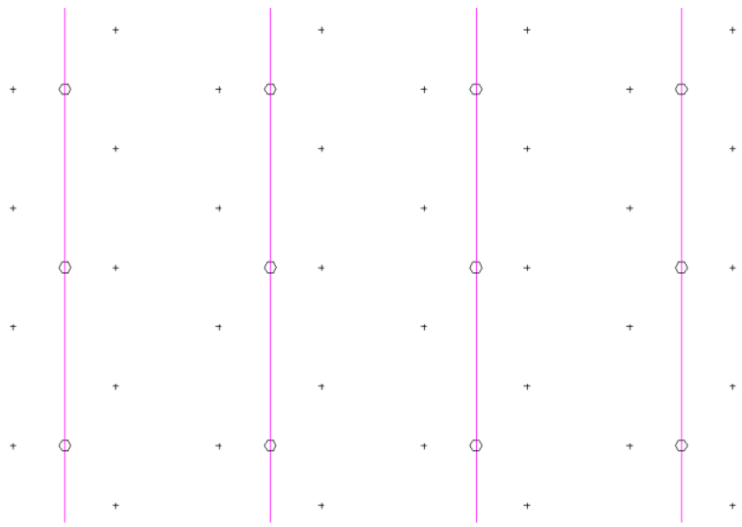
Examples:



Typical almond tree layout – every row and tree - triangular with 50% offset



Typical banana plantation layout – every 4th row and tree – rectangular with 50% offset and a trenching offset



Typical African oil palm layout – every 2nd row and tree – triangular with 50% offset and a trenching offset

Note: If a tree block has been created from a group of symbols (usually imported) the block may not be completely uniform. Sprinkler and lateral placement however will work in this case unless the tree placement is very non-uniform.

2.5.7 How to Layout a Design with Blocks of Laterals (without using Block Entities)

A large area of parallel spraylines or driplines (tapes) for an orchard, vineyard or field containing rows of crops may need to be designed. The following section details methods and IRRICAD tools that can be used to accomplish this.

Spray Block and *Tape Block* are layout tools used for entering a group of equally spaced parallel spraylines or tapes, respectively, in one action. This facility is commonly used to select and position laterals over a large area. Blocks are laid out by drawing the boundaries of the required group of laterals. Information on the physical arrangement (block properties) of these laterals is entered before the drawing process is commenced. Once entered, the spraylines or tapes are treated individually, i.e. the block laterals are retained as unique entities. If unconnected spraylines are used, once placed, each sprayline becomes a set of individual pipes and outlets.

2.5.7.1 Block Properties

A lateral spacing must be specified for the spraylines or tapes, indicating the distance between the parallel lines. The number of laterals in the block (enter a number) can be specified or left as zero (0) for IRRICAD to fill the block boundary with as many laterals as the lateral spacing will allow. If a number greater than the block boundary and lateral spacing will allow is entered, a message will be given to indicate the specified number and the number of laterals positioned after drawing the block boundary. If a number smaller than the block boundary is entered, IRRICAD will place the number required at the spacing specified.

The "User Defined" option for "Lateral Direction" indicates that the direction will be determined by drawing a line to indicate which way the laterals will run, rather than being determined by the first side of the block drawn on the screen. Alternatively, the lateral direction can be determined by the direction of the first side of the block boundary drawn - this is the "Determine Automatically" option.

Upon closing the lasso (*Right-click|Close* can be used for this or click to place a point on the starting point) the laterals will be drawn. If "User Defined" is selected for "Lateral Direction" then also draw a line to specify the direction of the laterals. Similarly, if "User Defined" for the "Reference Outlet" is selected, place a point to indicate the position of the first outlet (spraylines only). The laterals will be drawn automatically after the direction and / or reference position is specified.

2.5.7.2 Connecting a Submain (Manifold)

A tool is available to connect to the laterals placed by the *Spray Block* or *Tape Block* tools. *Zone|Cut Pipe* will automatically connect to all laterals or zone items it crosses. After selecting the tool draw a line through or along the end of the laterals, as required. Make sure that the pipeline crosses all the existing laterals.

If no block subdivision has been worked out it can be useful to enable the "Flow Check" while connecting up the submain. "Flow Check" is found in *Settings|Irrigation Items*. Check the "Enabled" check box and type in the maximum zone flow. Shown on the status bar will be f = and m = where m is the maximum flow that is entered in *Settings|Irrigation Items* and f is the flow through the currently connected tapes / spraylines. If the maximum flow has been exceeded, a warning message will appear. Click [Yes] to continue to connect to the next item or [No] to keep the flow under the maximum requirement and *Cut Pipe* will snap back to the last tape / lateral which was connected.

Note: *If Cut Pipe has been run through all the tapes / spraylines, and the total flow exceeds the maximum, upon pressing the [No] button, Cut Pipe will snap back to the starting position.*

2.5.7.3 Tools to Aid in Placing Laterals

Some tools are useful in aiding to draw the block boundary on the screen or positioning the laterals inside a fence boundary, for example.

The circular cursor is a useful tool to help place the lateral block the required distance from the boundaries (this creates the headlands and sidelands required). In *Settings|Drawing*, enable the "Circular Cursor" check box and enter a "Radius". The radius is equal to the distance from an existing object e.g., if the headlands are to be 5ft (5m), enter a radius of 5ft (5m).

"Grid" and "Snap to Grid" options can also be used to help with accurate placing of block boundaries and laterals. In *Settings|Grid/Origin/GIS* a "Grid Spacing" can be entered. In *Settings|Snap* the "Snap to Grid" option can be enabled where the cursor can only move between grid points. The grid points do not need to be displayed for "Snap to Grid" to work.

Blocks can be entered in one action with the option to delete out unwanted sections. Use *Tools|Cut Lasso* to delete, cut or change any laterals. *Zone|Sprayline* or *Zone|Tape* can be used to add extra laterals or to replace ones accidentally deleted.

2.5.7.4 Spray Block Tool

The *Zone|Spray Block* tool is used for multiple spraylines (connected and unconnected).

Note: *The Spray Block tool is only available as a zone item. Although the Mainline Sprayline option is also available this is merely a* *tool used for placing pipe and outlets at a required spacing and they are always unconnected.*

Outlet Spacing Properties

The "Block Properties" include "Outlet Spacing" properties. "Triangular" spacing indicates that the outlets will be offset between alternating the laterals. See Figure 2-35.

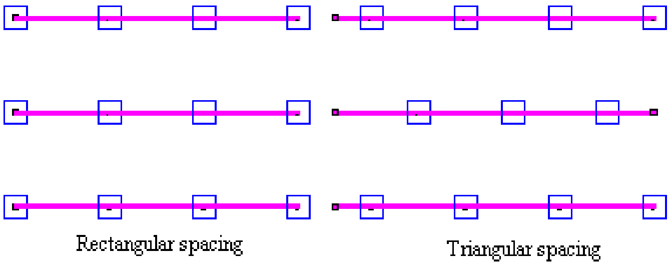


Figure 2-35 - Rectangular and Triangular Outlet Spacings

The value in the "Offset" edit field in the *Spray Block* dialog (as opposed to that of offset in the sprayline dialog) is the distance of the first sprinkler on the next row expressed as a percentage from the first sprinkler on the first row measured perpendicularly between the rows. If the "Rectangular" spacing has been selected the percentage change is cumulative. This moves the first sprinkler in each consecutive sprayline by the specified percentage change from the first sprinkler position on the sprayline above. If the "Triangular" spacing has been selected, the percentage difference only applies to every second sprayline. See Figure 2-36.

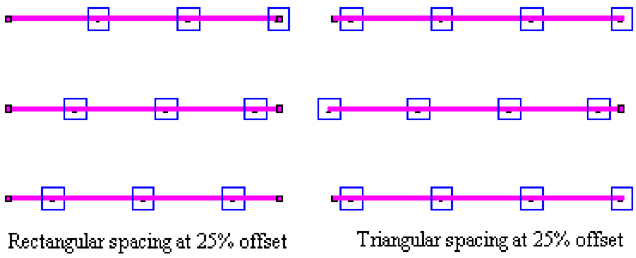


Figure 2-36 - Outlet Spacings With 25% Offset

The "Extra Outlets on Ends" option allows for extra outlets placed on the ends of the spraylines. If this check box is enabled, IRRICAD will position outlets on a lateral starting with the "Reference Outlet" and placing outlets at the designated spacing until the end of the lateral is reached. If the remaining length of pipe between the last outlet and the end of the lateral is greater than 50% of the "Outlet Spacing", an extra outlet will connected to the end of the lateral. This is treated as a separate outlet and does not form part of the connected sprayline.

The "User Defined" option for "Reference Outlet" indicates a starting or reference position for the first outlet to be placed. All other outlets in the block are placed relative to this known reference outlet. By default (i.e. "Determine Automatically" option) the reference outlet is assumed to be at the start of the first lateral drawn in the block.

Usually the "Create Sprayline Outlets" check box in *Settings|Irrigation - Design Specific* will be unchecked as there are likely to be a large number of outlets. To see the sprayline outlets enable the "Create Sprayline Outlets" check box in *Settings|Irrigation - Design Specific* before drawing the spraylines. If the spraylines have already been drawn, select the spraylines (*Modify|Select|...*) and select *Tools|Create Sprayline Outlets*. Turn the SPRAYLINE_OUTLETS layer on in the *View* menu (*View|Sprayline Outlets*).

To create connected sprayline wetted radii turn on *"Created Wetted Radii"* in *Settings|Irrigation - Design Specific* before drawing the spraylines. Aleternatively select the spraylines (*Modify|Select|...*) and use *Tools|Create Wetted Radii*. Turn the SL_WETTED_RADII layer on in *Settings|Layers* to display connected sprayline outlets' wetted radii.

> Note: *If sprayline outlets have not been created before drawing the spraylines, the Create Wetted Radii tool (in the Tools menu) will create both the sprayline outlet and its wetted radii.*

See also:

Working with Uniformly Spaced Outlets on a Pipe Section 2.4.10

2.5.7.5 Tape Block Tool

The *Zone|Tape Block* tool is used for laying out an area of equally spaced tapes (driplines).

Tapes are pipes with integral emitters at a relatively small spacing. Tapes have many emitters at a low flow, the flow is not constant during analysis and the small emitters are embedded in the internal wall of the tape. Connected spraylines tend to have higher flows than tapes and the flow remains relatively constant during analysis.

By enabling the "User Defined" check box for "Lateral Direction", and then enabing the "Polyline" check box bent tapes can be drawn.

See also:

Entering Driplines in a Design	*Section 2.4.11*

2.5.7.6 TURF

Turf irrigation systems include golf courses, parks and reserves, and landscape design. There are several situations where the *Spray Block* tool is useful for setting up these types of systems.

To place sprinklers at regular intervals over an entire area, e.g., a wall to wall watering for a golf course, use *Zone|Spray Block* (unconnected) with a "Circular Cursor" or "Grid" to help position the laterals. This will give parallel laterals and a regular sprinkler pattern, e.g., rectangular. Options such as "Extra Outlets on Ends" can be used to place additional outlets on the end of laterals when the outlet spacing is fixed. Pipes can be deleted and re-entered as required, especially if the block tool has been used to place sprinklers at a fixed spacing where the layout of the pipes is not required. See How to Layout a Design with Blocks of Laterals (without using Block Entities), Section 2.5.7, Tools to Aid in Placing Laterals, Section 2.5.7.3 and Spray Block Tool, Section 2.5.7.4.

For other types of turf systems where it is uncommon to use the block tool use *Zone|Sprayline*. Use Unconnected spraylines as described in Spray Block Tool, Section 2.5.7.4. Use "Circular Cursor" or "Grid" and "Snap To Grid" to place the spraylines an equal distance from the boundary all the way around. See How to Layout a Design with Blocks of Laterals (without using Block Entities), Section 2.5.7 and Tools to Aid in Placing Laterals, Section 2.5.7.3. This is particular useful when the area is oval.

See also:

Grid	*Section 5.10.6.1*
Spray Block	*Section 5.7.5*

Using Cut Pipe *Section 2.4.7.2*

2.5.7.7 Horticultural Systems

To lay a block of spraylines with drippers, sprinklers, or a block of dripline (Tape) for a horticultural or market garden design see How to Layout a Design with Blocks of Laterals (without using Block Entities), Section 2.5.7, Tools to Aid in Placing Laterals, Section 2.5.7.3 and Spray Block Tool, Section 2.5.7.4.

2.5.7.8 Summary

- *Blocks* are used to layout multiple laterals at a designated spacing.
- The physical arrangement of the laterals is entered before drawing the blocks.
- *Cut Pipe* is used to connect a submain to all existing laterals, or other zone items.
- "Circular Cursor", *Grid* and "Snap To Grid" are tools to aid in placing blocks or other items.
- "Outlet Spacing" properties are entered before drawing *Spray Blocks.*
- Tapes are not the same as Connected Spraylines.
- *Spray Blocks* can be used to place outlets at fixed spacing and the pipes deleted after placement.

2.5.8 Laying Out Sports Fields or Other Solid Set Systems

Sports fields come in different shapes and sizes, with different irrigating methods, management and design. This section looks at the basic shapes that are likely to be encountered and how to approach the drawing of such a design in IRRICAD. Designs of this type tend to have regularly spaced sprinklers in the center, and may have irregularly spaced sprinklers along the boundary of the field or area.

2.5.8.1 FOR RECTANGULAR FIELD

For a field that is a regular shape the *Spray Block* tool or the *Grid* tool can be used to help layout the sprinklers at a fixed spacing.

Using *Settings|Grid/Origin/GIS*, enter the desired outlet spacing as the X and Y "Grid Spacing". The grid can be set to have the outlets the required distance apart to achieve a good coverage and overlap of the wetted radius. This can be visually seen if the wetted radii are turned on (*View|Wetted Radii*). *Settings|Snap* - "Snap to Grid" can be used for drawing the field boundaries and placing outlets as the cursor can only move between the grid points. Pipe can be selected to connect to each outlet placed.

If the *Spray Block* tool is used to place the outlets the pipe can be deleted after placement if required. Use Unconnected spraylines (see How to Layout a Design with Blocks of Laterals (without using Block Entities), Section 2.5.7). *Grid* and "Snap to Grid" can also be used to aid with placement of the block in the design (see above). Alternatively "Circular Cursor" in the *Settings|Drawing Items* menu can be enabled to aid in drawing the block of laterals a specified distance from the field boundaries. If using the *Spray Block* tool is not preferred then each sprayline can be entered individually using the circular cursor to aid in the placement of the pipe and outlets. The distance between the spraylines should reflect the desirable overlap of the wetted radius of the selected sprinklers. For example, if the requirement is to have the sprinklers head to head then the distance should match the wetted radius. The circular cursor will help to ensure that the last outlet on the sprayline is at the required distance from the edge of the field.

Zone|Cut Pipe can be used to connect pipe or a submain to all zone items. It can be used across a row of sprinklers, connecting to each one automatically.

2.5.8.2 FOR AN OVAL FIELD

Viewing the field as a rectangle and two semi-circles is a way to approach an oval field design. The field can be drawn on the screen by using *Rectangle* and *Circle*. The *Break* tool can be used to erase the part of the circle inside the rectangle.

Draw an irrigation area boundary just outside the existing field boundary lines to orientate sprinklers to irrigate within the designated area by using *Zone|Area*. Enter as many spraylines (using *Zone|Sprayline*) within the field as possible. These can be Unconnected (the "Connected" box unchecked) and the pipes deleted after placement if required. If the sprinkler selected is a Variable or Matched sprinkler the spraylines drawn along the boundaries of the field will automatically be aligned to water inside the field (see Figure 2-37). If not, and half circle sprinklers are required, select an outlet or nozzle that allows for 180º arcs and place along the field boundary. All outlets and pipe can be moved or deleted and re-drawn.

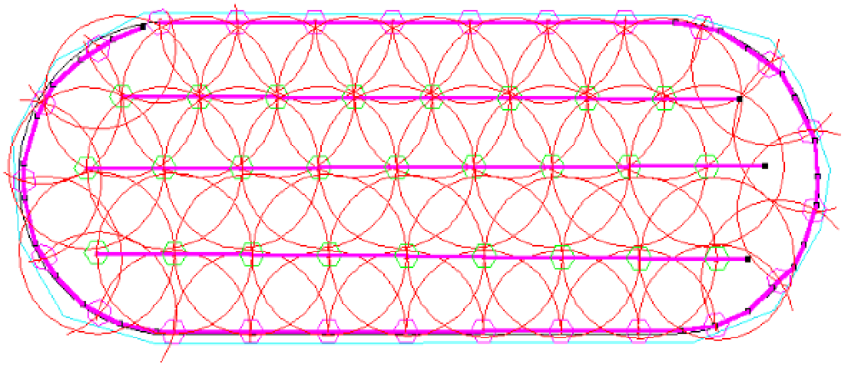


Figure 2-37 - Oval Sports Field

Use *Zone|Cut Pipe* to connect all outlets or spraylines to a submain.

2.5.8.3 FOR AN IRREGULARLY SHAPED FIELD:

Draw the outline of the field on the screen using the drawing tools. Use *Settings|Grid/Origin/GIS* and *Settings|Snap* – "Snap to Grid" to place spraylines or outlets in a regular pattern over the main area as described in How to Layout a Design with Blocks of Laterals (without using Block Entities), Section 2.5.7. Draw an Irrigation Area boundary along the existing field boundary lines to orientate part circle or variable sprinklers to irrigate within the designated Area by using *Zone|Area*. Place extra spraylines or outlets (*Zone|Sprayline*, *Zone|Outlet*) as required to encompass the outer boundary. The outer edges may not necessarily have regularly spaced outlets.

Use *Zone|Cut Pipe* to connect all outlets or spraylines to a submain. *Cut Pipe* will connect to any zone item it crosses or is within range (see Using Cut Pipe, Section 2.4.7.2).

2.5.8.4 SUMMARY

- Fill in regular shaped areas using *Spray Block*, *Sprayline*, "Circular Cursor" or *Grid* to help with placement of outlets.
- Use *Area* to orientate sprinkler arcs.
- Draw a sprayline or place outlets around the boundary of the field to complete.

2.5.9 AUTOMATICALLY PLACING SPRINKLERS FOR SMALL PARK OR RESIDENTIAL DESIGN

Zone|Autohead is a tool that can be used to automatically place sprinklers in small irregularly shaped areas, like those found in domestic or small commercial turf systems. It should be used as a fast way of placing sprinklers in an area, with final adjustments made using *Modify* tools such as *Change*, *Move* and *Copy*.

Autohead will place sprinklers on the boundary and work into the center; the center then tends to have irregularly spaced sprinklers. Hence it works best when there is not much center to fill in. With larger sports fields and parks *Autohead* is not usually used, as it is desirable to have regularly spaced sprinklers in the center and acceptable to have irregular spaced sprinklers on the boundary of the field. However, with smaller parks and residential landscape design *Autohead* is a valuable tool.

When *Zone|Autohead* is selected specify a representative sprinkler body, nozzle, and riser for the area in exactly the same way as an outlet would be selected. *Autohead* attempts to match the precipitation rate of all sprinklers within the area to the precipitation rate of the selected sprinkler. It does this by choosing appropriate nozzle sizes and arcs from the range available for that sprinkler. For this reason, ensure to select an outlet that has a range of suitable nozzles and arcs available in the database. *Autohead* works best with **Matched** or **Fixed** sprinklers.

If the sprinkler has **Matched** precipitation rate nozzles with variable arcs, make sure that a sprinkler with an appropriate radius of throw for the job is selected, as only one nozzle needs to be used. If the sprinkler has non-matched **Variable** arc nozzles, a range of nozzle sizes should be available in the database to give roughly equal precipitation rates over the range of arcs expected. Generally, this means that if a nozzle with a 360º arc as the representative sprinkler is selected, it should be one of the larger nozzles in the range so that smaller nozzles can be selected for 180º arcs and 90º arcs, and so on. When a sprinkler has **Fixed** arcs (such as many of the pop-up spray heads available), a full range of arcs and nozzle sizes should be available to allow the precipitation rate to be matched. As with **Variable** arc nozzles, the representative nozzle / arc combination that is selected should take this into account.

Once the representative sprinkler is selected, click [OK] on the dialog. The status bar will show the tool is in Lasso mode. Draw in the *Autohead* boundary for the automatic sprinkler placement using the lasso in the same way as for *Show Flow* boundaries. After closing the area, the automatic head placement will take place. Note that *Autohead* selects but does not orientate part circle arcs. If correct orientation is required, use *Zone|Area* to first draw a boundary just outside the location of the *Autohead* boundary (see Aligning Arcs with Boundaries, Section 2.5.2).

Once the *Autohead* has been completed for an area, further areas (using the same sprinkler) can be drawn and have heads automatically placed. To terminate the *Autohead* placement tool, select another tool or command.

Two warnings may occur during *Autohead*:

Cannot correctly space selected sprinkler along area edge
This means that the length of one or more of the area boundary lines does not allow sprinklers to be spaced along it within the overlap ranges set in *Settings|Irrigation Items* – "Autohead Spacing Limits". If this happens, IRRICAD will place the sprinklers as close as possible to the limits.

Autohead, where possible, will space sprinklers so that the overlap lies between the minimum and maximum values. The default values are 40% minimum to 60% maximum. (A 50% value corresponds to head-to-head spacing). Reduce these values for closer spacing (e.g., in windy areas), or increase them for wider spacing.

Required nozzle arc not found for selected sprinkler
IRRICAD has not been able to find a nozzle / arc combination that gives the precipitation rate required. The nearest available arc will be selected.

See also:

Irrigation Items — *Section 5.10.9*

2.5.10 SPRINKLERS IN ODD-SHAPED AREAS

For odd-shaped areas, the aim is to achieve relatively even precipitation over the area.

Zone|Area can be used to orientate part circle sprinklers within the boundary to be irrigated (see Aligning Arcs with Boundaries, Section 2.5.2). Several tools are available to help with placement of outlets in an odd-shaped area. *Settings|Grid/Origin/GIS* can be used to help place outlets at the required distances apart. Enter the grid point distance in "X" and "Y" (e.g., 5ft (m) for both will give a 5 x 5ft (m) grid). *Zone|Sprayline* is useful when placing pipes with outlets. Use the unconnected option (uncheck the "Connected" box) and specify no fixed spacing (Options button on *Zone|Sprayline* dialog and uncheck the "Fixed Spacing" check box).

Zone|Autohead can be used for small irregularly shaped areas. Select the required sprinkler, nozzle and arc. Draw a boundary for *Autohead* to work within inside the *Area* boundary if used.

See also:

Automatically Placing Sprinklers for Small Park or Residential Design Section 2.5.9
Area — *Section 5.7.7*
Sprayline — *Section 5.7.2*
Irrigation Items — *Section 5.10.9*

2.5.11 USING MAINLINE OUTLETS

If designing a system using *Mainline Outlets* rather than zones (control valves and zone outlets), the main differences are:

- All pipes are mainline pipes.
- All outlets are mainline valve-in-head outlets (sprinkler with a valve) and therefore mainline outlets are considered as separate zones.
- No control valves are required.

Connect the *Mainline|Outlet* on the *Mainline|Pipe* after choosing the outlet and nozzle required. Risers can be selected if applicable to the situation. The *Mainline|Sprayline* tool can also be used to quickly place equally spaced valve-in-head outlets. Note that this tool does not actually create a lateral since the spraylines are assumed to be unconnected (individual pipe and outlet once placed).

Because the outlets themselves are assumed to have an on / off switch like a valve, a control valve is not required to create the zones. If other valves are necessary for the design, use *Mainline|Misc. Hydraulic* valves (valves that have been entered into the Other Hydraulic component group of the database) rather than Control Valves. For each mainline outlet positioned in the design a zone is created and named accordingly - default name zone 1, zone 2, etc.

The default names can be changed in the *Settings|Names*. The default name can be changed for the immediate action by selecting *Default Name* in the *Right-click* menu after selecting the *Mainline|Outlet* or the Sprayline tool but before placing the item on the screen.

Note that, although there are no zone items, it is still necessary to carry out the *Zone Design* function in order to set up the required pressures and flows for each zone. Select *Design|Zone Design|Analyse* to do this. Then run management and the *Design|Mainline Design* options.

2.5.11.1 VALVE-IN-HEAD SPRINKLER SYSTEMS

Valve-In-Head Sprinkler designs are an example of a mainline design using mainline outlets. Each sprinkler used is a *Mainline Outlet* with on / off control. Select the valve-in-head sprinkler from the *Mainline|Outlet* dialog where the sprinkler has been previously entered and enabled in the database.

If the *Mainline|Sprayline* tool has been used to place sprinklers, the default names for the zones are Sprayline 1-1, Sprayline 1-2 for outlets on Sprayline 1, and Sprayline 2-1, Sprayline 2-2 for outlets on Sprayline 2, etc. Via *Right-click|Default Name* the name can be altered for the current action, or via *Settings|Names* for the design or saved as a default for all new desgns . This makes the naming of many valve-in-head sprinklers, for example in a golf course design, flexible and easy to use.

2.5.11.2 STOCK WATER SYSTEMS

Mainline outlets can be used in a stock water supply design. An outlet is entered into the database to reflect the hydraulic characteristics of water discharging through a ballcock valve.

If only one set of data is available (the flow through a valve at a specified pressure) enter the Index as 0.5. Calculate the Constant to solve the equation Q = Constant x Pressure$^{0.5}$. If more than one set of data is available for the valve, enter the pressure / flow combinations into the Outlet Flow *Curve Fit* utility (*Database Editor|View*). Use the Constant and Index generated when creating a nozzle for the trough.

Alternatively, a demand point can be used as the water trough. When placing a demand point, specify the flow and pressure required at that point. This is useful if the decision has not been yet made on the valve to use. Depending on the valve, only 7 – 15psi (5 – 10m) pressure may be required at the valve – just enough to get the water out into the trough. Some valves will have a higher headloss than others.

The newly entered outlets or demand points are placed on the pipe system where a water trough is to be situated, or already exists.

Management is determined by a series of troughs running at the same time or potentially running one at a time.

It is fairly common to have a pumped system up to a tank and then gravity feed to the water troughs. In this case, two separate systems need to be designed, the first with the pump (at the water supply) supplying a tank (the outlet), and the second with the tank (the water supply) supplying the troughs (outlets). In the first case, where the pump is supplying the tank, the tank can be a demand point (see Simple Mainline Design - Using Demand Points, Section 2.5.11.3) or entered into the database as an outlet / nozzle combination with a pressure / flow relationship. If an outlet / nozzle combination is used, the outlet needs to represent an open pipe scenario (normally filling a tank is approximately the same as discharging into the atmosphere). In this case the formula $v^2/2g$ can be rearranged to find the pressure discharge relationship for the nominal outlet giving an approximate 'emitter' equation of $Q=KH^n$ where:

K = D^2 x 12.5218 (where D is the pipe diameter is in mm)

and 'n' = 0.5.

These values may be subsequently used in the constant and index fields for outlet flow in the database Outlet dialog.

Note this method does not allow for any pipe exit losses.

2.5.11.3 Simple Mainline Design - Using Demand Points

Demand Points are very useful when designing a mainline system where the flow and pressure requirements are known at certain points. The pipe system can be designed or analyzed and the system duty calculated.

An example is hydrants for a travelling irrigator. Where a **Demand Point** can be used for any situation it is usually only used for a quick design or analysis of a system. As long as it is known what pressure and flow required at the hydrant to run the irrigator hose and cover any headloss through the hydrant, hose, and irrigator then a demand point may simply be placed at each hydrant and a suitable mainline connected to these demand points. Select *Mainline|Outlet* and select a known **Demand Point** that has been entered into the database prior. Enter the "Pressure" and "Flow" required. Place on the design or connect to a mainline pipe.

This method can be helpful in presenting the basic requirements of the system. Demand points can be used for a quick idea of the system capabilities without having to get into the intricacies of all the components that are downstream from the hydrant.

See also:

Outlets *Section 3.8.11*

2.5.11.4 Summary

- *Mainline Outlets* are assumed to have on / off control and are therefore zones.
- *Zone Design|Analyse* and Management needs to be completed before running *Mainline Design.*
- **Demand Points** can be used to designate flow and pressure requirements at placement points.

2.5.12 WHEEL LINE (SIDE ROLL) SYSTEMS

Wheel line or side roll systems can be entered in to an IRRICAD design as a *Zone Sprayline*. The active hydrant (the hydrant selected to be represented as a drawn wheel-line) is entered as a *Control Valve* and the idle hydrants drawn as **Demand Points** using *Mainline|Outlet*. Each hydrant becomes a zone. If a system has two wheel lines operating at the same time, they would both be entered as spraylines and there would be two active hydrants (control valves).

Draw in the wheel line as an unconnected sprayline. A "Riser" can be selected. This can be a custom-made wheel line sprinkler riser assembly, which uses components that take into account the height from the ground. Note that a riser must be used for any system where the outlets are above the ground. All sprinklers are assumed to be at ground level regardless of the height above or below ground the pipes may be at. All sprinklers connected to pipes above the ground require a "Riser" or Outlet Connector with the appropriate height data. Because a "Riser" is not physically required in the field in this case, as the sprinklers are connected straight into the sprayline, it is suggested that a "Riser" is added with no pressure loss and no cost in the database. The "Risers" and corresponding fittings can be edited out of the reports if required.

Place the wheel line (sprayline) on the screen. Make the length of the wheel line relative to the lengths able to purchase the aluminum pipe in. For example, if it is obtainable in 40 foot lengths, run the line out to a number divisible by 40 and add an extra 20 feet for the hose from the hydrant to the wheel line.

Place the Control Valve at the end of the wheel line to represent the active hydrant. Use *Mainline|Outlet* to represent other hydrants as **Demand Points** (see Simple Mainline Design - Using Demand Points, Section 2.5.11.3). An appropriate "Riser" can be selected with the **Demand Point**. The required "Flow" and "Pressure" at the hydrant can be entered. Set the "Pressure" and "Flow" for the demand points, as required for the pressure and flow to be available in the mainline at the hydrants. The pressure is an upstream pressure, not a downstream pressure. Allow for the losses through the hydrant, losses through the sprayline and any elevation changes. Grid points (*Settings|Snap* – "Snap To Grid") can aid in the placement of the items in this section. Use a grid point spacing that enables you to calculate distances easily for example, if the hydrants are 60ft (18m) apart logical grid spacing would be 60 x 60 (18 x 18).

Mainline|Pipe is used to connect the **Demand Points** and *Control Valve(s)* to the *Water Supply*. By running the *Mainline Pipe* out past the last hydrant or *Control Valve*, IRRICAD will tee the mainline into the last hydrant rather than elbow into it.

The design is now ready to be analyzed. Analyze the Zones (*Design|Zone Design|Analyse*). If the *Mainline Pipe* has been left as "Computer Sized", run *Design|Mainline Design|LP Design*.

2.5.13 TRAVELLING IRRIGATOR SYSTEMS

Travelling irrigators have turbines, piston drives or other mechanical methods to move the irrigator via water pressure. This often produces a pressure loss that will need to be taken into account to simulate a true picture of what is happening in the field. These items will need to be added to the database with the correct hydraulic characteristics as outlet connectors, other hydraulics or hydrants.

Travelling Irrigator designs tend to be mainline designs using *Mainline Outlets* where each outlet is a zone. If only one irrigator is running at any time, select *Assign Each Zone to a Unique System Flow* to automatically set up the management of the system.

If two or more irrigators are running at a time then each system flow will have two or more zones operating on it.

There are several ways to design a travelling irrigator system:

- Placing each item.
- Combining hydraulic properties.
- Using Demand Points.

2.5.13.1 PLACING EACH ITEM

In this method the individual item is placed as required in the design.

Create a fixed outlet (**Fixed** arc) for the irrigator in the database. The nozzles will express the necessary pressure / flow relationship as calculated by the *Curve Fit* utility from manufacturer's data (see Curve Fit, Section 3.5.1). Each nozzle will have a different pressure / flow relationship. Even though an irrigator may physically have many nozzles, IRRICAD requires one nozzle to be used at a time to reflect the hydraulic characteristics of the many physical nozzles for the entire machine.

Create an Outlet Connector for the hose. If the hose is a flexible hose, the “Equivalent Length Diameter” may be different to the nominal diameter e.g., 114mm flexible hose may have an internal diameter of 120mm when under pressure. To calculate the “Equivalent Length Diameter” use trial and error to achieve the required headloss based on the manufacturers information. To do this, connect an *Outlet* with the “Riser” to a length of *Pipe* in IRRICAD. Connect a *Control Valve* to the pipe and set up the management of the system to be one zone operating on one system flow. Run *Design|Zone Design|Analyse*. Check the reports to find the headloss through the length of riser (*Reports|Zone Design Reports|Zone Design Full* - find the section labeled Inflows and Outloss). Change the “Equivalent Length Diameter” in the database for the Outlet Connector (“Riser”) until the headloss is correct.

If the outlets are above ground level, this static lift can be accounted for as “Height” in the Outlet Connector component group dialog. For example if the outlets on the irrigator are physically 10ft (3m) above the ground, enter **10ft** (**3m**) in the “Height” edit field.

If the travelling irrigator uses a drive method that has a significant pressure loss an item will need to be created in the Other Hydraulic component group in order to allow for this pressure loss. A Headloss Equation Constant, Index and Intercept is required. It may be difficult to attain manufacturer's data on the losses, and the values may not be fixed as a change in speed could result in a change in headloss. If this is the case, make a guess at the average pressure change between the inlet to the drive and outlet of the drive. This pressure change will depend on the amount of power used, which is relative to the speed of the drive. The equation used to calculate the pressure loss is $H = KQ^n + C$, where H is the pressure loss, Q is the flow, K is a constant, n is an exponent and C is an intercept. If n is estimated to be approx. 1.5 the equation can be solved for K. If K and n remain at 0, C can be used to include an estimated loss e.g., 4ft (m). Connect the *Misc. Hydraulic* item slightly upstream from the *Outlet*. Do not connect the *Misc. Hydraulic* item directly to the outlet.

The outlet in most circumstances will be a *Mainline Outlet* connected to a *Mainline Pipe*. The *Misc. Hydraulic* items will also be selected from the *Mainline* menu and connected to *Mainline|Pipe*.

2.5.13.2 Combining Hydraulic Properties

This method would be more commonly used and involves placing an outlet that will account for the losses through the drive system. This means that only one item is placed on the mainline pipe per irrigator position. The outlet and nozzle will need to hydraulically account for the nozzle flow and turbine losses. Measure the pressure / flow relationship at the inlet of the irrigator and the flow at the nozzle. At least three sets of pressure / flow data are required. Use the constant and index generated by the curve fit utility (see Curve Fit, Section 3.5.1) in the Nozzle dialog by entering the pressure / flow data (pressure going into irrigator inlet, flow coming out of nozzle). This method may not be as accurate as the above method, because change in irrigator travel speed will affect the pressure / flow relationship.

Create the Outlet with a **Fixed** arc type, nozzle and outlet connector as above (in Placing Each Item, Section 2.5.13.1), using the new constant and index for the Nozzle dialog. Connect the *Outlet*, "Nozzle" and "Riser" (selected using *Mainline|Outlet*) to the *Mainline Pipe* at the hydrant positions.

2.5.13.3 Using Demand Points

Another method is to assume a required pressure and flow at the hydrants to run the irrigator. The assumed pressure will need to take into consideration any headloss that may result between the hydrant and the nozzle, with enough pressure to supply the required flow.

Create the **Demand Point** in the Outlet component group in the database. Select **Demand Point** as the "Arc Type". When selecting the demand point from the *Mainline|Outlet* dialog the default "Pressure" and "Flow" can be entered as required. Place on the design where hydrants are required.

See also:

About Assemblies	*Section 3.7.3.1*

2.6 MANAGEMENT & DESIGNING THE SYSTEM

This chapter looks at specifying how the system is divided and run, the designing process and using the program to select all the fittings to complete the list of materials required.

2.6.1 SELECTING A MANAGEMENT PRACTICE

Management is defined as entering zone control information to inform IRRICAD how the system will be operating. Worst case scenarios can be used, or all zones entered.

The options are:

- *Assign Zones to System Flows* – where the zones to run together are selected graphically on the screen.
- *Assign All Zones to One System Flow* – where all zones are automatically operated on System Flow 1.
- *Assign Each Zone to a Unique System Flow* – where each zone is given its own system flow number to operate on.
- *Other Management Options* – this gives three more options:- inputting *Water Supply Times*, *Zone Operating Times* or manually filling in the *Assign System Flows to Zones* table.

Select a Management option from the *Design* menu before selecting a *Mainline Design* option.

2.6.1.1 ASSIGN ZONES TO SYSTEM FLOWS MANAGEMENT

This is a graphically based management tool. It works by displaying symbols for all zones and water supplies (when more than one) on the screen. These symbols can then be selected individually, or in groups, and then assigned to a particular system flow. The process works as follows:-

Tool Operation

When the menu item is selected a dialog specifying the number of systems flows is displayed. The system flow times will be automatically filled out (day:hour:minute) with the default running time of one hour. These times can be changed as required.

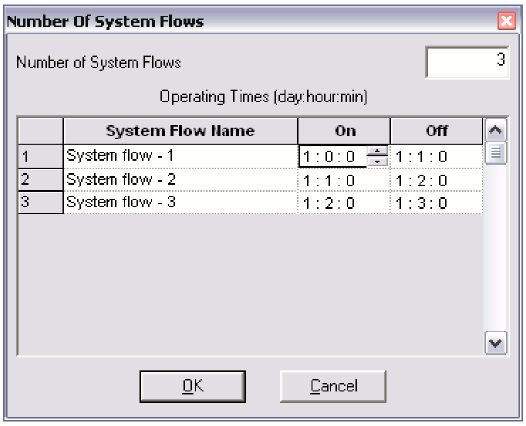


Figure 2-38 - System Flows

On clicking [OK] hatched symbols are displayed for all zones and water supplies (if more than one) in the design. These symbols are color coded with each color representing a different system flow. In addition the zone name, flow (nominal if before *Zone Design*), and system flows that the zone is assigned to are displayed in the centre of the symbol. To aid clarity only the CONTROL_VALVES, MAINLINE_PIPES, and MISC_HYDRAULIC layers are visible. In Figure 2-39 below three systems flows have been specified and because management has not been completed previously the colour of the zone symbols is set to black.

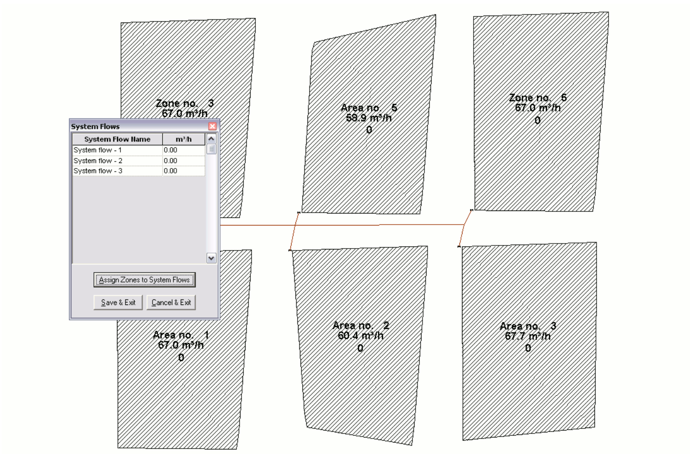


Figure 2-39 - Incomplete Graphical Management

The floating "System Flows" window shows the total flow currently assigned to each system flow. In the example above this is 0.0 since no zones have been assigned yet.

Zones are selected by simply left clicking on them and multiple zones can be selected at once. Zones can be deselected by left clicking or using the *Clear Selection* tool. Note that the status bar displays the cumulative flow of the selected zones and the total "Design Flow" from all water supplies.

The selected zones are then assigned to a particular system flow by either clicking the [Assign Zones to Sys Flows] button on the "System Flows" window, or by selecting the *Assign to Sys Flow* item from the *Right-click* menu. The following dialog is then displayed:-

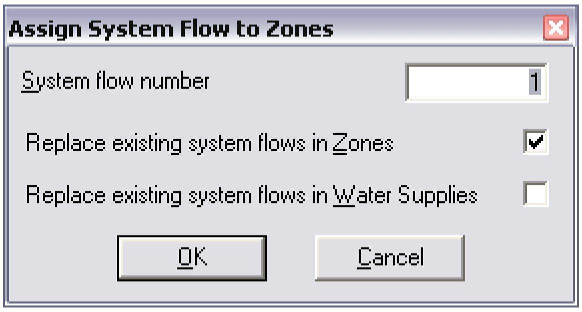


Figure 2-40 - Assign System Flows to Zones

The required system flow can be specified in the "System Flow Number" field. If "Replace Existing System Flows in Zones" is enabled (the default) then the selected Zones will be assigned to the specified system flow and removed from any others. By leaving this field unchecked zones can be assigned to more than one system flow.

In this way all zones can be assigned to system flows with the results visually displayed onscreen as in Figure 2-41.

At any time during the process zones can be reselected and re-assigned. When the arrangement of zones is acceptable it can be saved by clicking the [Save & Exit] button or choosing *Save and Exit* from the *Right-click* menu.

Clicking the [Cancel & Exit] button will exit from the tool without saving the current arrangement. This option is also available from the *Right-click* menu or by pressing the <Esc> key.

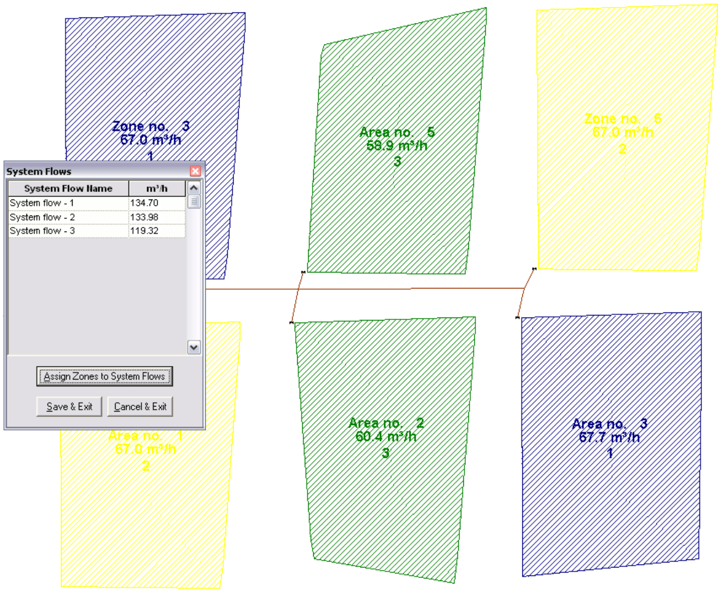


Figure 2-41 - Completed Graphical Managment

The process can be restarted (all changes made will be discarded) by selecting *Restart* from the *Right-click* menu.

Water Supplies

If only one water supply is present in the design, then a symbol for it is not displayed. It is assumed that the water supply will operate in all system flows. Where multiple supplies exist they are displayed as Hexagon shaped symbols that are 2.5 times the size of the base database symbol size (specified under *Settings|Miscellaneous*). These can be assigned to system flows in the same way as zones. Note that the "Replace Existing Sys Flows in Water Supplies" checkbox applies to water supplies rather than "Replace Existing System Flows in Zones". This is because typically System Flows are added to Water Supplies, without replacing those already assigned, which is the reverse of what is typically required for zones.

Mainline Outlets

Mainline Outlets are a zone in their own right and are treated in exactly the same way as other zones. The symbols used to represent them are:-

Normal Outlets: A hatched circle of one half of the radius of throw.

Demand Points: A hatched square size at 2.5 times the base database symbol size (from *Settings|Miscellaneous*).

Notes:

A range of about 75 different colours is used to signify different system flows. This range of colours is repeated when the number of system flows exceeds 75.

Zones operating on more than one system flow will display a combined color of the system flows' default colors.

The color used for selection is fixed as bright green to ensure that selected zones can be differentiated. This doesn't affect the selection color defined in Settings|Drawing, and all normal selection tools will display selected items in this color.

Selecting another tool (e.g., Zone Pipe) will cause the management tool to generate a warning message and then potentially exit without saving.

No file operations including Save, Open, Save As etc. should be selected while the tool is in operation. Certain menu items are disabled until the tool is exited.

Management Symbol

The graphical management process automatically creates a symbol, representing the current management arrangement, which can be subsequently drawn onto the plan (see Figure 2-42).

This symbol is accessed from *Draw|Management Symbol*, a symbol dialog is displayed that contains the normal symbol placement and creation options. Any management symbols in the design will automatically update if the management arrangement is changed.

The *Draw|Management Symbol* menu item is disabled when unavailable.

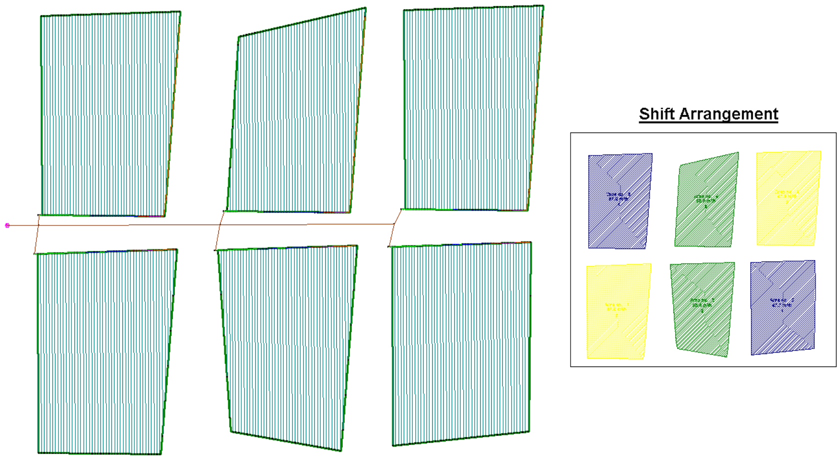


Figure 2-42 - Management Symbol

<u>Note</u>: *For quick editing of assigning zones to system flows there are three options - Assign Zones to System Flows, Assign all Zones to One System Flow, and Assign Each Zone to a Unique System Flow.*

2.6.1.2 Assign All Zones to One System Flow Management

IRRICAD will automatically set all zones to operate on System Flow 1. It will display this in tabular form. Any changes can be made before clicking [OK].

2.6.1.3 Assign Each Zone to a Unique System Flow Management

IRRICAD will automatically set each zone to a unique System Flow number, with each system flow operating for a default time of one hour. It will display this in tabular form. Any changes can be made before clicking [OK].

2.6.1.4 Other Management Options

Water Supply Times

Where more that one water supply exists, operating times can be entered for each water supply.

Zone Operating Times

This method requires operating times to be entered for each individual zone in the system (up to three separate pairs of start / stop times can be entered for each zone). *Zone Operating Times* would be used when start / stop times are important.

This method of entering system management information requires the designer to enter the required operating times for zones that are operating at different and overlapping times.

This option is best used for small irrigation systems where actual start and stop times for valves are important and need to be reported. Based on the operating times entered, IRRICAD will calculate the resulting system flows in the mainline.

Checks are made to ensure that the water supply flow, pressure or time limits are not violated, both for individual zones and for the system flows resulting from the management strategy entered. If violations occur, the designer is required to modify the entered times so that all limits are satisfied before being allowed to continue.

To use Zones Operating Times select *Design|Other Management Options|Zone Operating Times* before running the *Design* options.

Assigning System Flows to Zones

This tabular method of entering zone management information that allows selection of the number of system flows (or stations) and their operating times, and then assignment of the system flows each zone will operate on. It is the preferred option for larger systems where valve grouping, rather than actual valve start and stop times, is important.

This can be very useful to check existing management without inadvertently making unwanted changes - this table will show the management that already exists.

2.6.1.5 DEFAULT RUN TIMES

The default run time for each system flow is one hour. In order to run more than 24 system flows there are two options:-

- Adjust each run time to a shorter period to fit all system flows within the 24 hour period
- Edit the "Cycle time (days)" in *Design Parameters|Economic Parameters*. For example, if the number of system flows is between 24 and 48 set the "Cycle time (days)" to **2**. (Recommended option).

2.6.2 PARTIAL MANAGEMENT

Where designs contain a large number of zones, a designer will not normally examine all operating conditions in order to size the mainline. In these cases it is more efficient to design the mainline based on a number of worst case scenarios. IRRICAD allows this to be done.

Where a selection of zones will be grouped to operate together in order to represent a single worst case situation or a number of worst case situations use *Design|Other Management Options|Assign System Flows to Zones*.

Decide on the number of system flows or groups to enter and which valves or valve-in-head outlets (mainline outlets) will operate on each group.

Any number of system flows or groups can be specified. Actual operating times can be entered or the one-hour defaults accepted. The zone valves are assigned to a system flow by entering the number of the system flow next to the zone name. Zones not included in any system flow have their entries left as zero.

Click [OK] then IRRICAD checks for flow violation and if all Zones have not been assigned to at least one system flow a warning is issued on the screen to this effect. Continue (by clicking [Yes]), or click [No] to return to the table to make further entries or changes. This is a warning message only in case all zones were meant to be assigned. It can be ignored.

By deciding which combination of zones would provide worst case situations will cut down the number of system flows. A worst case situation is one which might have the highest possibility to being outside the design limits as currently set. If the worst case situations design within the limits, then other zones and outlets should not be under or over pressure either. It may also pay to analyze a combination of zones nearer to the water supply, as too much pressure is not beneficial, and to determine if a pressure-regulating valve may need to be installed.

Possible worst case situations are normally chosen by the following factors:-

- Distance from the water supply / pump.
- Two irrigators working close together.
- Rise in elevation.
- Fall in elevation if a 'worst case' is considered to be too much pressure.

2.6.3 DESIGN

For completing a quick analysis of zone pipes or spraylines only, mainline pipes and/or a water supply are not required; the zone pipes and control valves are sufficient. A quick mainline analysis can also be completed by providing at least one water supply and one or more mainline outlets, e.g., **Demand Points** or VIH sprinklers, connected by one or more pipes to the water supply.

In *Design|Zone Design Configuration*, the maximum number of sizes allowed for each lateral (connected spraylines) may be specified by entering a number (1-3) in the "Number of Lateral Sizes" column. The number of submain sizes allowed can be specified by a number, or left as 0 - meaning IRRICAD is unlimited by the number of submain sizes it can use.

When using IRRICAD to size pipes, select either *LP Design* or *Velocity Design*. *LP Design* sizes pipes based on the pressure requirements of the outlets, velocity limits, elevations and can trade off annualized capital cost against annual running costs to find a low total cost solution. It is important that the pipe prices in the databases are relatively correct, i.e., increasing with increasing diameter. If a large pipe with a very low price is enabled in the database, it may be selected in preference to a smaller pipe (assuming outlet pressure requirements can be met) because it results in a low valve or water supply pressure and lowest overall costs.

Velocity Design sizes pipes based only on the flow in the pipes. Often, this method is used to select pipe sizes as a starting point, particularly where *LP Design* is unable to find a solution due to the constraints on the system. *Velocity Design* will usually give a solution. However, there is no guarantee that the pressures at the outlets will be within the required range. If there is difficulty with *LP Design*, run *Velocity Design* and then check the reports to identify problem areas. *Velocity Design* must be used to size looped systems.

When computer sizing pipes, either by *LP* or *Velocity Design*, a pipe can change for different scenarios each time *Design* is run. A computer selected pipe can be fixed to a pipe size which *LP* or *Velocity Design* has chosen, by using the *Change* tool and unchecking the "Computer Sized" box; then re-run *LP Design* or *Velocity Design* to size other pipes.

2.6.3.1 Nominal Pressures

The nominal pressure for outlets is the "Pressure" entered in the *Outlet* dialog – the target pressure. In the Database Editor a "Flow Tolerance" is specified as "% above" and "% below". If the "Flow Tolerance" is **5%** above and **5%** below, this gives a pressure tolerance of approximately 10% above and 10% below (20% window) the nominal pressure which is designated. Hence, any outlet outside this pressure window will produce a warning message during *Design*. Therefore, for a 20% pressure window with the nominal pressure set at 10psi (m), any outlet less than 9psi (m) or over 11psi (m) will be out of the required range. Tape inlet pressures work in the same way. The "Inlet Pressure" is the target pressure for the start of the tape.

See also:

IRRICAD Database Editor Manual — *Section 3*

2.6.3.2 Analyze (Existing Sizes)

In *Design|Zone Design|Analyse*, IRRICAD will calculate, using non-linear pipe network analysis routines, the flows in all pipes and determine the pressures at outlets, pipe junctions and on the downstream side of zone control valves.

If the pressures at any outlets fall outside the allowable pressure range of the outlet / nozzle combination as specified in the database, a message will appear on the screen to that effect.

In *Design|Mainline Design|Analyse*, the methods are exactly the same except that the outlets are now zone control valves and the water supplies are the source of flow. The analysis occurs under a range of flow conditions resulting from management of the zones.

Select the *Analyse* option for pipes already sized where the downstream valve pressure is unknown. IRRICAD will analyze the system based on nominal pressures and flows and calculate the downstream valve pressure. View the *Reports|Design Reports*|...

2.6.3.3 Pipe Sizing - LP Design Option

In zone design, *LP Design* determines the downstream control valve pressure and selects pipe diameters so that the cost of pumping and the cost of pipe are reduced. For zones that contain spraylines, *LP Design* also determines suitable start and end pressures to enable sprayline or lateral sizing to take place.

Pipes (other than spraylines), regardless of their lengths, are sized in a single diameter. In order to allow for the possibility of using two diameters in long pipelines, permanent junctions should be inserted to divide the pipes into shorter lengths (see Working with Junctions, Section 2.4.14.

Velocity limits specified in the *Design|Design Parameters|Hydraulic Parameters* are considered during *LP Design*, although in some cases pipe sizes may be selected which result in these velocities being exceeded. A warning message will be displayed when this happens. IRRICAD will try to select a pipe even if the velocity is slightly exceeded to produce a solution. The problem can then be seen and rectified.

If *LP Design* is unable to select suitable pipe diameters to meet the pressure constraints at the outlets, a warning message will be displayed and IRRICAD will continue with the next zone.

In *Mainline Design*, if a water supply "Design Head" has been specified in management, IRRICAD uses this pressure to determine the pipe sizes needed to produce the pressure required at the zone valves. If a water supply "Design Head" is not specified, IRRICAD can consider the annual capital cost of pipes, annual running cost of the system and maximum allowable mainline velocities to determine a suitable pressure. The trading of capital versus running cost can be turned off in *Design Parameters|Economic Parameters*.

Select *Design|Zone Design|LP Design* or *Design|Mainline Design|LP Design* to size pipes and analyze the system.

2.6.3.4 Pipe Sizing - Velocity Design Option

During *Velocity Design*, the pipes are sized on velocity (as set in *Design|Design Parameters*) but a pressure at the control valve is determined to achieve close to the required outlet pressures. This includes any PRVs that are in the system.

Because this pipe sizing method is based on flow, there is no guarantee in *Velocity Design* that the required pressures at the outlets will be met. By setting the velocity lower, or by simply changing pipe sizes as necessary to meet the pressure requirements at the nozzles, the system can be designed within the pressure and flow limitations. As with *Analyse*, a message will appear on the screen if outlet pressures are outside their allowable range. Pipes can be changed manually and re-analyzed to complete the design.

During *Mainline Design* if water pressures have been specified IRRICAD uses these pressures after sizing the pipes to determine the available pressure at the valves. If a water supply pressure is not specified (single water supplies only), a pressure is calculated so as to supply the required pressure to all valves.

A comparison is made between the available pressure and the required pressure at the valves.

Select *Design|Zone Design|Velocity Design* when sizing pipes with loops in the Zones, or when Zone *LP Design* fails to find an answer.

Select *Design|Mainline Design|Velocity Design* when sizing pipes with loops in the Mainline, when there is more than one water supply, or when Mainline *LP Design* fails to find an answer.

2.6.3.5 Detailed Analysis

In the standard analysis mode (*Analyse* option in the *Design|Zone Design* and *Design|Mainline Design* menus) IRRICAD uses the selected nominal flows for emitters, spraylines and tape inlets to calculate the flow and resulting pressures in a system. In most circumstances this method is slightly conservative. *Detailed Analysis* however uses an iterative process to exactly match the flow of an emitter, sprayline or tape to the pressure at that point and therefore allows a designer to more accurately gauge how a system would perform in practice. This is especially so when the resulting pressures are substantially different from those specified.

Detailed Analysis can be used for zone drippers, sprinklers, tapes, spraylines and also VIH sprinklers in mainline. There is obviously no advantage in running a *Detailed Analysis* for systems that only contain pressure compensated emitters.

The control valve pressures in *Design|Zone Design Configuration* must be specified before a *Detailed Analysis* of a zone. Similarly the Water Supply pressure(s) need to be specified for a mainline *Detailed Analysis*.

The default maximum number of iterations for detailed analysis is 100; this can be altered by editing the "Max for Detailed Analysis" field in *Design|Design Parameters|Analysis Parameters*. Also in this dialog is a factor which controls how quickly the analysis converges ("Detailed Analysis Factor" field). The default value is 0.75 and in normal circumstances this should not be changed. Valid values are between 0.0 (fastest) and 0.99 (slowest), however using a smaller factor may mean that some systems will not converge at all.

Select *Design|Zone Design|Detailed Analysis* when a control valve pressure has been specified in *Design|Zone Design Configuration*. Select *Design|Mainline Design|Detailed Analysis* when water supply pressures have been specified in the water supply.

2.6.3.6 SUMMARY

- Select pipe sizes or **Computer Selected** pipe.
- Uncheck the "Computer Sized" check box if wishing to fix the manually selected pipe size.
- Complete the design.
- Run LP Design or Velocity Design to size pipe.
- Run *Detailed Analysis* when sizing stage is complete.

2.6.4 LP Design Limits

The size of zone that can be designed using LP based sizing is limited by the amount of memory allocated within IRRICAD for that purpose.

There is a trade-off between the complexity of a zone and the size of the zone that can be sized. The more complicated the zone in terms of shape, elevation changes and the number of pipe sizes required in the submain the smaller the zone will be before exceeding the memory limits of LP. The time taken to find a solution will also be increased.

For a particular zone, there may be little that can be done to reduce the complexity of shape or the effect of elevation changes without making major changes to layout. However if a pipe in a submain has a fixed size it does not need to be sized by LP, i.e., LP does not have to make a choice of diameter for that particular pipe, and therefore it is not included in the LP problem and hence reduces memory requirements.

Fixed size pipes can arise in four ways, they are:

- Specified by you as a fixed size pipe.
- Restricted in size by the zone velocity limit set (*Design|Design Parameters|Hydraulic Parameters*).
- Restricted due to the pipes enabled for use (flagged in the database). Again, if smaller or larger pipes could have been used than those available for selection from the database, *LP* may be forced to use a particular size. A typical example of this situation is where small zone pipes have been flagged out of the database that results in a number of the pipes towards the end of the submain forced to be a larger size.
- The number of submain sizes has been restricted in *Zone Design Configuration*. If there are no restrictions on the number of submain sizes and none of the above restrictions apply, *LP Design* will be required to determine diameters for all pipes. If the number of submain sizes is specified as 2, the bottom segments of the submain would be fixed in one size, and the top segments fixed in a larger size. This leaves a few segments in the middle of the submain that could be one or the other of the two sizes. The number of pipes where *LP Design* has to make a choice is very much reduced.

In large complex zones restricting the number of sizes to be used (*Design|Zone Design Configuration* - number of lateral sizes and number of submain sizes), setting sizes manually (*Zone|Pipe*), and restricting velocity (*Design|Design Parameters|Hydraulic Parameters*) may result in *LP Design* being unable to find a solution. Some trial and error may then be required.

In smaller, complex zones where *LP Design* size is not a problem, the chances of finding a solution may be enhanced by increasing the velocity limit to **30ft/s** (**10m/s**) in *Design|Design Parameters|Hydraulic Parameters* (simply to make sure the velocity is not restricting *LP Design* from making a choice). Making a full range of zone pipe sizes available in the database will also enhance the chance of finding a solution. Do not restrict the number of submain sizes by specifying a number in *Design|Zone Design Configuration* if a solution is difficult to find.

2.6.5 Flushing Calculations

The "Flushing Analysis" calculation results are based on the valve pressure to provide an accurate report of groups of tapes under flushing conditions. This feature is useful for checking the required velocity is met at the specified valve pressure.

The manifold (group of tapes) to be 'flushed' is specified in *Design|Zone Design Configuration*. All other tapes in the zone are assumed to be operating in normal irrigation mode and all flows and headlosses in tapes and submains are calculated accordingly.

2.6.5.1 Virtual Manifolds

In *Design|Design Parameters|Hydraulic Parameters* the "Assign Virtual Manifolds" option represent a simple way of designating which manifolds are flushing without having physical manifolds. In zones without physical manifolds this flag controls the use of virtual manifolds. The flag has no effect if manifolds have been created via the tape irrigation block tool. If all laterals are to be flushed at the same time, leave this box unchecked; all laterals will be assigned to "0" which can then be specified in *Zone Design Configuration*.

2.6.5.2 Manifold Numbering

Manifolds are automatically numbered when :-

– physical manifolds are placed on the block via the Irrigation Block tools
– when virtual manifolds are assigned via *Design|Design Parameters|Hydraulic Parameters* and a design/analyse process is actioned. See Section 2.6.5.1.
–

Virtual manifold numbers can be labelled on the plan, see Section 2.6.5.3.

2.6.5.3 Manifold ID Keyword for Labeling Laterals

The #FLUSHID# keyword has been added and can be included in labels for Tapes and Misc. Hydraulic items to graphically indicate manifold numbering. The manifold type controls how this label keyword is applied:-

- If physical manifolds are present the keyword may be used to label flush valves and/or tapes with their associated manifold number.
- If virtual manifolds are specified the keyword can be used to label tapes with their designated manifold number. Note the "Assign Virtual Manifolds" option needs to be enabled in *Design|Design Parameters,* and a *design* process run, in order for laterals to be assigned to virtual manifolds.

2.6.5.4 How to Use Tape Irrigation Block Flushing Calculations

To perform the flushing calculations after the zones have been designed (if computer sized) or analyzed (if virtual manifolds):-

1. Enter the required flushing velocity, and virtual manifold properties if applicable, in *Design|Design Parameters|Hydraulic Parameters*.
2. In *Design|Zone Design Configuration* enable "Flushing" for the required zone(s) and enter the manifold number to flush during the next design run. For example, "**2**" for manifold #2, or "**-2**" for virtual manifold #2. If no physical or virtual manifolds have been assigned enter "**0**" to flush all laterals at the same time.
3. Enter a "D/S Valve Pressure". Click [OK].
4. Run *Design|Zone Design|Detailed Analysis*.

5. View the *Reports|Zone Design Reports|Zone Flushing V13* report. The manifold currently flushing will be indicated by "**" in the right-hand column.

If the end velocity for any tape is below the required velocity a message will be issued during the design process and red asterisks will be displayed in the "End Velocity" column of the Zone Flushing report.

Notes:

When designing pipe sizes it is not appropriate to have the "Flushing" *option enabled. A message will be issued that flushing analysis cannot be undertaken when designing the system.*

To produce a report for another manifold under flushing conditions change the manifold number as required in Design|Zone Design Configuration *and re-run* Detailed Analysis/Analyze*. Open the report to view the results. Note that reports may be saved in RTF format for subsequent viewing.*

Under flushing conditions it is recommended that Detailed Analysis is used even for pressure compensating emitters. Using Detailed Analysis will ensure that actual tape inlet pressures are used and consequently the tape end velocity and actual flows at the emitters calculated. This is particularly important when the tape pressure drops below the emitter pressure compensating range. In many cases this is quite likely unless there is a large back pressure. However, even in cases where the PC emitters remain in the compensating range the end velocity and total flow is affected by the inlet pressure so an actual inlet pressure is still advantageous. Consequently it is recommended to only use Analyze in the event that Detailed Analysis does not converge (exceeds the number of iterations).

The end flow for laterals has been added to the information displayed in Object Info window.

Tips: In some situations it may be obvious which manifold is the 'worst case' in a zone. If these tapes flush successfully then all other manifolds in the block should flush equally well or better and it may not be necessary to repeat the analysis.

A quick way to use the Actual Valve Pressure values to set the D/S Valve Pressure required for Flushing is by copying the current actual valve pressure column. Highlight the "Actual Valve Pressure" *column by clicking on the heading and use* <Ctrl>+<C>*. Then highlight the* "D/S Valve Pressure" *column and use* <Ctrl>+<V>*. (Note the* [Paste Selected] *button will copy the first pressure into all cells in the column).*

2.6.5.5 Minimum PC Pressure Tape Database Field

Typically a pressure compensating emitter has a range of pressure over which it compensates and under flushing conditions the pressure is likely to drop below this range in a proportion of the tape. To account for this the tape emitter flow calculation is adjusted so that if the pressure is below the value specified in the "Minimum PC Pressure" field in the Tape database then an index of 0.5 is used. This calculation is used only if the Emitter Index listed in the database is below 0.001.

For PC tapes this value is typically identical to the specified minimum allowable operating pressure. However for some types of emitters (e.g., non-leakage) this value may be different from the minimum allowable operating pressure and the tape manufacturer should be contacted for details of these.

Note that this field is not applicable for non-PC emitters and can therefore be left at 0 for these types of components.

Version 13+ is supplied with an Irricad database which contains those values as specified by the manufacturer. If in doubt what these values should be contact the manufacturer or their support agent.

2.6.6 Calculation of Travel Times

The time it takes for water and solutes to travel through an irrigation system can be calculated by enabling the "Calculate travel times" option located in *Design|Design Parameters|Hydraulic Parameters* under the "Misc Parameters" section. Travel times from the water supply to mainline outlets or control valves and from the control valves to all emitters may be calculated and reported

This setting is disabled by default as the calculations may take additional processing time on large designs.

The steps required to produce travel time reports are:-

1. Enable "Calculate travel times" in *Design|Design Parameters|Hydraulic Parameters* and click [OK] on the dialog.
2. Run a design or analysis option (zone or mainline), without re-running *Design* the travel times will not appear in the reports.
3. Open the required report from the *Zone Design Reports* or *Mainline Design Reports* menus.

Three reports that display travel times are available:-

- Zone Design Summary – displays the maximum travel time from the water supply to the control valve or mainline outlet, the maximum travel time along connected sprayline or tape laterals, and the maximum total travel time to any outlets or lateral ends. Note that mainline design (with the calculate travel times option selected) must be run for times from the water supply to be populated.
- Zone Design Travel Time Report – displays the travel time from the control valve to each outlet or lateral inlet, the travel time down each lateral, and the maximum travel time from the water supply to the valve. Note that mainline design (with the calculate travel times option selected) must be re-run for the times from the water supply to be populated.
- Mainline Design Travel Time Report – displays the maximum travel time to each valve or mainline outlet operating.

2.6.7 GRAPHICAL REPORTING TOOLS

2.6.7.1 GRAPHICAL MANAGEMENT SYMBOL

A representation of the selected management, as assigned via *Assign System Flows to Zones,* may be placed on the plan to indicate the system flows/shifts to the client. The graphical management process automatically creates a symbol, representing the current management arrangement, which can be subsequently drawn onto the plan. For steps on how to do this see Management Symbol, Section 5.6.15.

A symbol dialog is displayed and contains the normal symbol placement and creation options.

The Management Symbol menu item is disabled when unavailable (before Management has been completed).

> *Note: If the Management is changed the symbol will automatically be updated.*

See also:

Assign Zones to System Flows Management *Section 2.6.1.1*

2.6.7.2 Graphical Flow or Pressure Maps and Min/Max Pressure Indicators

Flow and pressure maps may be used to troubleshoot problem areas in a zone or convey the pressure or flow variation to the client in a graphical manner. For steps on how to use the Zone Pressure Map and Zone Flow Map see Sections 5.14.7 and 5.14.8 respectively.

The emitters with the minimum and maximum pressure may also be indicated on a plan by using the Zone Pressure Limits tool. See Section 5.14.6.

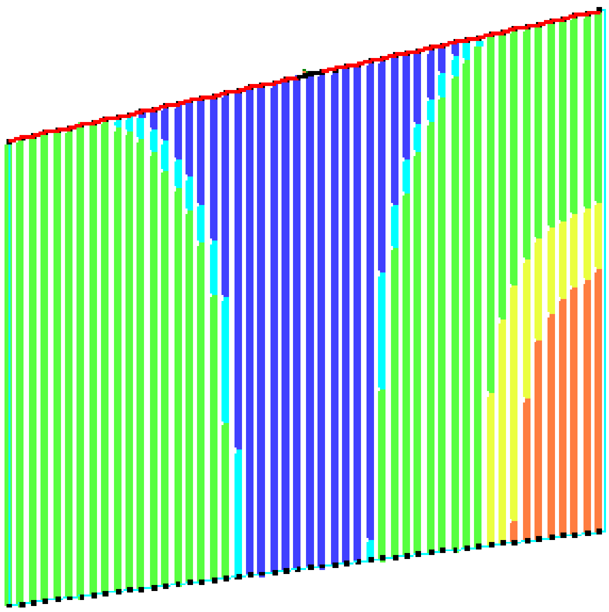


Figure 2-43

2.6.7.3 GRAPHICAL ELEVATION MAP

The digital elevation model can be displayed via the 3D DEM tool in the Reports menu. This tool presents the ground elevation and can be used for pinpointing errors in the imported data or inserted as an OLE item on the final plan. See Section 5.14.5.

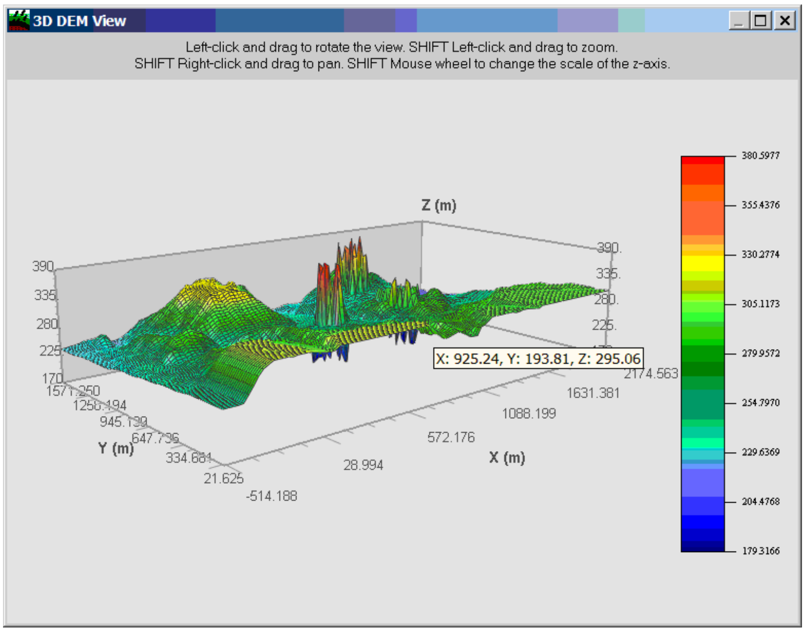


Figure 2-44

2.6.7.4 GRAPHICAL HYDRAULIC GRADELINE

The *Reports*|*Hydraulic Gradeline* dialog displays the ground elevation and the 'head' in the pipe/tape, the minimum and maximum allowable pressures for the zone and, for submains, the minimum and maximum pressures for each lateral in the zone. Valve position is indicated for submains, as is submain position for laterals. Pipe size changes are indicated using the pipe colors from the design.

The location, elevation and pressure at each emitter or junction are displayed in the dialog status bar when the cursor is moved over the chart. Clicking the chart places a locator icon at the indicated position on the design to help orientate the user.

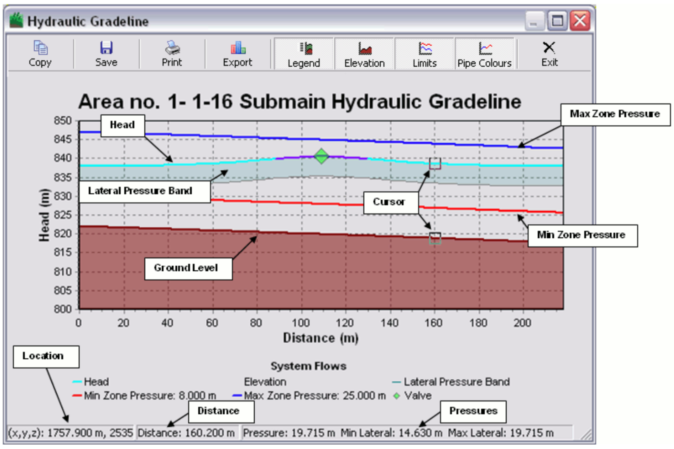


Figure 2-45

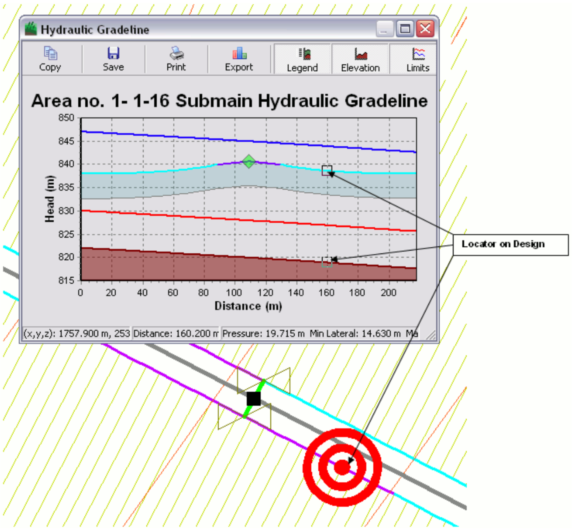


Figure 2-46

2.6.7.5 Mainline Gradelines

The HGL tool can automatically determine which mainline 'path' to analyze by selecting a mainline outlet, junction or valve. Alternatively, select the mainline pipes to be included before invoking the tool.

The mainline HGL dialog displays the ground elevation and the 'head' in the pipe. It also indicates the maximum allowable pipe pressure and the location of any water supplies and / or valves. The gradeline can be show for any of the system flows in the mainline and the cursor can be moved between system flow lines by clicking on the relevant series (the left-hand legend indicates with a * the series that currently has the cursor).

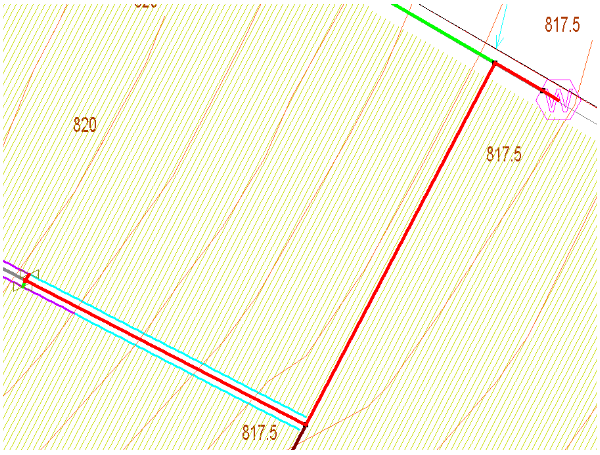


Figure 2-47

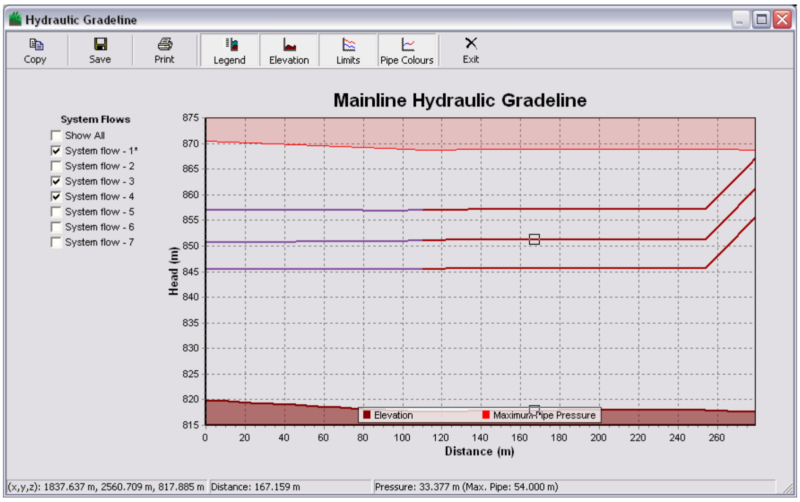


Figure 2-48

For information on the dialog see Section 5.14.10.

2.6.8 IRRICAD SELECTING FITTINGS FOR THE DESIGN

For IRRICAD to automatically solve junctions in a design select *Design|Computer Selection of Fittings*. IRRICAD then considers the geometry of the junction and the type of components to be joined and attempts to select a suitable arrangement of fittings to resolve the junction.

As IRRICAD completes the fitting selection, the internal junction numbers will be displayed on the screen. Details of missing fittings or unsolved junctions may be viewed in Costing and Bill of Materials reports (*Reports|Costing/BOM Reports|…*) and in the [Show Fittings] part of the *Change Tool* dialog.

Missing items can be entered into the database and enabled for selection. New items that solve previously unsolved junctions will be selected when *Computer Selection of Fittings* is re-run.

Fittings that IRRICAD has chosen to solve a junction can be changed if required. Select a junction, outlet or control valve using *Modify|Change* and click on the [Show Fittings] button in the dialog.

Items that have been selected to solve the junction are listed. Click the [Add] or [Remove] buttons as required. Changes made here are reflected in the *Costing/BOM Reports*. Note that any changes made here will be lost if *Computer Selection of Fittings* is re-run. Hence it is better to edit the database to solve fittings problems.

Miscellaneous items can also be selected and added to the design and subsequently the *Costing/BOM Reports* by via *Design|Miscellaneous Costs* and using the [Add] button to select any item currently in the database. Note that any changes made via *Miscellaneous Costs* remain if *Computer Selection of Fittings* is re-run.

2.6.8.1 MANUALLY ADJUSTING FITTINGS

It is often the case that adding one item, or turning items on or off in the database will solve many fittings errors. This is the preferred method, as the next design will also automatically select the fittings normally used if the database is customized.

However, the fittings can be edited at each junction.

After running *Design|Computer Selection of Fittings*, fittings selected at a particular point in the system may be viewed. The Bill of Materials or Costing reports will list any errors after running *Computer Selection of Fittings*. The reports will also give the coordinates where a problem is occurring. By using *View|Goto Coords* and entering the x and y coordinate supplied the connection point can be identified. These fittings can be viewed at a point object (junction, valve, outlet etc) by selecting the item (*Modify|Select Object*) and using *Modify|Change* to bring up the dialog for the item. Click the [Show Fittings] button. The dialog will show each item involved in the connection. If IRRICAD has failed to find an item from the database required for solving a connection, the error is listed in this dialog. This error is the same as reported in any of the Bill of Materials or Costing reports. You may want to view the fittings in this way to: a) make changes, or b) find out the connection codes for items IRRICAD may not have found a fitting for.

Add: This adds an item to the connection. These items would then be listed in the Bill of Materials and Costing reports. Click the [Add] button on the [Show Fittings] dialog and select an item or items from the database list. You can move between component groups by clicking on the tabs. Click on the gray square to the left side of the item to automatically select, or click in the white description field of the item and click the [Select] button. Items selected will be listed at the bottom of this dialog. Click [Close] to finish.
The quantity of an item can be edited by changing the number in the Quantity field of the [Show Fittings] dialog. Click the [Hide Fittings] button on the [Show Fittings] dialog to return to the Change dialog.

Replace: An item existing at the connection can be replaced. Highlight the item to be replaced and click the on the [Show Fittings] dialog. Select another item from the database list; you can move between component groups by clicking on the tabs. Click on the gray square to the left side of the item to automatically select, or click in the white description field of the item and click the [Select] button. Click [Close] to finish.
The quantity of an item can be edited by changing the number in the "Quantity" field of

the [Show Fittings] dialog. Click the [Hide Fittings] button on the [Show Fittings] dialog to return to the *Change* dialog.

Delete: An item existing at the junction can be deleted. Highlight the row by clicking on the gray square to the left of the item to be deleted and click the [Delete] button on the [Show Fittings] dialog.

2.6.8.2 Changing and Fixing Many Fittings Errors in One Go

It is often the case that adding one item, or turning items on or off in the database will solve many fittings errors. This is the preferred method,, however, if the database is not to be edited, *Change Type* can be used to solve fitting errors for like items:

1. Select all junctions that will have the same fitting to be changed or added.
2. Select *Modify|Change Type*.
3. Click the [Show Fittings] button in the dialog.
4. Make the change required (e.g., click on the [Replace] or [Add] button and select an item or items from the database dialog).
5. Click [OK].
6. Select the appropriate "Match" and "Change" fields in the *Change Type* dialog. If **All Fittings** is enabled, for example, then those items, e.g., sprinklers, which have the same fittings, will be included in the global change. If **Exact Errors** is enabled, then only those sprinklers, for example, which had the same error message during *Computer Selection of Fittings* will be included in the global change. The **Bend Angle Range** option will broaden the **Exact Errors** option. For example, an error message was displayed, concerning sprinklers in the design, which a bend could not be found to solve the junctions. Where each instance of the error displayed a slightly different bend angle, the **Bend Angle Range** can be used to cover several errors.
7. Click [OK].

2.7 ENHANCING THE PRESENTATION OF PLANS

This chapter looks at many of the drawing aids and tools to help enhance plans for presentation to clients.

2.7.1 PLACING SYMBOLS ON THE PLAN

Symbols are used to store diagrams or illustrations for use in several designs. They can be used to enhance presentation and can contain trees, assembly details, compass roses, copyright symbols, or anything else that may be required to appear on several drawings.

To place a symbol select *Draw|Symbol*. Click the [Load] button to select a symbol to use. To use the company logo, first import the file in DXF, DWG, VCD or GCD format, or draw / digitize the logo into IRRICAD and saved the logo as a symbol. If the logo in image format has been imported, it cannot be saved as a symbol.

2.7.1.1 MAINTAIN SHAPE

If the “Maintain Shape” box is enabled the shape or relative dimensions of the symbol are maintained regardless of size. If it is unchecked then the shape of the symbol may be distorted. For most symbols leave the box enabled e.g., trees, shrubs, logos. It may be necessary to uncheck the box to elongate symbols such as hedges, walls and the North symbol.

2.7.1.2 DYNAMICALLY SIZE

If the “Dynamically Size” box is enabled, the symbol can be dragged out to any size using a rubberband rectangle. If it is unchecked then specify the size of the symbol using the width and height fields and place the symbol with a single click. Often the symbols are just representative and size does not matter e.g., to place a few bushes of different sizes to indicate a garden area on the plan. In this case the “Dynamically Size” box would be enabled. However sometimes a particular feature needs to be drawn to scale e.g., a large tree whose size is known. In this case the box would be unchecked and the size entered in the width field.

The "Orientation" field is set to 0º since new symbols are created unrotated. To change a symbol's orientation, select the symbol using *Modify|Select Object* for example, then *Modify|Change* and type a new value in the "Orientation" field. *Modify|Rotate* can also be used.

2.7.2 Making the Database Symbols Larger for Large Designs or Smaller for Small Designs

Database symbols are assigned a size in the database by selecting a size from 1-10. This size can not be converted into a measurement as such. Size 5 is assigned the base database symbol size and the other sizes are relative to this e.g., if the "Base Database Symbol Size" in *Settings|Miscellaneous* is selected as 3.28ft (1m) then a size 5 symbol will be 3.28ft (1m) in diameter. A size 4 symbol would then be $^{4}/_{5}$ of this - 2.62ft (0.8m) and a size 6 symbol would be $^{6}/_{5}$ of this - 3.94ft (1.2m).

If the design being created is getting larger and larger and the symbols are disappearing when zoomed out, select *Settings|Miscellaneous* and increase the "Base Database Symbol Size" until happy with the results. Make sure the "Update Database Symbols" check box in *Settings|Irrigation Items* is checked to ensure existing symbols in the design are updated to the new size.

Similarly, if the design is a small design decrease the "Base Database Symbol Size" until the symbols are an appropriate size.

Changing the "Base Database Symbol Size" changes all the database symbols in the design. To change the size of a particular hydraulic item e.g., an outlet, change the symbol size of that item in the database. If the symbol size is currently a size 5, increase the size of the symbol relative to other symbols by selecting a size 6-10. To reduce the size of this symbol relative to other symbols select a size 1-4.

Note: *that water supply and junction symbols cannot be changed in this way. These symbols are found in the Settings|Irrigation Items tab and can be adjusted there.*

See also:

Design Size	*Section 5.10.12.3*
Irrigation Items	*Section 5.10.9*

2.7.3 USING HATCHES AND FILLS

Hatches and fills are great tools to add that little bit extra to the plan and enhance the presentation.

Both hatches and fills can be used in three ways:

- Selection
- Boundary
- Seed

There are a few key things to know when using hatches and fills:

Note: *An object needs to be completely closed if using the Selection or Seed options. If using lines or curves to create the object select Right-click|Close to connect the start point to the end point to close the object.*

If there are many closed objects or intersecting objects on the plan *Seed Hatch* or *Fill* may have difficulty filling the selected area. A message may appear indicating there are over 100 objects or IRRICAD may beep and no fill or hatch appears. The *Selection* option can be used in this case with the same results, if the correct items are selected.

See also:

Hatch	*Section 5.6.9*
Fill	*Section 5.6.10*

2.7.4 USING DIMENSIONS

When any of the first five dimensions are selected (Linear, Angular, Radial, Diameter, Ordinate) the *Dimension Settings* dialog appears. This dialog has two tabs - Dimension and Dimension Text.

See also:

Dimension	*Section 5.6.11*

2.7.4.1 DIMENSION TAB

Drawing Properties

The first part of the Dimension tab deals with the drawing properties. These can be editing as required - changing the layer from the default layer of <DRAWING> to another layer of the choice, changing the color, line type or line width of the dimension line.

Line Direction

The section headed "Line Direction" determines the direction of the dimension line.

Aligned: If "Aligned" is selected, the dimension line will dimension horizontal lines and vertical line parallel to the line selected to dimension.

Horizontal: If "Horizontal" is selected, only the horizontal component of the selected object is measured. For a non-horizontal line e.g., at 95°, the distance between a specified point on the line and vertical (90°) will be measured. (See Figure 2-49).

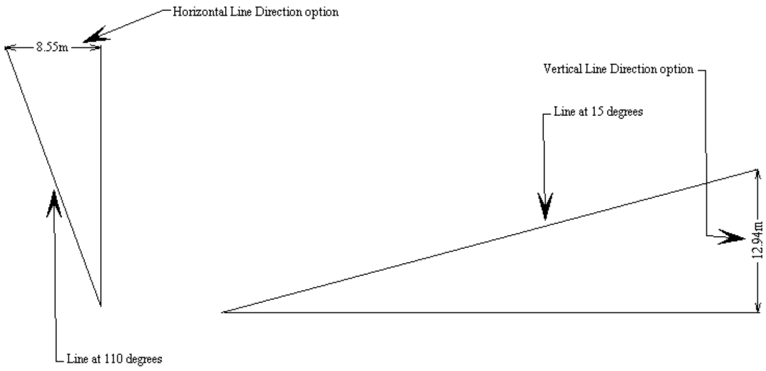


Figure 2-49 - Dimensions

Vertical: If "Vertical" is selected, only the vertical component of the selected object is measured. For a non-horizontal line e.g., at 15°, the distance between a specified point on the line and horizontal (0°) will be measured. (See How to Find Lengths and Distances, Section 2.2.5.6).

Note that if the vertical text direction to be the same on all vertical lines is required, select the vertical option, not the "Aligned" option.

Angle: If "Angle" is selected, enter the required angle. If the angle entered is 45°, the dimension line will be drawn at a 45° angle to horizontal (0° plane). (See Figure 2-50). A horizontal dimension is equivalent to a 0°-angle dimension, and a vertical dimension is equivalent to a 90°-angle dimension.

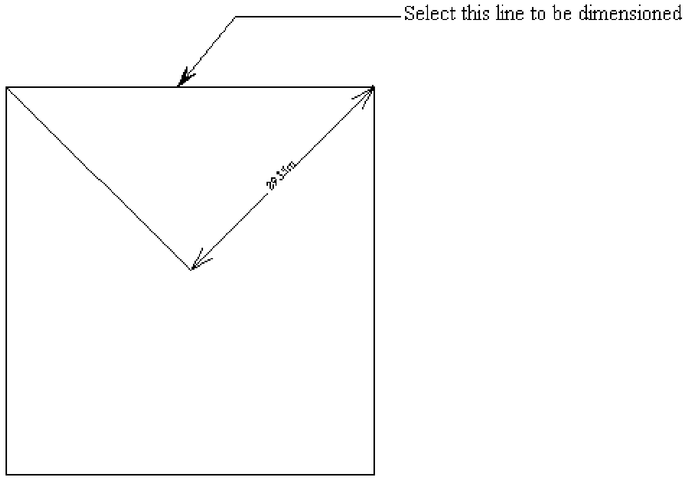


Figure 2-50 - Angled Dimension

Mode

A section at the top right, headed "Mode", selects the type of dimensioning. To demonstrate the different modes, draw a 2-point rectangle. Using *Right-click|Snaps|Midpoint*, place a line to divide the rectangle in half. Name the top left corner A, the top midpoint B and the top right hand corner C.

Single: Select *Draw|Dimension|Linear* and select "Single" as the mode. Click on the top line of the rectangle, the whole rectangle length will be dimensioned.

Partitioned: Select *Draw|Dimension|Linear* and select "Partitioned" mode. Right mouse click and select *Right-click|Snaps|Endpoint* and click on point A. Wherever the next point clicked is where the dimension will finish, so right mouse click and select *Right-click|Snaps|Endpoint* to finish exactly at the midline (point B). Now right mouse click and select *Right-click|Snaps|Endpoint* again and click on point C. Each partition of the rectangle has been dimensioned.

Cumulative: Label the bottom left corner D, the bottom midpoint E and the bottom right corner F. Select *Draw|Dimension|Linear* and select the "Cumulative" option. Using *Right-click|Snaps|Endpoint*, select point D. Select *Right-click|Snaps|Endpoint* again and select Point E. Select *Right-click|Snaps|Endpoint* and select Point F. The dimensions are cumulative distances. (See Figure 2-51).

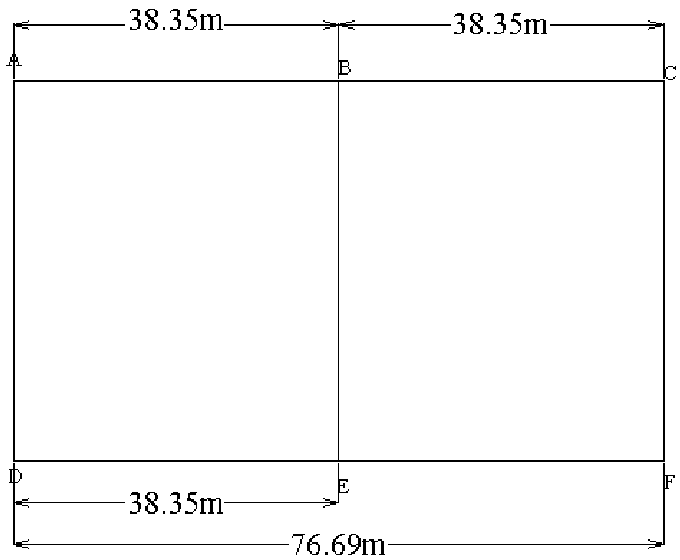


Figure 2-51 - Dimension Modes

Extension

This section looks at Extension options.

Offset, Above, Below with Proximity Fixed on: An "Offset", "Above" and "Below" distance can be entered (see Figure 2-52). If the "Proximity Fixed" check box is checked:

- The "Offset" value adjusts the space between the drawing object and the end of the extension lines.
- The "Above" value adjusts the distance that the extension line extends past the dimension line and away from the drawing object.
- The "Below" value adjusts the distance the extension line extends beyond the dimension line and toward the drawing object when Stretch is also unchecked.

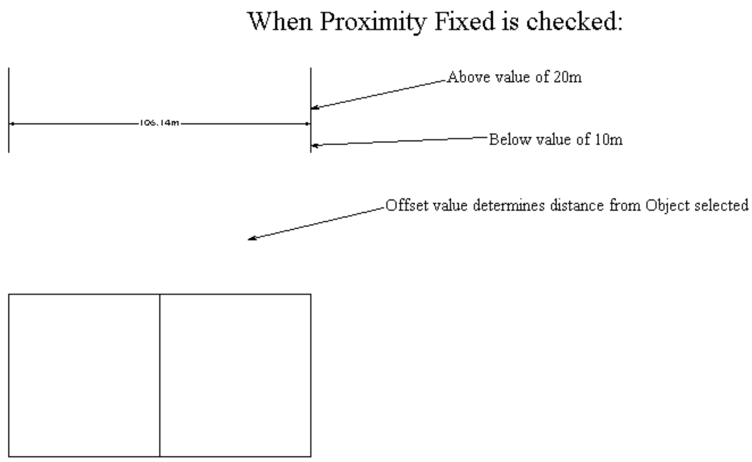


Figure 2-52 - Dimension Proximity

Offset, Above, Below with Stretch on: When "Stretch" is checked, the extension lines stretch to reach the drawing object (minus the "Offset" distance). When unchecked, the "Offset" setting is ignored, and the extension lines follow the setting of the "Below" distance. If "Proximity Fixed" is checked when "Stretch" is checked, "Stretch" is ignored as the dimension is placed at the offset distance (see Figure 2-53).

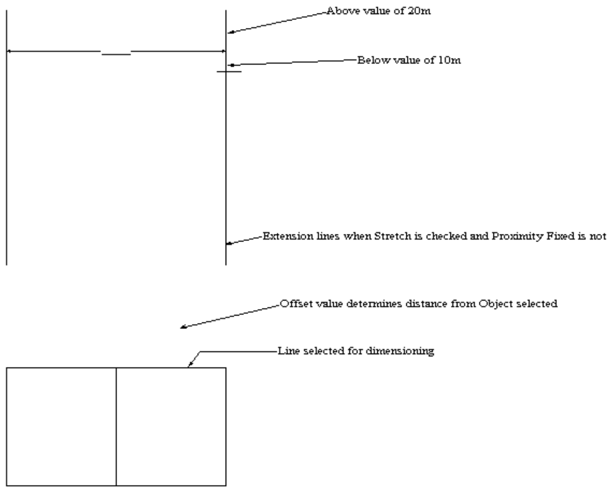


Figure 2-53 - Dimension Stretch

Arrow

This section allows the dimension arrow to be specified.

Type: Select an "Arrow" "Type" from the dropdown list.
Size: Change the "Size" of the arrowhead.
Angle: Change the "Angle" of the arrowhead as required.
Flip: Check the "Flip" box to draw the arrowhead outside the extension lines.
Flip Distance: Left and Right - Enter the length of each arrow required if "Flip" is used. (See Figure 2-54).

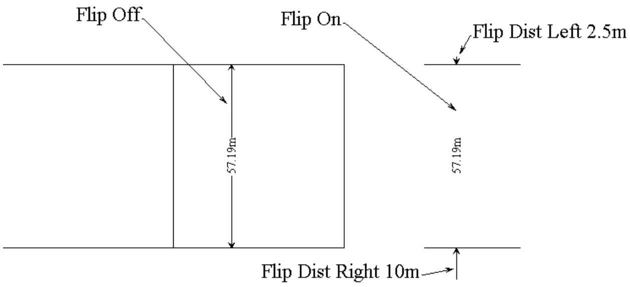


Figure 2-54 - Dimension Arrow Flipping

2.7.4.2 DIMENSION TEXT TAB

Tolerance

An allowable variation in the dimension can be specified and displayed.

Type: Select the "Type" of tolerance required from the dropdown list.

Lower and Upper Tolerances: Enter a "Lower" and "Upper" tolerance. In Figure 2-55 each tolerance type is displayed. Each tolerance has a "Lower" value of 5m and an "Upper" value of 1m.

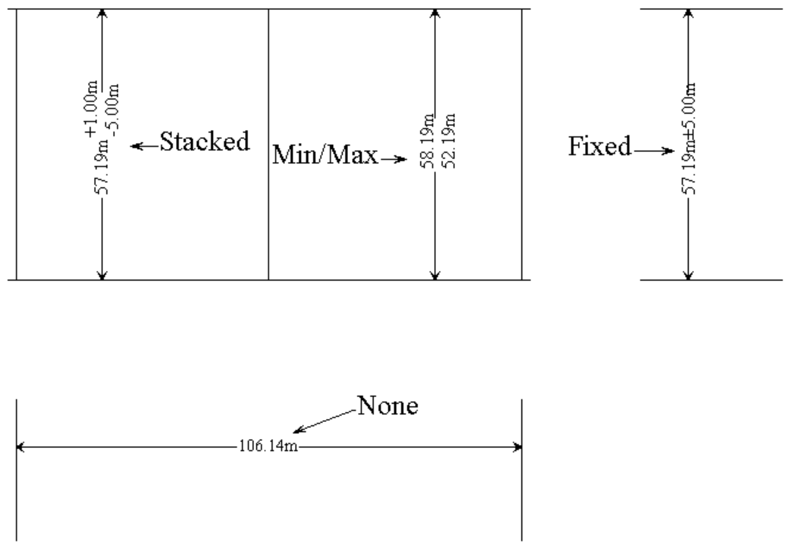


Figure 2-55 - Dimension Tolerances

Prefix, Suffix and Overwrite

If "Prefix", "Suffix" or "Overwrite" is checked, any text entered for the checked option will be placed before, after or in place of the dimension length. See Figure 2-56 where the use of a "Prefix" is shown (text placed before the dimension length) and use of "Overwrite" is used.

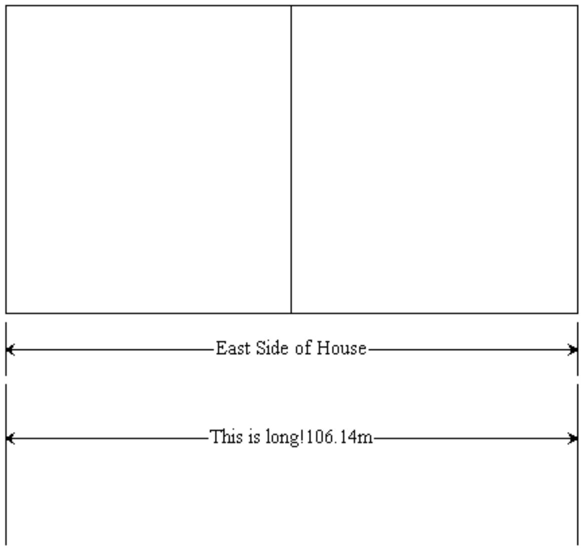


Figure 2-56 - Dimension Prefix

Location

Two location options can be chosen (see Figure 2-57):

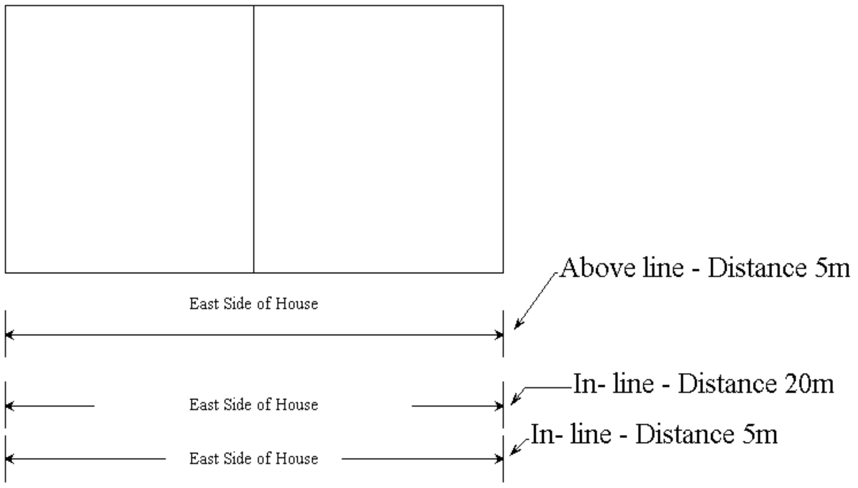


Figure 2-57 - Dimension Location

In Line: "In Line" where the dimension text will be in the middle of the line, and the distance entered will be the space between the text and the dimension line.

Above Line: "Above Line" where the text will be placed above the dimension line at the distance entered. Only positive values can be entered.

Vector Text Settings

These options only apply to Vector fonts and will not affect any True Type fonts.

Note that *Dimension* can only have one font. If another font is selected to use in a subsequent dimension, all previously placed dimensions will change to the new font selected.

Char Space: "Char Space" specifies the spacing between characters of a text line as a percentage of the character size. The default is 20%.

Slant Angle: "Slant Angle" specifies the angle at which vector text is slanted to emulate Italics. The angle must be between -45º and 45º (see Figure 2-58).

Mono Space: "Mono Space" specifies all characters to be the same width. When unchecked, wide characters (M and W) take up more space than narrow characters (I and L).

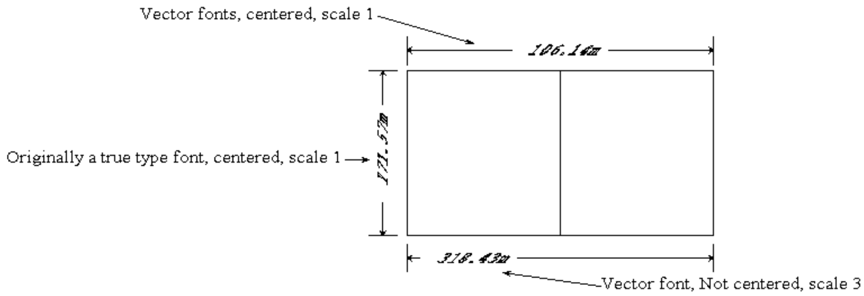


Figure 2-58 - Dimension Vector Fonts

Fill Text: When "Fill Text" is checked, characters are solid filled. When unchecked, characters are displayed in outline, making both redrawing and printing faster.

Scale and Centered Options

The "Scale" sets the real-world size of dimension text in current drawing units. Enter the appropriate scale.

When the "Centered" check box is checked, dimension text is placed at the midpoint of the dimension line, regardless of the orientation or mode chosen. When unchecked, the dimension text is positioned by moving the cursor along the dimension as the line is positioned (see

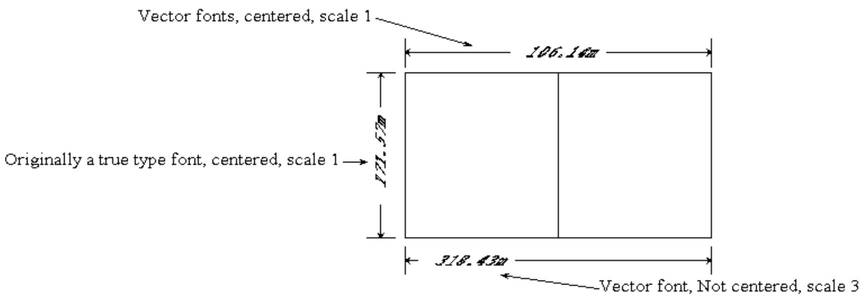


Figure 2-58).

Orientation

Two options are available with "Orientation" – "Aligned" and "Horizontal".

Aligned: If "Aligned" is selected then the dimension text is aligned to the orientation of the dimension line. If the dimension line is vertical, then the text will be vertical, if the dimension line is horizontal the text will be horizontal.

Horizontal: If the "Horizontal" action is selected, then the text is placed horizontally regardless of the orientation of the dimension line. This can make the text easier to read, as it will always be the right way up and not sideways (see Figure 2-59).

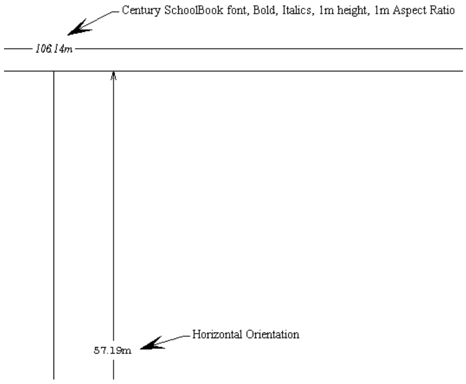


Figure 2-59 - Dimension Text

Dimension Text

Dimension text deals with the properties of True Type text placed. Select the font required, type in the height required - which will be relative to the size of the drawing, type in the aspect ratio required (width relative to height), style required (bold, italics, underlined), and line spacing. The line spacing sets the spacing (as a percentage of one line height) between lines of text for stacked tolerance display (see Figure 2-55).

2.7.4.3 HOW TO USE LINEAR, ANGULAR, RADIAL, DIAMETER AND ORDINATE DIMENSIONS

Using Linear Dimension

Dimension Tab, Section 2.7.4.1 and Dimension Text Tab, Section 2.7.4.2 explain the use of the different options available in the *Dimension* dialog.

Typically, *Linear Dimensions* are used to show the length of an object, but they can also show the distance between objects, or any other distance.

Linear Dimension can be used for dimensioning lengths of pipelines, buildings, fence lines etc. on any IRRICAD drawing. This dimension can be used on any object e.g., rectangles, lines and pipes simply by clicking on the line to dimension.

Other objects such as circles and partitioned objects can be dimensioned by using snap options from the right mouse menu to select a start and end point anywhere on an existing object boundary. "Mode" options such as "Single", "Cumulative" and "Partitioned" can be used to dimension a segregated object entirely ("Single"), each section from the same starting point ("Cumulative") or each section singly ("Partitioned").

Distances between objects can also be dimensioned, by using *Snaps* to select the first object and the second object.

Using Angular Dimension

Dimension Tab, Section 2.7.4.1 and Dimension Text Tab, Section 2.7.4.2 explain the use of the different options available in the use of the different options available in the *Dimension* dialog.

Angular Dimension will give the angle between any two points specified. Use the *Angular Dimension* tool to measure any angle in the drawing by first identifying a vertex and then a point on each ray. For every angle, select the inside or the outside measurement to be dimensioned (see Figure 2-60).

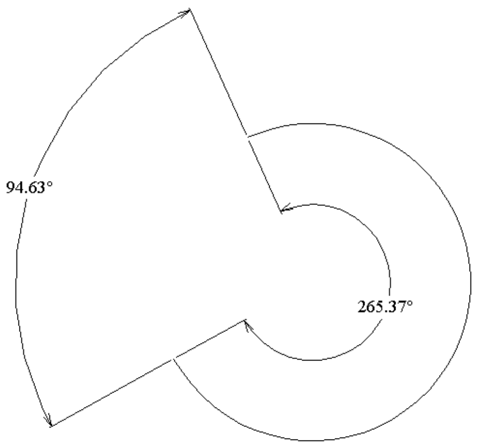


Figure 2-60 - Angular Dimensions

Using Radial Dimension

Dimension Tab, Section 2.7.4.1 and Dimension Text Tab, Section 2.7.4.2 explain the use of the different options available in the use of the different options available in the *Dimension* dialog.

Radial Dimension is used to display the radius of any circular object such as a circle or arc. Select *Draw|Dimension|Radial* and click on the boundary of the circle or arc. The radial dimension will appear. Move the cursor along the circular boundary to position it. Click when in the correct position.

Using Diameter Dimension

Dimension Tab, Section 2.7.4.1 and Dimension Text Tab, Section 2.7.4.2 explain the use of the different options available in the use of the different options available in the *Dimension* dialog.

Diameter Dimension is used to display the diameter of any circular object such as a circle or arc. Select *Draw|Dimension|Diameter* and click on the boundary of the circle or arc. The diameter dimension will appear. Move the cursor along the circular boundary to position it. Click when in the correct position.

Using Ordinate Dimension

Dimension Tab, Section 2.7.4.1 and Dimension Text Tab, Section 2.7.4.2 explain the use of the different options available in the use of the different options available in the *Dimension* dialog.

Ordinate Dimensions place a series of dimensions based on a point specified on the drawing. If a large rectangle has been drawn, the base point may be placed on the bottom side of the rectangle. Future points will have the measurement displayed relative to the distance from the base point.

After selecting *Draw|Dimension|Ordinate*, select the base point to use (enter an origin point). Now draw a line at 90° from the direction to be labeled. This also indicates the direction in which the dimension will measure from the base point (enter a direction point). If the measurements are to be vertical (e.g., from ground level upward) draw the first line horizontally. Now enter the text placement point. Notice that if the previous direction entered is vertical, text can only be placed horizontally, either to the left or right of the origin point. Click to place the text.

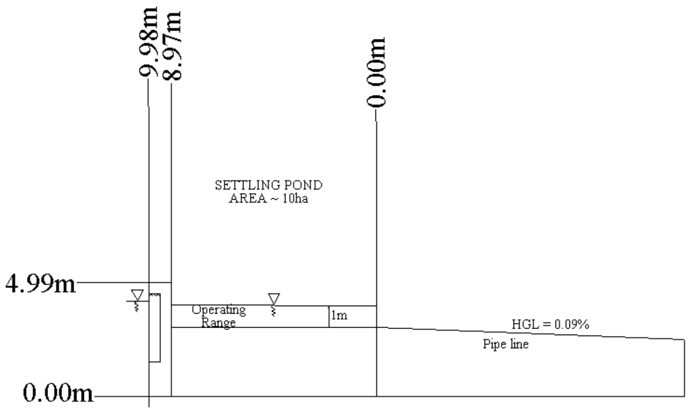


Figure 2-61 - Ordinate Dimensions

The first text placed will indicate the base point - 0.00ft (m). Now place another click where required to dimension and place the text again. The second dimension is the distance from the base point along the positive axis (vertical if the direction point was placed in a vertical direction). Continue to place origin points until a new dimension or new direction is required (see Figure 2-61).

2.7.4.4 DATUM / LEADER SETTINGS

Drawing Properties

The first part of the dialog deals with the drawing properties. These can be editing as required - changing the layer from the default layer of <DRAWING> to another layer of the choice, changing the color, line type or line width of the dimension line.

Vector Text Settings

These options only apply to Vector fonts and will not affect any True Type fonts.

Note that *Datum* can only have one font. If another font is selected to use in a subsequent dimension, all previously placed dimensions will change to the new font selected.

Char Space: "Char Space" specifies the spacing between characters of a text line as a percentage of the character size. The default is 20%.

Slant Angle: "Slant Angle" specifies the angle at which vector text is slanted to emulate Italics. The angle must be between -45° and 45°.

Mono Space: "Mono Space" specifies all characters to be the same width. When unchecked, wide characters (M and W) take up more space than narrow characters (I and L).

Fill Text: When "Fill Text" is checked, characters are solid filled. When unchecked, characters are displayed in outline, making both redrawing and printing faster (see Figure 2-62).

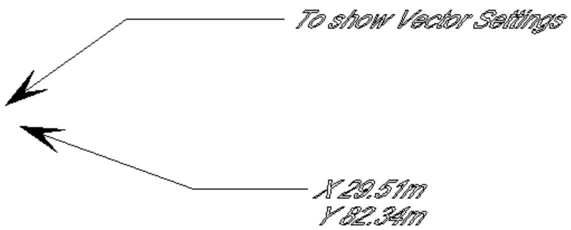


Figure 2-62 - Outline Vector Font

Text Edit Field

This field is available to enter any text required with *Draw|Dimension|Leader*. Any text in this field when *Draw|Dimension|Datum* is used will be ignored unless the "None" option in Datum Dimension is selected. The "Vector Text Settings" control the properties of any vector text used here.

Datum Dimension

Select the option required to place a datum - X and Y co-ordinates of the point, X co-ordinates only, or Y co-ordinates only. If "None" is selected, any text entered in the text edit field will be placed with the datum.

Arrow

This section specifies how the arrow is to be displayed.

Type: Select an "Arrow" "Type" from the dropdown list.
Size: Change the "Size" of the arrowhead.

Angle: Change the "Angle" of the arrowhead as required.

Offset and Shoulder

The Offset field is used to describe the distance between the end of the leader or datum and the text placed. Increase or decrease this as required.

The "Shoulder" field describes the length of the shoulder or horizontal line attached to the end (2nd mouse click) of the Leader or Datum. See Figure 2-63.

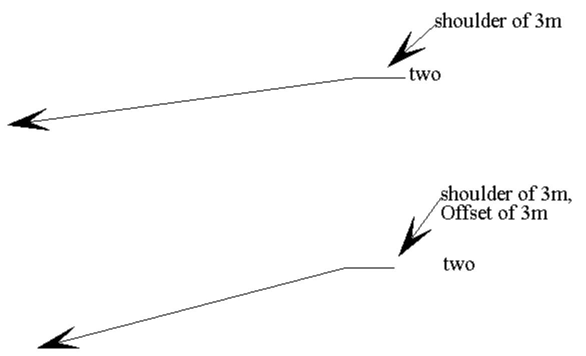


Figure 2-63 - Shoulder And Offset

Leader Text

Dimension text deals with the properties of True Type text placed. Select the font required, type in the height required - which will be relative to the size of the drawing, type in the aspect ratio required (width relative to height), style required (bold, italics, underlined), and line spacing. The line spacing sets the spacing (as a percentage of one line height) between lines of text. Use <Ctrl> + <Enter> to type a second line of text.

2.7.4.5 Using Leader and Datum Dimensions

Leader Dimension

Draw|Dimension|Leader is a useful tool to label items in the design. Text can be highlighted and copied from the *Object Info* dialog, *Show Flow* dialog or any of the reports for example.

Type in the text required. The first point placed on the screen will become the arrow point. Draw the arrow as a continuous line, placing points where a change of direction is required. When completed select *Right-click|Done*. By moving the mouse, select which side the text should be placed - either left or right. A "Shoulder" may be added and an "Offset" placed before the text (see Datum / Leader Settings, Section 2.7.4.4).

Dimensions can be exploded to edit the text separately if needed. Co-ordinates or lengths and angles can be typed in to place the first and subsequent points (see Sizing and Placing Objects Accurately Using Direct Entry, Section 2.2.5.5).

Datum Dimension

Datums are used to specify the co-ordinates of a point on the screen. Where the first click is placed defines the datum value.

Datums are placed in the same way as *Leaders*. The first point placed on the screen will become the arrow point. Draw the arrow as a continuous line, placing points where a change of direction is required. When completed select *Right-click|Done*. By moving the mouse, select which side the text should be placed - either left or right. A "Shoulder" may be added and an "Offset" placed before the text (see Datum / Leader Settings, Section 2.7.4.4).

Dimensions can be exploded to edit the text separately if needed. Co-ordinates or lengths and angles can be typed in to place the first and subsequent points (see Sizing and Placing Objects Accurately Using Direct Entry, Section 2.2.5.5).

2.7.5 INSERTING OLE DATA

OLE Functionality

Items such as IRRICAD reports, spreadsheets, documents etc. can be inserted into the IRRICAD design. The methods available to do this are described below.

Edit|Paste

This option allows only a single instance of the object to be inserted.

Tools|Insert OLE

Allows multiple instances of the object to be inserted.

Edit|Open OLE Item

OLE items that have previously been added can be opened and altered in the appropriate application. To do this, simply select the OLE item and then use *Open OLE Item* from the *Edit* menu. Any changes made will be reflected in the inserted item.

Notes:

In both cases, the required data needs to have been copied to the clipboard in the appropriate application (e.g., the IRRICAD report viewer) or a file copied in My Computer or Windows Explorer). The size and shape of the OLE object is selected by specifying two corners of a rectangle (clicking one corner then moving the cursor to the desired second corner and clicking again - NOT click and drag). Although there is no restriction on the shape of the OLE rectangle it is advisable to ensure that the relative dimensions of the rectangle approximate those of the OLE object to be displayed.

It is a restriction of OLE that only the first page of the copied data can be displayed. NOTE: in order for IRRICAD reports to be displayed correctly an application that can render RTF data, including tables, must be installed on the system - examples of suitable applications are MS Word, Open Office, etc.

OLE items can be printed or exported to PDF files. In both cases only the enclosing rectangle is displayed in the Print/PDF preview screens.

OLE items are not exported to VCD/DXF/DWG files.

OLE items are selected by using a select tool and clicking on the bounding rectangle for the item. This rectangle is white and therefore will be invisible when using a white background. It is normally not difficult to select it, but should difficulty arise, using a non-white background color may help.

2.7.5.1 OLE EXAMPLE

The following process illustrates the process of inserting an IRRICAD report as an OLE object into a design.

Copy Data from Report

Choose the required report from the *Reports* menu then select *Copy* from the *Edit* menu in the report viewer.

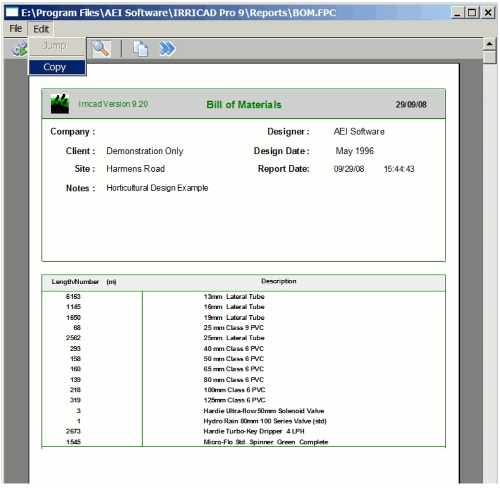


Figure 2-64 - Irricad Report

Insert into IRRICAD

Now select either *Edit|Paste* or *Tools|Insert Ole* in IRRICAD and specify the location and size of the inserted report by clicking two points that define a rectangle. Note that everything that is visible on the first page of the IRRICAD report is displayed including any page headers and footers etc. It is possible to easily create special report templates that do not include some information for use with OLE (contact the IRRICAD support representative for details).

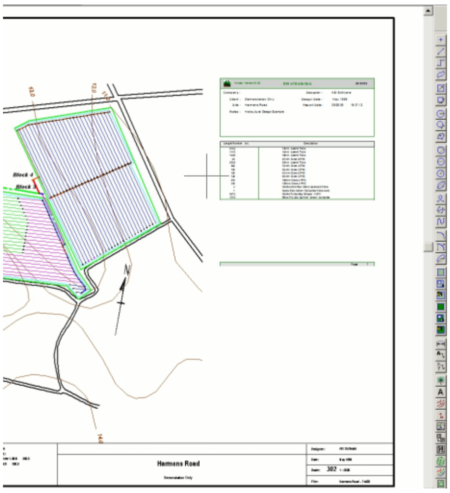
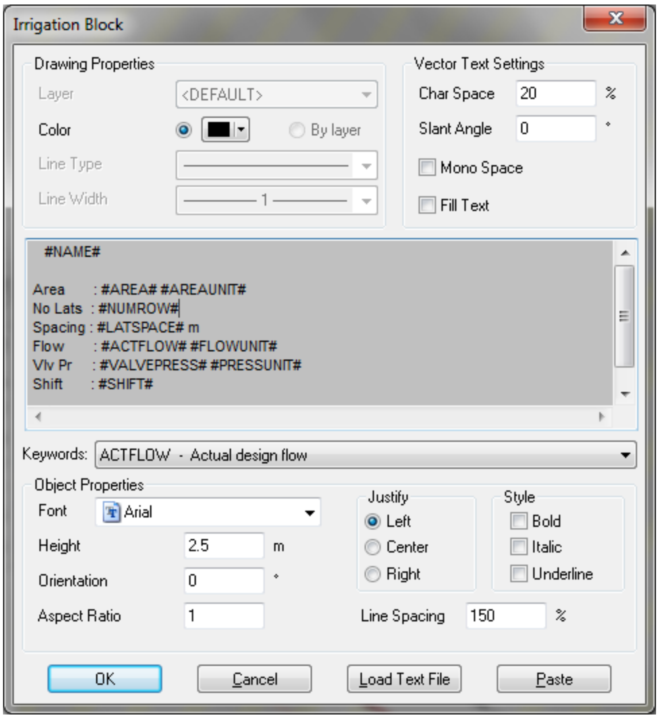


Figure 2-65 - Irricad Report In Design as OLE Object

2.7.6 AUTOMATIC LABELING

The labeling tool in IRRICAD enables a fast method of annotating multiple hydraulic items in one action from preset templates. It is a useful tool to not only display product descriptions on the plan but also hydraulic information and design results as well. Labeling can be set up once and then made available for all future designs.

When actioned the tools work by automatically substituting pre-programmed keywords in the templates with the required data for each individual hydraulic item. Keywords are denoted by surrounding hashes (#) and are normally abbreviations based on their function. Any other text in the template is simply reproduced and a text object, with an optional background and border, is created and placed on the design for each item selected as shown in Figure 2-66.


Irrigation Block
Drawing Properties
Layer
<DEFAULT>
Color
By layer
Line Type
Line Width
1
Vector Text Settings
Char Space
20
%
Slant Angle
0
Mono Space
Fill Text
#NAME#
Area : #AREA# #AREAUNIT#
No Lats : #NUMROW#
Spacing : #LATSPACE# m
Flow : #ACTFLOW# #FLOWUNIT#
Vlv Pr : #VALVEPRESS# #PRESSUNIT#
Shift : #SHIFT#
Keywords:
ACTFLOW - Actual design flow
Object Properties
Font
Arial
Height
2.5
m
Orientation
0
Aspect Ratio
1
Justify
Left
Center
Right
Style
Bold
Italic
Underline
Line Spacing
150
%
OK
Cancel
Load Text File
Paste

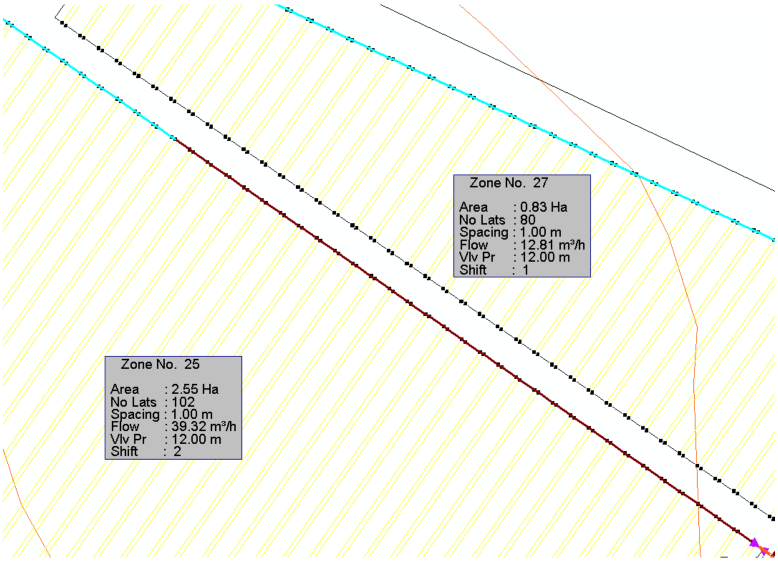

Zone No. 27
Area : 0.83 Ha
No Lats : 80
Spacing : 1.00 m
Flow : 12.81 m³/h
Vlv Pr : 12.00 m
Shift : 1
Zone No. 25
Area : 2.55 Ha
No Lats : 102
Spacing : 1.00 m
Flow : 39.32 m³/h
Vlv Pr : 12.00 m
Shift : 2

Figure 2-66

Labeling is typically a two-step process:-

Firstly, the required information using keywords and text is set in the template (*Settings|Labels*) [Text] box. Keywords may be selected for the dialog from the drop-down. Settings for background, border, and alignment relative to the item can be specified in the main Labels dialog. Enable the item types to be labeled by checking the "Name" column as required.

Secondly, to give complete control the *Create Labels* tool will only create labels for selected (highlighted) items. Highlight the required items, or use *Modify|Select|All*, then action *Tools|Create Labels* to create the labels. Only the item types enabled via the checkboxes in *Settings|Labels* that are highlighted on the plan will be labeled.

Note the list and useability of keywords can be found in the Technical Reference (Appendix I: Keywords for use in Labels and Plot Templates, Section 6.10.1).

The format of existing labels may be changed by modifying the appropriate template in *Settings|Labels* and then using *Tools|Update Labels* to update the existing labels.

More than one template can be saved for each type of label by using Label Sets. When labeling one or both label sets can be enabled for use. See Using Label Sets, Section 2.7.6.4 for more information and a working example.

2.7.6.1 MAXIMUM LABEL LENGTH

Labels for 'point' type items will always be created if the item type is checked in *Settings|Labels*. This is not necessarily the case for 'line' objects (pipes, wires etc.). By default a label for this type of item will not be created if the length of the label symbol exceeds 90% of the length of the longest line segment in the item.

It is possible to alter this behavior by changing two values in the *Label* settings tab. The "Check Label Length" setting determines whether the length of a label is checked against the longest line segment while the value in the "Length Allowance" field, multiplied by the length of the longest segment, gives the maximum allowable label length for a particular item.

2.7.6.2 Labels for Multiple Pipes

An option in the *Settings|Labels* tab allows multiple pipe segments to be represented by a single label.

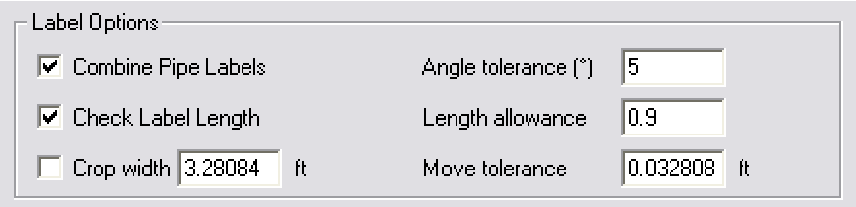


Figure 2-67 - Label Options

If the "Combine Pipe Labels" is checked then, when labeling Zone or Mainline pipes, any that are connected, and are of the same type, will be combined and a single label produced. Zone and Mainline pipes are considered independently, therefore labels are not combined over a valve.

For pipes to be combined the total angle between them must be less than the value set in the "Angle Tolerance" field. If pipes branch (attached tapes and connected spraylines are not considered to be a 'branch') then a new label will be produced. The LENGTH2D / ROLLS and LENGTH3D / ROLLS3D keywords will be based upon the combined length of the pipe segments.

This method of labeling is useful for creating labels for sub-mains.

<u>Note</u>: *that hydraulic labeling (i..e, adding labels to show hydraulic information) is not supported when the "Combine Pipe Labels" option is specified. Hydraulic values will be displayed as stars (****) in this case.*

2.7.6.3 Block Labels

Labels may be created for block entities (*Tape Irrigation Blocks* or *Spray Irrigation Blocks*). To enable this, check the "Irri Blocks" entry in *Settings|Labels*. Labels for blocks act in exactly the same as for other items.

Labels can also be constructed for simple Irrigation Areas. The settings for Irrigation Blocks are used to control the construction of labels for these items.

2.7.6.4 Using Label Sets

Label Sets provide the ability to apply more than one label to an item and easily maintain multiple label formats for each category. Both label sets can be enabled for use at the same time, or independently, and sets can be saved and restored as required.

The parameters contained in the "Label Options" panel are also retained for each set and this feature is extremely useful to maintain, and apply, an alternate set of labels, containing hydraulic keywords which cannot be used with the "Combine pipe labels" option, for pipes.

An example of how label sets may be used in this manner is shown in the image below. The label containing the pipe description has been created with the "Combine pipe labels" option checked while the label with the pressure and flow has this option unchecked and therefore is displayed for each pipe section.

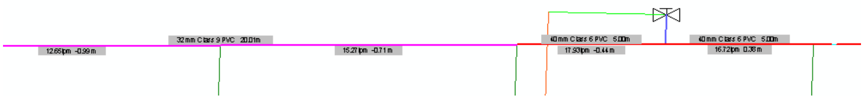


Figure 2-68

Detailed steps for this example:-

1. Select *Settings|Labels* to open the Labels dialog box.
2. Select "Label Set 1".
3. Enable the item type to label e.g., **Zone Pipes**.
4. Add any hydraulic keyword required by clicking the text button in the "ABC" column. For example add **#HY_FLOW# #FLOWUNIT#** and **#HY_HL# #PRESSUNIT#,** and set the text properties as required. Click [OK].
5. Edit the Background and Border properties as needed.
6. Select **BELOW** for the label position.
7. Make sure "Combine Pipe Labels" is unchecked.
8. Now select "Label Set 2".
9. Add any keyword required by clicking the text button in the "ABC" column. For example add **#DESC#** and **#LENGTH# #LENUNIT#,** and set the text properties. Click [OK].

10. Edit the Background and Border properties as required.
11. Select **ABOVE** for the label position.
12. Enable "Combine Pipe Labels" so a single label will be applied to contiguous pipe segments of the same type.
13. Enable "Use Label Set 1" and "Use Label Set 2".
14. Select the items to label (*Modify|Select All* can also be used.)
15. Select *Tools|Create Labels*.

2.7.6.5 Label Operations

Modifying 'Parent' Items

When labels are created, links are established between the label symbol and the 'parent' object the label is representing. If the 'parent' object is moved or deleted then the corresponding label will be modified in the same way. An exception to this rule is when a point item is moved that is connected to a line item (pipe, tape or sprayline) that has a label associated with it. In this case the label for the line item will be deleted.

Modifying Labels

Labels may be modified independently from their 'parent' items, all the normal modification tools (*Move*, *Rotate*, *Delete*, Change etc.) can be applied in the same way as for any other drawing symbol. If a label is modified the parent item remains unchanged. Note that it is not recommended that the symbol name is changed since each label has a unique symbol definition created for it.

2.7.6.6 Database Editor Label Field

The database contains a "Label" field that can be used to store preset generic descriptive information that may then be used in the creation of labels for hydraulic items. Accessed via the #LABEL# keyword this field typically contains an abbreviated form of the item description and may also include relevant hydraulic parameters. For example a label for "50mm PVC Class 6" could be "50/6". Up to a maximum of 12 characters can be entered.

2.7.6.7 Use Crop Widths

This option affects the way the area for Irrigation Blocks specified by the #IRRAREA# label keyword, is calculated. If "Crop Width" is unchecked (the default) then the area is calculated using:-

Total Lateral Length * Lateral Spacing.

When "Crop Width" is checked then the area specified by IRRAREA is calculated using:-

With Lateral Groups:	Total Lateral Length / Num Laterals per Group * Crop Width.
No Lateral Groups:	Total Lateral Length * Crop Width.

Note that if "Crop Width" is greater than the Group Spacing + (Number of Laterals per Group – 1) * Lateral Spacing, or the Lateral Spacing (with no groups) then the normal method is used to calculate the area.

2.7.6.8 Label Rounding & Roll Lengths

It is possible to round numeric values in labels to a 'nearest value'.

The format for rounding is keyword-semicolon-number:

#KEYWORD;0.1#

Meaning: round the value of 'keyword' to the nearest 0.1. This would give one decimal place of accuracy; similarly 0.01 would give two decimal places etc.

Two keywords, #ROLLS# and #ROLLS3D# are available, such that pipe lengths can be displayed as a number of 'rolls' (based on the roll length of the pipe type in the database – see the *Pipe Fitting Matching Table*).

2.7.6.9 Label Alignment

Labels for point items are always constructed so that the included text is horizontal while those for 'line' items are aligned at the same angle as the object. Tapes and contours lines may be composed of multiple line segments; in this case the label will be located on the longest line segment making up the item.

2.7.6.10 Design Based Label Settings

Label settings are saved with each design. This means that individual designs can be setup with different label settings. However to save the current templates as the default for all future new designs click the [Save As Defaults] button on the main Labels dialog.

2.7.7 Symbols

Database symbols are used in the database to display a symbol for each hydraulic item. The exception is the Pipes and Wires groups, where a line type is selected.

The program comes with an extensive choice of symbols, however, symbols can be drawn and saved, or imported and saved.

Start with a clean design (*File|New*). Draw the new symbol at the size 100 inches by 100 inches (2.54 metres by 2.54 metres). This will make sure that it is the same scale as the existing database symbols so a size 5 for the new symbol will be the same size as a size 5 of existing symbols. Use any of the drawing tools to draw the elements of the symbol on the screen.

Using a selection tool select all the items required to make up the symbol. When everything is highlighted, use *Tools|Create Symbol* to store the items as symbols. Enter a name for the symbol and check the "Database" check box. Leave the path as suggested as this path is stored in *Settings|Irrigation Items*, however the symbol can be saved elsewhere if required. Now the symbol is present in the folder containing the database symbols.

Run the database editor program and open the working database (if this is not the default database click [Save Changes] on the database that initially appears and select *File|Open* to open the working database). Go the item required to use the new symbol for. Click the [Edit / View] button when this item is highlighted. To the left of the "Plotting Symbol" field is a small button with three dots on it. This is a [Browse] button. Click this button and find the new symbol in the \symbols\database folder or whereever it is stored. Select it and click [Open]. After making the changes to this item click [Save] and [Save Changes] to save and close the database.

2.8 PRINTING REPORTS AND PLANS

This chapter covers producing reports and the preparation and printing of the final plan.

2.8.1 PRODUCING REPORTS

IRRICAD Reports supply tabulated results and may be used to present detailed or summarised information for the designer and/or client. The reports may be produced at different stages throughout the design process.

The reports (accessed from the *Reports* menu) include:-

- Management Reports – detailing the operation of the system
- Zone Design Reports - the results of the hydraulic calculations via *Zone Design*
- Mainline Design Reports - the results of the hydraulic calculations via *Mainline Design*
- Materials List and Costing Reports – lists of the components used in the design

Reports may be viewed on screen, copied and pasted into the design as an OLE item, printed, and saved to a variety of formats as required. Note that the on screen view is rendered for printing and as such individual elements in a report are not selectable.

By default the printer used to generate reports is the computer's default printer, this may be changed in *File|Reports Print Setup*.

See Reports, Section 5.14 for details of each standard report.

2.8.1.1 SAVING OR EXPORTING REPORTS

Reports can be saved as an RTF, HTM or TXT version using *File|Save* in the report viewer.

Additonally reports can also be exported directly to files in CSV, TSV or TXT format and subsequently be opened in other applications (Microsoft Excel or Notepad for example). A selection of the reports already formatted for direct export are available and may be obtained by contacting your local IRRICAD support team.

Report templates are customizable via a report editor. Typically this is not undertaken by users, contact your local IRRICAD support team for details. The report templates are located in the Irricad Pro xx\Reports folder.

2.8.1.2 Placing a Report on the Plan

A single page report can be copied to the clipboard via *Edit|Copy* in the Report Viewer and pasted on to the design as an OLE item. Select *Tools|Insert OLE* in IRRICAD and left-click to place the top left and then the bottom right of the required extents of the report page. Ensure that the shape you have outlined is similar to the actual proportions of the copied page i.e. narrow and tall for portrait mode rather than short and wide. After placement the size can be adjusted by selecting the bounding rectangle of the OLE item and using *Change* to edit the height and width as required.

See also:

Inserting OLE Data	*Section 2.7.5*
OLE Example	*Section 2.7.5.1*

2.8.2 How to Print a Plan

In most circumstances you will want to produce a paper plan once the design is complete for presentation to the client and to provide installers with accurate layout information.

Before printing however, a key (legend); information about the scale of the plan, client, company, and designer; and a border around the printable area are usually desirable. IRRICAD provides these automatically via preset templates which are selected in the *Draw|Plot Layout* tool.

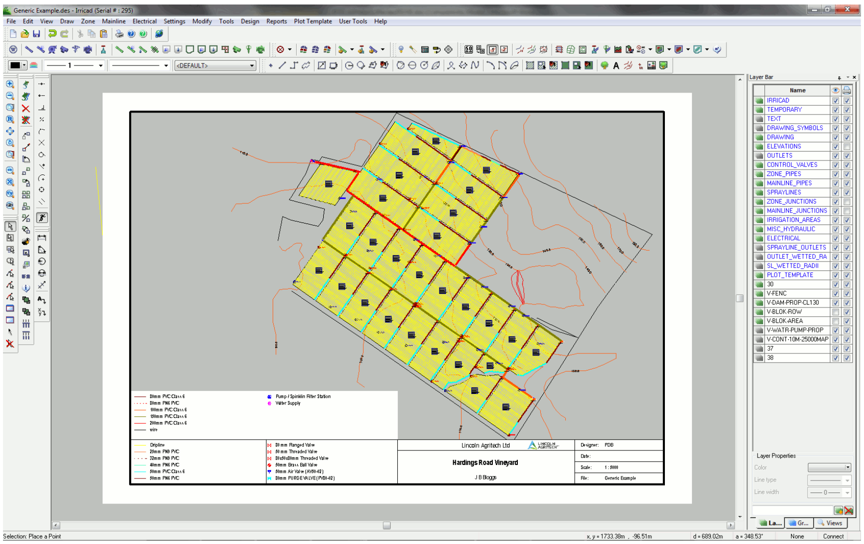


Figure 2-69

See also:

Print	*Section 5.3.16*
Plot Layout	*Section 5.6.14*

2.8.2.1 USING PLOT LAYOUTS

Plot Layouts place a border around the printable area based on a preset scale. Standard plot layouts typically include the following items:

- A legend showing the pipes and wires used in the design.
- A legend showing the valves, outlets, electrical and other miscellaneous hydraulic items used in the design.
- Information from *Design Details*, *Company*, *Client* and the "Designer" in *Settings* and the current date, scale and file name.

Zoom in to the area to be printed and create a plot layout using *Draw|Plot Layout*. It is recommended to do this after the design is complete to ensure that all hydraulic items used in the design will be listed in the legends.

A suitable scale can be calculated automatically, based on the current zoom state and paper size, by clicking the [Calculate] button. Alternatively this may be entered, or changed, manually.

Select the required “Drawing Template” from the list, making sure it matches the paper size and orientation already selected.

Click [OK] for the plot layout to be automatically produced. It will appear centrally on the current screen view.

The drawing templates used to create Plot Layouts may be customised as required. See Editing Plot Templates, Section 2.9.8.

Tips:

When a printing a smaller portion of the plan or when an image is present “behind” the plan enable “Keep Fills”. This option will place white fills underneath the legend and border so that items outside of the plan or underneath legend areas don't obscure the selected view .

Clicking [Save As Defaults] will set the current configuration as the default used for new designs.

To change the format of the current plot layout select Draw|Plot Layout again and make the required changes.

Position the layout over the plan by using Modify|Move and clicking on the border of the layout.

The plot layout can be exploded and minor changes made manually if required.

Note: *Selecting Draw|Plot Layout will remove every item on the PLOT_TEMPLATE layer so if items, other than a plot layout, are also on this layer they will be deleted.*

2.8.2.2 PLAN PRINTING

After placing the Plot Layout the plan is ready for printing. To print the design go to *File|Print*.

Select the paper size required. If this size is not listed click the [Printer] button (bottom right) and change the printer which will update the available paper sizes.

A preview is displayed on the right-hand side of the dialog. The plan can be dragged to a more suitable position with the mouse or the [Center] button used. When the plan is ready to print click the [Print] button.

Tips:

Do NOT check "All Colors to Black" if fills have been enabled on the plot layout as the fills will be printed in black.

To present the scale in the form of 1" =? ft (1mm =? m) make sure the Settings|Units - "Paper" field is set to inches (mm).

2.8.2.3 Exporting to PDF

Plans can also be exported directly to a PDF file via *File|Export PDF File*.

Note that the scale in a PDF file is only nominal as it can be printed to any size paper by the end-user.

A preview is displayed on the right-hand side of the dialog. The plan can be dragged to a more suitable position with the mouse or the [Center] button used. When the plan is ready to export click the [Save PDF] button.

Note: Ensure the "Paper" unit is appropriate for the current distance unit settings. For US select the "English" unit, for metric select the "Metric" unit option.

2.9 ADVANCED TOPICS

2.9.1 SPRAYLINES, TAPES AND MINOR LOSSES

2.9.1.1 WHEN TO USE CONNECTED OR UNCONNECTED SPRAYLINES

Connected

Connected spraylines should only be used when there are at least 10 emitters on a sprayline, this is because of the calculation method used. The hydraulic analysis may be less accurate if there are less than 10 emitters. Note that this limit is per **sprayline size** (not per lateral i.e. a lateral may have 3 sprayline sizes) so it also applies to the results of sprayline design or manual size changes.

The analysis of connected spraylines takes into account the elevation at individual emitters whilst the pipe sizing methods (i.e. Design) assume a constant slope along a sprayline. Note however that an analysis is carried out automatically after pipes have been sized.

Unconnected

Unconnected spraylines can be used, with higher numbers of emitters, if it is wished to have pipe sizing take account of the elevation at each emitter.

2.9.1.2 ANALYSIS OF TAPES

Tapes (driplines) generally have very low flows and closely spaced emitters, because of this it is not accurate to assume that the flow from each emitter is relatively constant (this is assumed for connected spraylines). Consequently a different calculation method is used for tapes that allows for changing emitter flows. The elevation at each emitter is taken into account.

2.9.1.3 MINOR LOSSES EXPLAINED

Minor losses are the headlosses associated with fittings i.e. size changes, crosses, tees, elbows, take-offs etc. IRRICAD accounts for minor losses with a conservative equivalent length method, an extra length is assigned to each pipe segment to allow for the headloss.

Spraylines and Sprayline Blocks

Losses down a submain (allowing for LTO or losses through Tees/Crosses), in blocks of connected or unconnected spraylines, are calculated using the minor loss method.

For connected spraylines minor losses, to account for barb losses at the emitter/riser connections, are calculated in a similar manner, however the loss assigned in a connected sprayline is 50% of the loss assigned in an unconnected sprayline.

The allowance for minor losses (in pipes and connected spraylines) may be disabled in *Zone Design Configuration*. This will effect both submains and laterals in sprayline blocks.

Tapes and Tape Blocks

LTO Losses down submains in Tape blocks are assumed to be negligible. Barb losses for tapes are calculated directly using the Kd specified in database.

2.9.2 How To Simulate Tapes Using Spraylines

Since tapes cannot be telescoped (changing sizes down the lateral) in IRRICAD tapes will need to be simulated as spraylines to achieve this feature.

This is a brief description of how to simulate tapes with suitable spraylines so that analysis and design can be carried out for blocks with tape that have multiple sizes.

2.9.2.1 Summary

- Enter the required data into the database as a sprayline and nozzle.
- Duplicate the design, replace existing tapes with spraylines and nozzles.
- If using Zone *LP Design* to size the submain, guess a nominal pressure, analyze and adjust as required so it simulates the tape as closely as possible.

- If the submain has been manually selected, guess at a nominal outlet pressure and use detailed analysis to analyze.

2.9.2.2 Setting up Databases

Entries to simulate the tape need to be made in the pipe and outlet databases.

In the pipe database add a pipe with the same internal diameter as the tape entry (do not forget to give it a unique warehouse code). The roughness for the pipe can be determined from trials to achieve the same headloss through the pipe that the tape gives. In a clean design run out a tape a set length (similar to the run length in the design) e.g., 300ft (100m). Then run out the new pipe the same length. Connect with a large submain pipe and a control valve. Analyze the zone and check the *Zone Design Full* report. Change the "Pipe Roughness" factor for the new pipe until it achieves the same headloss through the pipe that the tape is giving.

In the outlet database, make an entry for the tape outlet. The constant and index for this can be derived in a number of ways:

- Directly from tape manufacturers data.
- From manufacturers data using *Outlet Flow Curve Fit* utility.
- Assuming the index is 0.5 and calculating the constant by substitution in the equation (this method is normally accurate enough) Flow (lph) = Const * (Pressure (m)$^{0.5}$) (for PC emitters the index is 0 and the constant is equal to the flow rate).
- Contact AEI Software.

The radius is not important just use a Constant of say 1.0 and an Index of 0.0.

2.9.2.3 Creating the Simulated Design

It is generally better to duplicate the tape design and make the changes required to simulate the tapes on a separate copy.

Make a copy of the design by using *File|Save As* and save the design under new name.

In the copy of the design, replace the existing tapes with connected spraylines using the tape pipe and tape outlet created for this purpose.

To do this select the block and then select *Tools|Tapes to Spraylines* and select the new pipe and new outlet.

Sprinklers are always assumed to be at ground level. If in the design they are not at ground level, select an outlet connector with the appropriate height previously entered in the "Height" field (in the database) to ensure that IRRICAD uses that height in the pressure calculations at the sprinkler. Note the "Height" entered into the database is the height above ground, not the length of the outlet connector from a buried submain to the height of the outlet. For subsurface outlets (e.g., subsurface dripline) the height above ground will be negative (-ve).

If the submain is going to be designed with this method, then it is important to determine what nominal pressure is required to assign to the outlets so that the resulting flow for the simulated tape matches the tape specifications. This is required because the inlet pressure is specified for tapes and it is needed to get the average pressure that will normally be less than the inlet. The simplest way to do this is to layout a single simulated tape (with the same length and slope of the tapes in the block) connected to a very short (no headloss) submain and valve. The valve pressure then is fixed (in *Design|Zone Design Configuration*) to the tape inlet pressure required. Guess a pressure for the outlets (e.g., half way between the minimum pressure allowed and the inlet pressure) and then analyze the simulated tape (normal analysis, not detailed). Adjust the guess and re-analyze until the flow for the simulated tape matches that for a real tape of the same length, slope and inlet pressure.

If an existing submain requires analyzing, then it is unnecessary to go through the above process. Simply make a guess at the nominal pressure of the outlets and then use Zone *Detailed Analysis* to analyze the system. This does not apply to normal analysis where it is needed to use the method outlined above.

2.9.2.4 Sizing / Analysis

The simulated block can now be sized or analyzed. It is advisable, after sizing, to run *Detailed Analysis* (do not forget to set the valve pressure in *Zone Design Configuration*) as a check.

2.9.3 DETAILED ANALYSIS OF TAPES UNDER FLUSHING

Because IRRICAD cannot have two submains on a block of tapes, the following method must be used to analyse tapes under flushing conditions.

The flushing valves used need to be entered as outlets in the database. The radius equation is unimportant so use a K of 1.0 and an n of 0.0. Values for the pressure / flow equation (Constant and Index) should be derived using the tabulated headloss vs. flow values for the valve in the Outlet Flow Curve Fit utility.

Tape needs to be mirrored as a sprayline as tapes cannot have a submain on both ends.

2.9.3.1 SUMMARY

- Simulate the tape as a pipe and outlet.
- Use *Change Type* to change all tapes to spraylines using the pipe and outlet.
- Add the flushing main.
- Analyze.

2.9.3.2 SETTING UP DATABASES

Entries to mirror the tape need to be made in the pipe and outlet databases.

In the outlet database make an entry for the tape outlet. The constant and index (for the Iteration calculation method) for this can be derived in a number of ways:

- Directly from tape manufacturers data.
- From manufacturers data using *Outlet Flow Curve Fit* utility.
- Assuming the index is 0.5 and calculating the constant by substitution in the equation (this method is normally accurate enough) Flow (lph) = Const * Pressure (m) ** (0.5) (for PC emitter the index is 0 and the constant is equal to the flow rate).
- Contact AEI Software.

In the pipe database add a pipe with the same internal diameter as the tape entry (do not forget to give it a unique warehouse code). The roughness for the pipe can be determined from trials to achieve the same headloss through the pipe that the tape gives. In a clean design run out a tape a set length (similar to the run length in the design) e.g., 300ft (100m). Then run out the new pipe with outlets the same length. Connect with a large submain pipe and a control valve. Analyze the zone and check the *Zone Design Full* report. Change the roughness factor for the new pipe until it achieves the same headloss through the pipe that the tape is giving.

2.9.3.3 Creating a Flushing Design

Draw a block of tapes.

It is generally better to duplicate the tape design and make the changes required to carry out the flushing analysis on a separate copy. To do this, use the *File|Save As* command and save it with a different file name.

In the copy of the design select the tape block and change the tapes to connected spraylines (use *Modify|Select|Window* then select *Tools|Tapes to Spraylines)*. Select the tape pipe entered above then the tape outlet in the dialog.

Sprinklers are always assumed to be at ground level. If in the design they are not at ground level, select an outlet connector with the appropriate height previously entered in the "Height" field (in the database) to ensure that IRRICAD uses that height in the pressure calculations at the sprinkler. Note the "Height" entered into the database is the height above ground, not the length of the outlet connector from a buried submain to the height of the outlet. For subsurface outlets (e.g., subsurface dripline) the height above ground will be negative (-ve).

Add the flushing main to the tape block using *Zone|Cut Pipe*.

2.9.3.4 Flushing Valves

Firstly, look at the flushing valves pressure loss curves and select one that has approx 2psi headloss at the expected flow. The expected flow can be worked out by:

required velocity x Area x number of laterals on the manifold

The enter the data from the valve's pressure loss curves into the Outlet Flow Curve Fit utility.

Under detailed analysis this flushing outlet will need to have a pressure of 1.4-2.1psi and the flow you are expecting from above. You can change your manifold sizes or select a flushing valve size which will give you the values from Detailed Analysis that you require. It is important to focus on the Object Info data for the flushing outlets rather than the pressure you entered into the outlet dialog as Detailed Analysis will tell you the actual pressure and the actual flow at the outlet.

2.9.3.5 Sizing Manifolds

If you wish to size the manifold and/or submain (note we think it best to LP design the submain initially) then it will be again be trail and error process. Remember that velocity design will only give you a starting point and you may need to change these pipes to achieve the results you want.

Also note that when trying to achieve the correct flushing velocities and expected flow through the flushing valve, you can change the manifold sizes to try and achieve these goals.

2.9.3.6 Analysis

Set the valve pressure required for the zone in *Design|Zone Design Configuration* (you can get this from the Zone Summary report from the design of the real tape block).

Run *Design|Zone Design|Detailed Analysis*, this will analyse the tape block under normal conditions.

Now insert flushing valves where required (from the Outlet database) onto the flushing main. You can vary the valve pressure as you wish and examine the results in reports.

> Note: *A word of warning - Do not use a flush valve that is too big, i.e. make sure you use one that has 2m or 3m of headloss at the flushing flows you expect (use the Curve Fit utility to create the correct data to input). If you use a flushing valve that has too low a headloss, you will have problems getting a solution.*

If you do have problems with convergence, there is a detailed analysis factor in *Design|Design Parameters|Analysis Parameters* that you can increase (e.g., use 0.85 rather than 0.75). Remember to return the parameter to its original value after you have finished this design.

The required flushing velocity rule of thumb is 0.305m/s (1ft/s) down the tapes. Set the valve pressure to achieve the correct velocity.

The process is:

1. Draw a Tape Block Entity complete with flushing manifold (BOM Only for Scope) - select a size you think might be suitable for the flushing manifold.
2. Use LP design to size the submain.
3. Explode the block and convert Tapes to Spraylines using the pseudo pipe and sprinkler you have made to mirror this particular dripline.
4. Change the Scope of the flushing manifold to Design + BOM.
5. Set the control valve pressure to the same pressure as the tape block had previously.
6. Place the flushing valve that will be open in Situation # 1.
7. Run Detailed Analysis and check the velocities in the 'Tapes' - aim for approx 1ft/s. Check the pressure and flow at the flushing valve (Object Info).
8. Remove the flushing outlet from Situation #1 and place it at situation #2. Run Detailed Analysis again and check the velocities in the 'Tapes' - aim for approx 1ft/s. Check the pressure and flow at the flushing valve (Object Info).
9. Repeat steps 7 & 8 for as many flushing outlets as you will have on your manifold(s) that operate one at a time (assuming you are not opening all flushing valves at one time).

If the velocity and the outlet pressure and flow is what you are aiming for, then you are finished. If not, change the manifold sizes and see what effect that has, or change the flushing outlet for one more appropriate. It would be best not to change the control valve pressure as the grower will simply want to open the flush valves when flushing is required.

2.9.4 Modeling Multiple Driplines as a Single Line

Due to the size constraints in IRRICAD it is sometimes useful to be able to reduce the size of an analysis by combining a number of laterals / driplines into a single notional one. This is especially true in highly looped systems such as the analysis of tape / lateral blocks with flushing submains.

The following notes show how to accomplish this.

Add a new emitter / emitter nozzle to the database that has the same index as one used on the single lateral / dripline. The constant will be n times the single one, where n is the number of laterals being combined. If using a tape / dripline then see the notes on flushing analysis for sources of the emitter equation. Make sure that the warehouse code is different to the normal emitter / nozzle.

A new pipe needs to be added to mirror the hydraulic performance of the required number of laterals / driplines. Make sure that the description identifies what the pipe is for and use a unique warehouse code. The actual diameter is set by the following equation:

$D_{new} = (d^{4.871} \times n^{1.852})^{0.2053}$

where d is the single lateral diameter, n is the number of laterals being combined, and D_{new} is the diameter of the combined lateral. For example a 16mm ID combined into 10 laterals gives a new diameter of 38.4mm. This equation will work with any units. Use the same C factor as for the single lateral.

Make a copy of the design and remove the laterals that are going to be combined leaving one for each group. Generally it is best to have the notional lateral approximately in the center of the group of laterals being modeled. This means that a half lateral will be needed at the beginning and end of the submain, the diameter and emitter parameters for this lateral will need to be calculated and entered into the database separately. For example if there are 100 laterals that are being split up into groups of 10 then start and end with a group of 5 and then have 9 groups of 10 laterals in between. Change tapes to spraylines if required and then replace the emitters and pipes with the Multiple items determined above.

2.9.4.1 SUMMARY

- Create an outlet and nozzle to simulate the multiple laterals.
- Create a new pipe.
- Remove a group of laterals and replace with a single lateral.

2.9.5 Factors Affecting LP Pipe Sizing

Overview

These notes explain the factors that IRRICAD takes into account when it sizes pipes. A summary of these factors is shown in Figure 2-70. They represent the design tolerances that you can set within IRRICAD.

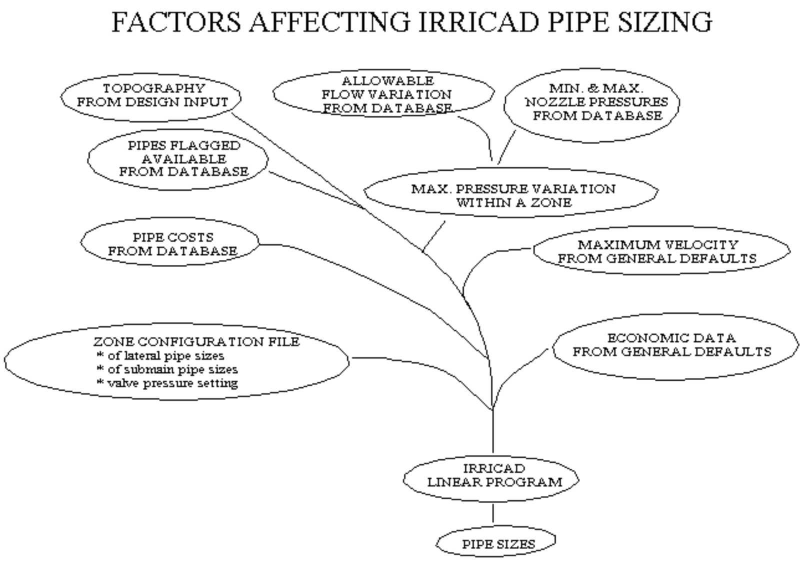


Figure 2-70 - Factors Affecting Pipe Size

Terminology

A quick review of terminology will help clarify the following notes.

Operating Pressure: The designer specifies the operating pressure of the emitter when the design is laid out in IRRICAD. For example a sprinkler may be set to operate at 50psi (35m).

Allowable Flow Variation: This is the design tolerance that is set up by the designer in the database for each emitter. A common design standard is +/- 5% of flow. If the example sprinkler delivers 10gpm (38lpm) at 50psi (35m) then the range of the flows within a zone should be between 9.5 and 10.5gpm (36 and 40lpm).

Exponent (or Index): The exponent for a nozzle is a number that describes how sensitive the flow from the nozzle is to pressure. Exponents are normally close to 0.5 and will vary depending on the style of the nozzle.

Allowable Pressure Variation: IRRICAD converts the allowable flow variation to an allowable pressure variation. If the exponent of the nozzle is 0.5 the relationship between flow variation and pressure variation is double (e.g., 10% variation in flow will equal 20% variation of pressure). In the above example, the allowable pressure variation will be about 45 to 55psi (31.5 to 38.5m). Nozzles with exponents higher than 0.5 will have a narrower band of allowable pressure and nozzles with exponents below 0.5 will have a wider allowable pressure variation for a given flow variation. The table below gives an idea of how different exponents affect pressure.

Table 2-2 - Allowable Pressure Variation

Exponent	Flow Variation%	+% Pressure Variation	-% Pressure Variation	Total Pressure Variation
0.47	+/- 5	10.94	10.34	21.28
0.50	+/- 5	10.25	9.75	20.00
0.53	+/- 5	9.64	9.22	18.86

In this example, if the sprinkler operated at 50psi (35m) the allowable variation for the 0.47 exponent would 10.64psi (7.45m). The 0.53 exponent nozzle only gives an allowable pressure variation of 9.43psi (6.6m). This is why IRRICAD uses flow variation as a design standard. It takes advantage of nozzles with better exponents.

Connected Spraylines: A connected sprayline in IRRICAD is treated as a length of pipe with many emitters on it. The pipe is sized using sprayline hydraulic routines. This reduces the task of pipe sizing because each row of emitters is treated as one pipe. Connected sprayline pipes are selected from those pipes in the database with a flag of L for lateral pipe.

Unconnected Spraylines: An unconnected sprayline in IRRICAD is treated as a series of emitters and separating pipes. Each piece of pipe between each emitter is sized separately using pipes from the database with a flag of Z for zone pipe. A large orchard block of sprinklers cannot be optimized in IRRICAD using unconnected spraylines because the size of the task is too big. It may be analyzed or sized using *Velocity Design*.

Factors affecting IRRICAD Pipe Sizing when using *LP Design*:

- Topography as entered in the design.
- Allowable flow variation for outlet as entered in the database.
- Min. & Max. nozzle pressures as entered in the database.
- Max. pressure variation within a zone.
- Maximum velocity as entered in *Design Parameters.*
- Economic data as entered in *Design Parameters.*
- Pipes flagged available in the database.
- Manually selected pipes – fixed pipes.
- Pipe costs as entered in the database.
- *Zone Design Configuration*
  - of lateral pipe sizes.
  - of submain pipe sizes.
  - valve pressure settings.

2.9.5.1 Drip Tape Design Notes

The Tutorials go over a drip tape design and this should be reviewed. Here are a few additional comments on drip tape designs.

IRRICAD designs drip tape systems using an allowable pressure variation. This is stored in the tape table in the pipe database. A typical setting may be an allowance of 20% above tape inlet pressure and 30% below tape inlet pressure.

The relationship between pressure variation and EU (emission uniformity) is not clearly defined however figures in the following table will give some indication. They will vary from tape to tape.

EU %	Pressure Variation
90	30
85	65
80	100

If designed to an allowance of 20% above tape inlet pressure and 30% below tape inlet pressure then will be designing to an EU in the mid-to-high 80's.

Many tape blocks have more rows than the existing IRRICAD limits for a zone. The *Zone Design Configuration* table can limit the selection of pipe sizes in the submain. This will increase IRRICAD's design limits. If the block is still too big the best way to design it is by using *Velocity Design*. A couple of trial error runs may have to be done to find the velocity setting that gives the pressure variation desired.

2.9.5.2 PRESSURE COMPENSATING DESIGN NOTES

When pressure-compensating emitters are used in IRRICAD there are no clear upper and lower pressure limits in each block. In theory, the flow out of a pressure-compensating nozzle is the same regardless of pressure. IRRICAD designs to a flow variation so it assumes the pressure variation can be infinite. With non-pressure compensating emitters the pressure window is easily determined because there is a relationship between pressure, the nozzle exponent and flow. Each emitter entered in the database has an allowable flow variation that the IRRICAD designer sets. For example, if a nozzle has an exponent of 0.50 and the designer has set the allowable flow variation to +/- 5% then IRRICAD will calculate the allowable pressure variation to be +/- 10% of operating pressure.

With pressure compensating emitter designs the designer often determines the minimum and maximum pressures in a block that he or she is happy with even before the hydraulic calculations are done. This is often related to the minimum and maximum pressures that the designer wants in the lateral pipe. In IRRICAD there are ways to do just that.

When pressure-compensating emitters are used the lower pressure limit in a block is usually the minimum operating pressure in the nozzle properties as entered into the database. So to set the minimum pressure required in the design go to the outlet tab in the database editor. Find the emitter in question and double-click on the nozzle required, as shown in the list of associated nozzles at the bottom of the screen. Set the minimum and maximum pressures to the minimum and maximum pressures that are required in the block.

The upper pressure limit in a block for pressure compensating emitters can be determined from a number of factors. It could be the maximum operating pressure in the nozzle record, but often other factors start to have an effect before the maximum operating pressure is reached. These include velocity limits and the energy verses pipe cost calculations. To make sure IRRICAD uses the full pressure window that has been set in the database for the nozzle, go into the *Design Parameters*. Change the "Zone Operating Hours per Year" to a low figure e.g., 500 hours. Also, set the "Max Zone Velocity" a little higher than normal. Often the best way to set an upper design pressure limit is to specify the valve pressure required. This is done in *Design|Zone Design Configuration*.

2.9.6 Using a Pump in a Design

The pump must be placed downstream from the water supply and must not be placed in loops. Remember a water supply can only have one connection and this is one end of the mainline pipe. Enter the water supply details to reflect true conditions of the supply – the height of water relative to ground level, or the existing pressure of the water source.

If the water supply is a river or open water source and therefore the pressure may be zero, enter a small number for the water supply design and maximum pressures so that IRRICAD will not calculate the pressure required to run the system (e.g., 0.1).

If the water supply is a tank, enter the height of the water level above ground level as the design and maximum pressures e.g., 2ft (m).

If the water supply is a well, enter the pressure as a negative pressure, indicating the level of the water below ground level e.g., –2ft (m) pressure if the water level is 2 feet (meters) below the ground (i.e., the static water level). If the well is artesian i.e., positive static water level, enter a positive number e.g., 2ft (m).

When a pump is used in a system, there are often more items that result in a headloss. These items such as rising column losses (submersible pump only), drawdown losses (well only), headworks losses, etc. can be entered in to the design and therefore analysed as close to field results as possible.

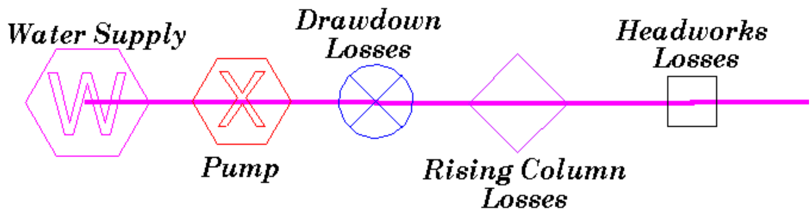


Figure 2-71 - Pump With Miscellaneous Losses

If the water supply is a well with a static water level below ground level, there will be a negative pressure in the pipe between the water supply and the pump, which will be reported during analysis. It does not matter in which order the above items are placed on the mainline pipe, only that they are placed so that any losses are accounted for. The items above can be entered at the depth they are at, or left at zero for convenience.

2.9.6.1 USING PUMPS IN PARALLEL

If two pumps are in parallel – they are effectively in a loop – NEVER put pumps in a loop. If this is the case, draw two water supplies with a pump each and connect the mainline after the pumps:

e.g.:

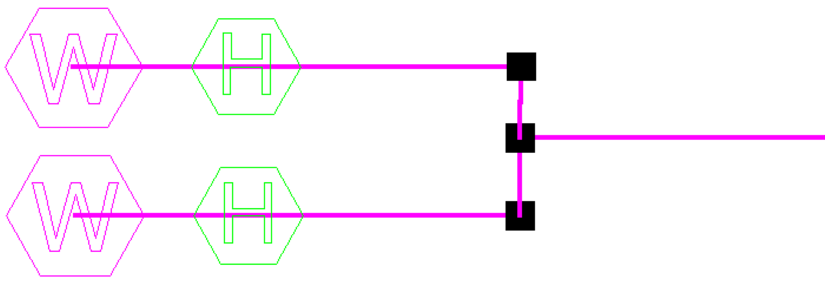


Figure 2-72 - Pumps In Parallel

Remember using the same pump in parallel doubles the flow.

2.9.6.2 Pumps in Series

Pumps can be placed in series. Once again, no pump should be placed within a loop.

Remember using the same pump in series doubles the pressure output.

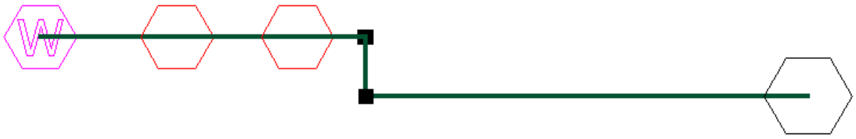


Figure 2-73 - Pumps In Series

2.9.6.3 Miscellaneous Hydraulic Items in The System

These are items that have a pressure loss in the system. These losses can be based on flow or can be a fixed loss.

If fitting selection is not important, it is convenient to enter the "Connection Type" for Misc. Hydraulic items to reflect the description e.g., **DD** for drawdown. This makes it easier to find them in the *Mainline Design Full* Report. Also change the connection codes after design but prior to fitting selection easily if required.

Drawdown Losses

Drawdown losses are based on well tests. Determine the drawdown for the well (pumping level - static water level).

Solve the formula used for Misc. Hydraulic items: $H = K \times Q^n$ where H is in meters and Q is in m^3/hr.

The drawdown is equal to the headloss in m (e.g., if the dd = 9 6m, then the headloss = 9.6m).

Q is the flow at the well, e.g., 49m^3/h. n is the exponent.

For alluvial aquifers: If there is only one well test (Q-dd pair) available estimate the index is around 1.5. For a large flow use 1.7 (> 50 l/s). Find the value of the constant e.g., $K = H/Q^n$. If there are two points supplied (2 well tests) on the same well can calculate the index (exponent). N = log (D1/D2)/log (Q1/Q2). $K = D1/Q1^n$.

For wells that are uncased in rock or limestone use an index (n) close to 1.0

Enter the constant (K) and index or exponent (n) in to the correct edit fields in the Other Hydraulic component group in the database. The intercept (C) is 0.

Rising Column (Rising Main) Losses in a Submersible Pump

This item can also be the suction pipe loss in a surface pump.

Use a friction loss chart for the type of rising column used.

Enter at least three sets of numbers read from the chart for the correct flow and rising column size into the *Curve Fit* utility for *Valves* (same as Misc. Hydraulic but no intercept), making sure the units above each column match the units from the chart. Click the [Fit Curve] button. The *Curve Fit* generates two numbers to use in the database. This produces constants and intercepts that IRRICAD uses in the Misc. Hydraulic formula to calculate the headloss through the rising column. It is easier to calculate for 100m and then adjust for the actual length.

For galvanised rising columns use the following: These have been calculated for a column 328ft (100m) long

Pipe Size	Constant	Index
8”	0.0001479	1.834
6”	0.00049076	1.84
5”	0.001254	1.810
4”	0.003307	1.852
3”	0.01174	1.855
2 1/2"	0.02448	1.874

Alter the constant relative to the length of the rising column (using the metric)

e.g., constant x length (m) /100m

for an 8" rising column which is 85m long:

0.0001479 x 85 / 100 = 0.000126

Enter 0.000126 in to the “Headloss Equation Constant” field in the database. Make sure the description specifies the length.

The rising column of the pump we will be using is 6” (150mm) and is 213ft (65m) long. Calculate the constant relative the length (as above).

Headworks Losses

This Misc. Hydraulic item can be used to account for other losses relative to the flow.

- n = 2
- H = for example, if the estimated pressure loss in the headworks is 5psi @ 26385gph (3.5m@100m³/h) assume n=2 (in most cases) and solve for K.

Solve for K: $H = KQ^n$

There is no intercept so leave the “Headloss Equation Intercept” field (C) as 0.

Calculate the headloss through each of the items in the headworks or expected to be in the headworks at a particular flow and therefore calculate the constant and the index. The headloss will change as the flow increases or decreases. Note that existing systems tend to have high headloss at the headworks.

Miscellaneous Fixed Losses

Misc. losses can be added to account for any other possible losses. These can be added into the Other Hydraulics component group by entering an intercept and leaving the constant and index as zero. Use only if required to include a fixed loss regardless of flow.

2.9.7 Multiple Water Supplies

If only one water supply exists for a system the pressure and flow can be left at zero for IRRICAD to calculate based on each system duty.

However, if there are 2 or more water supplies present for the same system and pumps will not be used in the design, enter at least the pressure in to all water supplies (required). Increase or decrease the pressure to achieve the flow required from each. If the water supplies are supplying the same system then *LP Design* cannot be used. Use *Velocity Design* to size the pipes.

<u>Note</u>: If the multiple Water Supplies are unconnected in the design then they must supply different system flows as set in Management.

2.9.7.1 PRVs with Multiple Water Supplies

If a PRV on the water supply is required, in a design containing multiple water supplies, do the following:

Make the water supply the PRV – enter the water supply pressure equal to the PRV pressure setting e.g., if the PRV is to be set at 70psi (50m), enter the water supply pressure as 70psi (50m). Never put PRVs in loops. Manually check the PRV is able to regulate at that set pressure and at that flow.

2.9.8 Editing Plot Templates

New templates can be created or existing templates edited by going to the *Plot Template* menu. Plot templates are placed on a design by going to the *Draw* menu selecting *Plot Layout* and specifying the "Drawing Template".

Company logos can be added if available in vector or image format. When saving a plot template with an image do NOT embed the image.

For working examples on Plot Templates see the tutorial on Plot Templates, Section 4.9.

2.9.8.1 Overview

Plot templates are borders with legends and title blocks that can be placed around designs. Normally plot templates consist of the following:

- An active area that defines the printable area on the paper. It is also used together with the entered scale to calculate the required size of the plot layout.
- A pipe legend that shows the pipe sizes and wires used in a particular design.
- A symbols legend showing the valves, outlets, electrical and other miscellaneous hydraulic items used in a particular design.
- Information about the design and the company, e.g., site, scale, date and designer.

- A border inside the paper limits.
- Lines to separate the legends and information.
- Several fills which are areas of a solid color. In plot templates these fills are normally white and are placed in the legend areas and outside the border. They are used to prevent parts of the design from being plotted in these areas. This is particularly useful when a small part of a large design is printed or plotted.

Plot templates are normally created for specific paper sizes to ensure that the proportions of legends and title blocks, and text and symbol sizes, are appropriate to the paper selected.

2.9.8.2 CREATING A NEW PLOT TEMPLATE

The important steps involved in creating a new plot template are:

- Change the background color. In order to see the white fills and black lines, it is best to change the background color so it is neither black nor white.
- Change the distance units to feet (meters). Determine the maximum printable area on the paper and multiply by 1000 e.g., a printable area of 17 x 11" becomes 1416.67 x 916.67ft (420mm x 297mm becomes 420 x 297m). B (A3) size paper with an assumed margin perimeter around the paper of 0.3” (8mm) then becomes 25ft (8m). If the lower left corner of the paper is assumed have coordinates of 0, 0 then the printable area is from 25, 25 to 1391.67, 891.67 (8, 8 to 412, 289). To see a table of paper sizes and their dimensions see Paper Sizes, Section 2.9.8.7.
- Start with a new design and draw a rectangle to represent the paper size. Draw an inner rectangle to represent the maximum printable area. Define the Active Area using *Plot Template|Active Area*. Drawing a line between the bottom left corner of the inner rectangle and the top right corner can do this. It is a good idea to start and finish this line just beyond the rectangle's extents.
- A white fill can be used between the two rectangles to ensure that any part of design that is outside the border (inner rectangle) is not printed. Fills may also be placed under the title block and as part of the legends (see Fills, Section 2.9.8.4).
- Draw lines to create an area that will be used for the legends, company name and design details. Place literal text as required

using *Draw|Text*. Add a company logo or other symbols using *Draw|Symbol* (see Placing Symbols on the Plan, Section 2.7.1) or *File|Import Image*. To automatically place information about the job and the company see Using Keywords, Section 2.9.8.6).

- Create the legends (see Creating Legends, Section 2.9.8.3).
- Select all the objects making up the template using *Modify|Select|Window* and save it using *Plot Template|Save Template*. The template is saved with the given name in the folder specified in *Settings|Drawing Items* - "Plot Layout Path".

2.9.8.3 Creating Legends

Legends are an area on the plan that lists the hydraulic and electrical items used in a specific design. IRRICAD will automatically place this list of pipes and valves on the plan if the plot template being used has a formatted legend.

There are three legend options:

- Pipes
- Symbols
- Combined (Pipes and Symbols)

Each legend is made up of the following items:

- A filled rectangle defining the space that the legend will take up on the plan.
- For pipes and wires, a placeholder line is needed to tell IRRICAD where the first pipe in the list should be, how long it should be and the line width.
- For valves and outlets, a placeholder symbol is needed to tell IRRICAD where the first valve in the list should be.
- For combined legends both a placeholder line and placeholder symbol are required. These should normally be placed one on top of the other (the start of the line should be in the center of the placeholder symbol).
- In all legends, placeholder text is needed to tell IRRICAD where to write the descriptions for the pipes and valves.

The placeholders can be any line, symbol or text string since they do not actually form part of the generated plot layout; they are merely used for positioning information and drawing properties. However, the default symbol called PlaceHolder is found in the \IRRICAD\symbols\database folder and the default text is #TEXT#.

Place the items making up the legend where appropriate. Make sure the placeholder line is the length and width required for the pipes, the placeholder symbol is the size required for the valve and outlet symbols and the text is the color, font and size required for the descriptions. (The colors of the placeholder line and symbol do not matter as they are replaced by the pipes and valve symbols whose colors come from the database). The fill rectangle will normally be white so that it does not appear on the printed page.

Select everything making up the legend using *Modify|Select|Window* so that everything in the legend is selected. Select *Plot Template|Make Legend* to create a legend object. The dialog box that appears when *Make Legend* is selected has three fields. The definitions of these fields are:

Type

Pipe:	lists the pipes, wires and spraylines used in the design.
Symbol:	lists the outlets, valves, pumps, Misc. Hydraulic objects and electrical objects used in the design.
Combined:	combines both pipe and symbol legends

Order

The "Order" relates to how the legends are filled. If three pipe legend areas are being placed, designate the order in which these areas are filled. The pipe legend area with the lowest number e.g., 1 will be filled first. When this area is full, the area with the next lowest number e.g., 2 will be filled next. Only if an area is filled completely will items be placed in the extra areas designated for that type of legend. If a legend of the same type already exists, enter a higher number.

Between Line Spacing

The space between items in the legend as a percentage of the text height.

2.9.8.4 FILLS

Fills are areas of a solid color (see Fill, Section 5.6.10).

In plot templates, fills are normally white and are placed in the legend areas and outside the paper border line. They are used to prevent parts of the design from being plotted in these areas. This is particularly useful when a small part of a large design is printed or plotted.

For notes on fills relating to legends see Creating Legends, Section 2.9.8.3.

To complete the plot template it is necessary to place a fill over the title block section of the template so parts of the design will not be plotted in the area containing the company name, scale, etc.

Set the current color to white in *Settings|Drawing Items*. Select *Draw|Fill|Boundary* and draw the fill boundaries for the legend fills and the title block. As each boundary is closed it will be filled. Select *Draw|Fill|Seed* and click in the area between the outer rectangle representing the paper size and the inner rectangle representing the maximum printable area to create the fill outside the paper border. Once all fills have been created, reset the current color to black (or the previous current color).

2.9.8.5 Moving Fills to Back

When a fill is placed in a template it will often obscure text and lines that it is useful to see. The fill can be moved behind these objects so they can be seen. The command to do this is located in *Plot Template|Move Fills to Back*. It is important to use the *Select Window* command when selecting the fill to move back. *Select Window* will ensure that the objects obscured by the fill are also selected. The *Move Fills to Back* command needs to know what objects to move the fill behind.

Note: that the Modify|Z-Order tools can also be used to move the fills.

2.9.8.6 Using Keywords

Keywords are used to automatically place information on a print or plot. Often, the information changes from design to design and keywords eliminate the necessity of manually entering this information into each design. An example is date. If the Key Word #CDAT# is placed somewhere in the plot template, IRRICAD will replace #CDAT# with the actual current date when the template is drawn on the design using *Draw|Plot Layout*. When placed within a plot template, keywords must have the # sign placed at either end of the word. Keywords are placed using *Draw|Text*. The available keywords include:

Table 2-3 - Plot Template Keywords

Key Word	Information	Source of Information
#CONA#	Company Name	*Settings|Company* – "Formal Name"
#NUMB#	Design Name	*Design File Name*
#SCLE#	Plan Scale (Number only)	*Plot Layout* or *Print* Dialog boxes
#DATE#	Design Date	*Settings|Design Details*
#CDAT#	Current Date	Today's date (computer)
#DESR#	Designer	*Settings|Miscellaneous*
#TITL#	Design Title	*Settings|Design Details -* "Site"
#CLNA#	Client Name	*Settings|Client*
#NOTE#	Design Notes	*Settings|Design Details -* "Notes"

See Section 6.10.2 for a complete list of the Plot Template Keywords available.

2.9.8.7 PAPER SIZES

The following table gives dimensions in inches (US) or mm (metric) for the standard paper sizes. Most printers and plotters cannot print or plot to the edge of the paper. For information on printable areas and necessary margins in plot templates, please refer to the printer or plotter manual (or driver information).

Paper Size	X Dimension	Y Dimension
E	44in	34in
D	34in	22in
C	22in	17in
B	17in	11in
A	11in	8.5in
A0	1189mm	841mm
A1	841mm	594mm
A2	594mm	420mm
A3	420mm	297mm
A4	297mm	210mm

2.9.8.8 How to Edit a Plot Template

This is a brief overview of how to edit an existing template.

1. Change the background color. In order to see the white fills and black lines, it is best to change the background color so it is neither black nor white.
2. Start with a new design.
3. Select *Plot Template|Edit Template*. Select a plot template from those available. These plot templates have either come with the program or been converted from IRRICAD Version 6 (*File|Convert|Plot Layouts*). Select the plot template to change and click [Open].

Adding New Items

To add a logo to the template use *Draw|Symbol* or *File|Import Image* and load the symbol or image required. Place this on the layout where needed. (See Symbol, Section 5.6.12 or Import Image, Section 5.3.7).

Keywords can be added by placing the keyword as text where required. For a list of keywords see Using Keywords, Section 2.9.8.6.

Literal text can be added using *Draw|Text* and placing the text where required. Lines, rectangles etc. can be added using the appropriate tools from the *Draw* menu.

Making Changes to Existing Items

Use the *Change* tool to change objects individually or *Change Type* to change groups of objects e.g., to change the font of all text in the title block (excluding legends) set the selection filter to text (*Modify|Selection Filter* and select **Text** for the "Type" and check the "Filter" check box). Select the text using *Modify|Select|All*. Select *Modify|Change Type* and click on one item of text. Select a new font in the text dialog and click [OK].

The *Change Type* checklist will now appear:

1. Uncheck **Text** in the "Match" column. Do not match the text if all text is to change not just the text phrase which was selected.
2. Keep both the "Match" and "Change" columns for the Font checked. This means that all text (which has been selected) which is the same font as the text selected will be changed to the new font that has been selected.

3. Click the [OK] button.
4. Select *Modify|Clear Selection*.
5. Turn off the selection filter (*Modify|Selection Filter* and uncheck the "Filter" check box)

Note the use of the selection filter to select text on top of a fill. This method can be used to select any type of object on top of a fill e.g., symbols, lines.

> Note: *The text in a legend will not change. Explode the legend area to change this text. Remember to re-make the legend with all is components (line and / or symbol, text and fill) before saving the plot template.*

Any object obscured by fills can also be made visible by moving the fills to the back (see Moving Fills to Back, Section 2.9.8.5).

Editing Legends

Before a legend can be edited it must be exploded into its constituent parts. Select *Modify|Select Object* and click on the legend to be changed. Select *Modify|Explode*. Now the fill, placeholder text, line or symbol can be changed as required (see Making Changes to the Design or Drawing, Section 2.4.4).

When all the necessary changes have been made the legend must be recreated. Use *Modify|Select|Window* and drag a window around the legend items. Select *Plot Template|Make Legend* to recreate the legend object.

Saving the Changed Template

When all the necessary changes have been made, select all the objects making up the template and select *Plot Template|Save Template*.

The plot template may be saved with the same name as the original in which case it will overwrite the original or with a new name which will create a new template. The template is saved in the folder specified in *Settings|Drawing Items* - "Plot Layout Path".

2.9.9 ADVANCED LABELING

2.9.9.1 USER ATTRIBUTES AND USER KEYWORD

A ‘User Attributes’ text field is available in control valve, water supply, pump, block entities, autohead, outlet, pipe, sprayline, tape and miscellaneous hydraulic item dialogs. It allows you to attach any information to these items and subsequently use it in labels and reports.

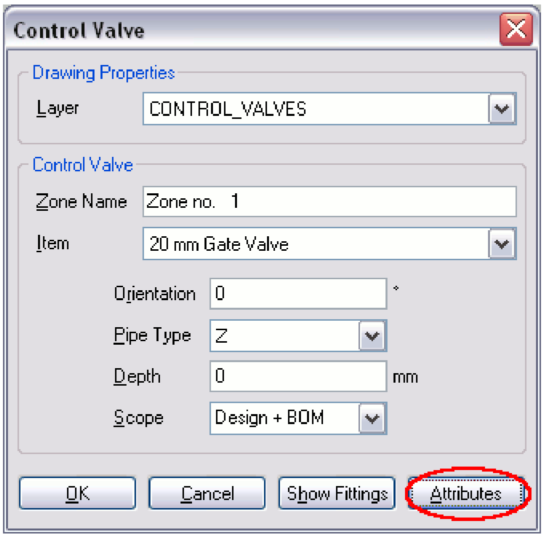


Figure 2-74 – User Attributes button

The label keyword USER displays the following:

#USER#	Displays the entire contents of the user attribute string.
#USER*n*#	Displays line *n* from the user attribute string (*n* is an integer).
#USER<*TAG*>#	Displays tagged information from the user attribute string. Data should be tagged with XML style tags e.g., *<MYTAG>My data goes here</MYTAG>*. *TAG* may be any string that excludes the characters <,>, and #.

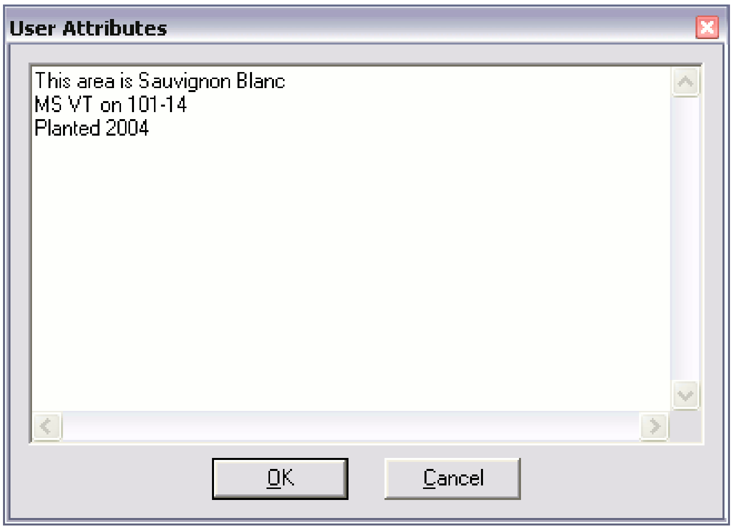


Figure 2-75 – User Attributes

In Figure 2-75 three lines of information have been written. For all three lines to be included, the key word #USER# needs to be added to *Labels* [Text]. If only the 2nd line is required in the label, use the key word #USER2# in *Labels* [Text] (and subsequent lines if required). If only specific text from a line is required in the label then the #USER<*TAG*># is used. For example if only ‘Sauvignon Blanc’ is required from line 1, use **<CROP>Sauvignon Blanc<CROP>** in place of ‘**Sauvignon Blanc**’ where CROP is simply a tag used in this case and can be any word in uppercase (capitals).

Figure 2-76 shows the #USER<*TAG*>#, #USER2# and #USER3# keywords in *Labels* [Text] thereby specific text and lines 2 and 3 in the User Attributes will be included in the label as shown in Figure 2-77.

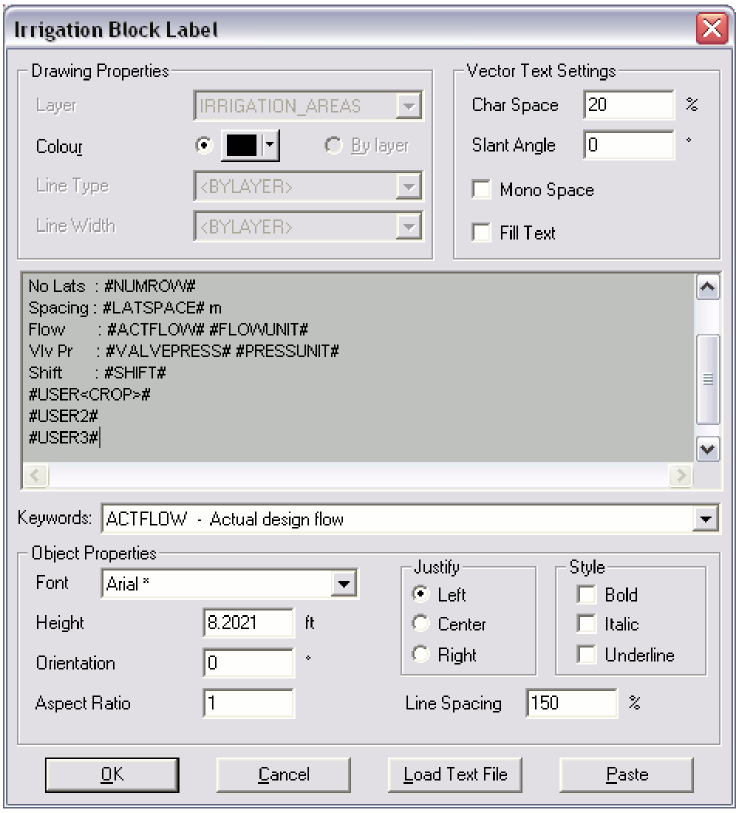


Figure 2-76 – Label using User Attributes

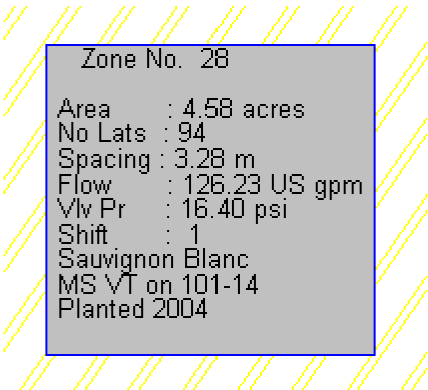


Figure 2-77 – Label on Plan

Note: The report keyword 'UserData' can be used to output this field in Reports. Note that in the Reports this field will contain the complete user attribute string. However the logic and functions available in the report template editor can subsequently be used to extract any data required for display in a report. Contact your local support consultant for more information.

2.9.9.2 CREATING ALTERNATIVE LABELS FROM EXISTING KEYWORDS

It is now possible to perform basic arithmetic operations using existing keywords to create alternative labels.The format is as follows:

#<keyword><operator>[<number>]#

Where:

- <keyword> is an existing keyword
- <operator> depicts addition (+), subtraction (-), multiplication (*), division (/), power (^), modulus (| subtraction giving absolute result) or modulo (% remainder after division).
- <number> may be a constant number or another keyword.

For example, to automatically increase the length by 10m/ft:-

- – The keyword is **LENGTH**
- – The operator is **+**
- – The number is **10**

Therefore the new keyword is #LENGTH+[10]#

Note that the decimal points are specified in the normal way, for example:

#LENGTH;0.001+[10]#

2.9.10 ECONOMIC REPORTING

The overall long term cost of a design to a client is more than just the initial capital cost of the equipment. One of the major sources of associated on-going cost is the power required to operate the system, referred to as running costs. Bill of Material reports provide information on these additional costs, where the annualized capital cost, annual running cost and total annual cost for the specified term is section displayed. This information is very useful to compare the total cost of different system options and provide the most economical solution for the client.

The total costs and parameters used for each design can be viewed in the B.O.M with Costs, Zone/Mainline BOM, and Zone Summary/Mainline BOM reports. Note that reported costs are effected by any selection set and “Design Only” scope implementation (capital costs only) being used.

Length/Number (m)	Description	Price
120	13mm LDPE Pipe	135.60
2	15 mm Class 15 PVC	4.14
1	16mm Lateral Tube	0.54
15906	AmnonDrip CNL 16MM 1.6 L/H 1.0m Spacing	17,496.60
1	19mm LDPE Black Pipe	0.54
4	20 mm Class 12 PVC	16.28
1	25mm LDPE Black Pipe	0.83
8	32mm LDPE Black Pipe	11.08
20	40 mm Class 6 PVC	143.00
11	50 mm Class 6 PVC	90.86
13	FlatNet 2" 51mm	76.70
36	65 mm Class 6 PVC	405.36
23	FlatNet 3" 78mm	188.60
24	80 mm Class 6 PVC	386.88
42	100mm Class 6 PVC	732.90
1	2" Nelson 800 Series Valve F BSP	24.00
	Total Capital Cost	19,713.91

Pump Efficiency (%) :	75.00	Power Cost (/kWh) :	0.100	Interest rate (%) :	10.00
Operating Hours (per year) :	2000.0	Term (Years) :	10		
Annualized Capital Cost :	3204.44				
Running Costs :	70.03	Total Annual Cost		3,274.47	

Figure 2-78

The parameters used to calculate the annual running costs are the “Default pump efficiency (%)”, “Power Cost/kWh”, and “Operating hours / yr” located in *Design|Design Parameters|Economic Parameters*. The parameters used to calculate the annualized capital costs are the “Default interest rate (%)”,and “Economic term (years)”, also located in the *Economic Parameters*. Note that the operating hours and economic term will be used even when “Trade capital costs vs running cost” is not enabled.

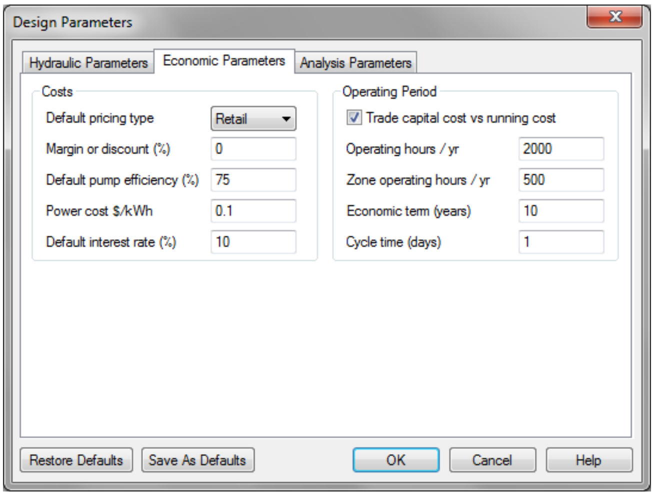


Figure 2-79

An important factor in this calculation is the "Operating Hours / yr" parameter which is used, along with the relative contribution of each system flow, to calculate the annual run time for each system duty. Each system duty's running cost is then added to report the total annual running costs of the entire system.

For example, if there are four system flows and three system flows operate for one hour each and the fourth system flow operates for three hours then if 2000 hours per year specified the first three system flows will run for 333.33 hours and the fourth for 1000 hours per annum. The annual run time for each system flow is then used to calculate running costs for water supplies and pumps that pertain to it.

For multiple unconnected systems in a single design the "Operating Hours / yr" should reflect the combined number of hours each mainline is operating per annum. If the systems have different annual operating hours it is important to alter the system flow run times so the relative run time is in proportion to the annual run time of each system. For example, if one system runs for 1000 hours per annum and the other system for 1500 hours per annum the total operating hours should be set to 2500. Set the run times for the system flows in the first system to 1 hour each and set the run times for the system flows in the second system to 1.5 hours each.

Only the default Bill of Materials with costs reports show the additional economic reporting as these reports include any rounding or extra %

allowance as specified in the *Pipe Fitting Matching Table*. Customized Costing/BOM reports can have the economic reporting included if required, email the report template to Support@IRRICAD.com for updating.

2.9.10.1 Calculate Running Costs

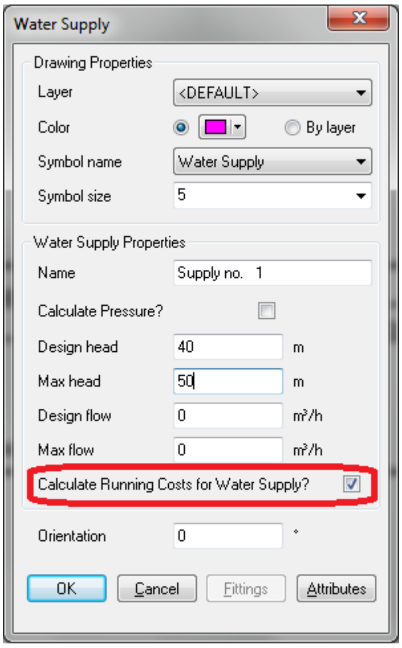


Figure 2-80

As part of the Economic reporting feature the water supply dialog contains a check box to control whether the cost of producing the duty for this supply is included in the calculations. When there is no running cost directly associated with a supply (for example when a pump is included downstream, as part of a water supply scheme, or a gravity system) then the field should normally be unchecked. For water supplies where the automatic calculation of pressure has been specified this option would usually be enabled.

Tip: To include a pump in the capital costs without placing a pump in the hydraulic design add a pump (or item of similar value) via Design|Miscellaneous Costs.

2.10 TROUBLE SHOOTING PROBLEMS

2.10.1 DESIGN RECOVERY OPTIONS

2.10.1.1 SEND A PROBLEM DESIGN

Having a problem with a design? Use *Help|Send Problem Report*, click [Yes] to include your design and your design will be sent to the IRRICAD developers with a log of the tasks you have been performing.

2.10.1.2 RECOVERY OPTIONS

Should a crash occur (IRRICAD closes down unexpectedly) an error report is prepared and this is easily emailed to IRRICAD developers along with information about tasks you were performing at the time of the crash.

1. The first time an error crash report appears enter your email address.

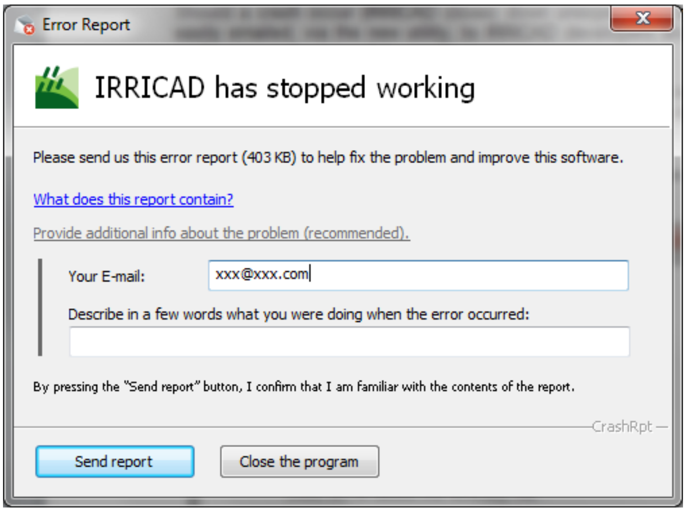


Figure 5-81

2. Each time a crash report appears select [Yes] to attach a copy of the design and enter information about what tasks you were performing when the crash happened. Then click [Send Report].
3. A message will pop up regarding running your email program in order to send the report. Click [OK].

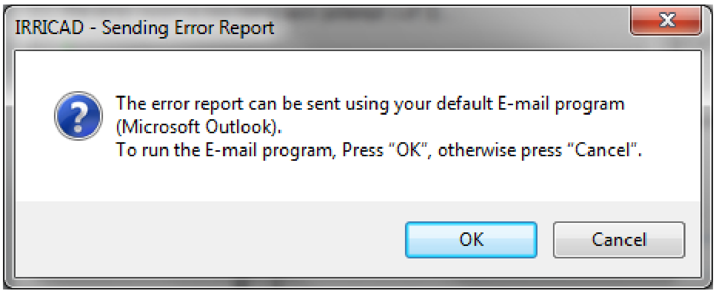


Figure 5-82

4. A message will appear similar to below

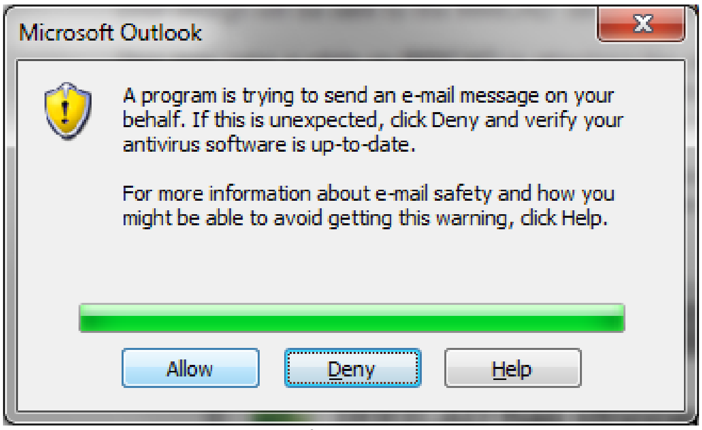


Figure 5-83

Click [Allow] to the complete the process and send the crash report to IRRICAD Software.

<u>Note</u>: *You can see the information IRRICAD is sending by clicking the "What does this report contain" link in Step 1 above. The email includes an ErrorLog.txt, a Session.log, a crashdump.dmp, and a crashrpt.xml file.*

Upon re-starting IRRICAD a message similar to the one below will appear. Click [Yes] to reload the design prior to the crash, or [No] to delete the recovery file.

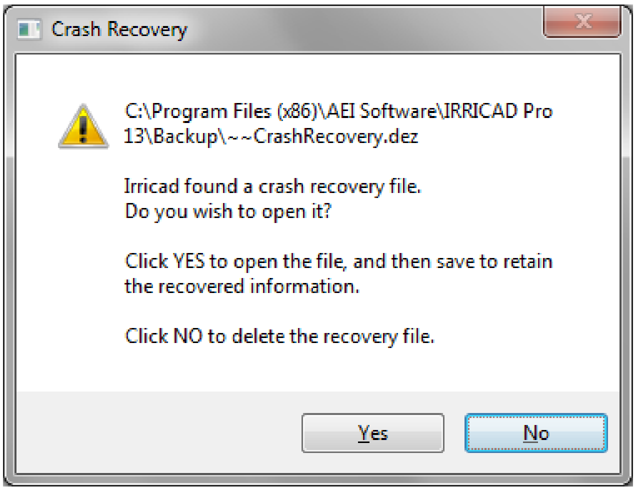


Figure 5-84

2.10.1.3 HOW TO RECOVER A BACK-UP DESIGN

In some cases a crash recovery design may not be created, or if a design has somehow been lost or corrupted, a back-up file can be loaded. The AutoSave settings are located in *Settings|Miscelleanous*. When enabled IRRICAD will save a backup of the design based on the autosave time delay.

To recover an AutoSave file select *File|Open* and browse for the Backup folder normally located in *C:\Program Files (x86)\AEI Software\IRRICAD*. Load the required backup design, denoted by the design name appended by ~~Backup.dez). Use *File|Save As* to save the file back in to the Designs folder; to retain the original file save under a new name.

Notes:

The default autosave time is 15 minutes. If you have opened the corrupted design close it before IRRICAD autosaves and overwrites the potentially good backup file.

When the autosave file is open IRRICAD cannot autosave. Save the file with a different filename to the Designs folder as soon as possible.

The autosave files are removed after a designated time. The default is 7 days.

If the program has crashed (shut down unexpectedly) in most cases a copy of the design will have been saved as ~~CrashRecovery.dez. When IRRICAD is restarted the option to load the recovery file will appear.

2.10.2 FITTINGS SELECTION ERRORS

Fitting Selection errors are recorded in the *Costing/BOM Reports* after running the *Design|Computer Selection of Fittings* option.

2.10.2.1 GENERAL FITTINGS SELECTION ERRORS

Where fitting selection errors have occurred during fitting selection a list of the errors is given in the *Costing/BOM Reports*. Note that no screen messages are given.

These fitting selection errors include the following information:

- The type of junction it relates to, e.g., a coupler, bend, three or four pipe junction.
- The x and y coordinate of the junction where the fitting selection error occurred.
- Details of the fitting selection error, connection types, sizes and angles required. Note that the fitting connection type is the code for the pipe or fitting that is to be connected to, not the code for the required fitting.

The details reported for the various different components are:

Couplers:	Major fitting type, diameter, minor fitting type, diameter.
Bends:	Major fitting type, diameter, minor fitting type, diameter, bend angle.
Tees:	Major axis fitting type, diameter, minor axis fitting type, .00, diameter.
4-pipe junction:	No information is given due to the possible complexity and variations involved in a cross type junction. If difficulties are encountered with this type of junction, they can usually be

resolved by creating two tee junctions a small distance apart.

The most common fitting selection errors are:

- Problem completing end cap selection.
- Problem selecting suitable bends.
- Problem completing coupler selection.
- Fittings for 4 pipe junction incomplete.
- Could not find Tee for 4 pipe junction.
- Two point objects connected, unable to solve junction.
- Not all fittings loaded into memory. Costing may be slowed.
- Too many fittings to display in menu.
- Potentially more than the maximum allowable number of fittings could be chosen.
- Unable to find required item in database.
- Fitting type for item does not exist.
- More than the maximum allowable number of items are required to connect objects at this junction.

Most error messages relating to *Computer Selection of Fittings* will be related to the database. Errors occur because hydraulic items have been changed in the database and cannot be found or the required items to solve a junction do not exist or are not enabled for use. See the Database and Fittings Selection Tutorial to aid in helping to solve fitting errors relating to missing items (Section 4.5).

Once the database has been updated with all possible tees, bends, couplers and crosses with the correct inlet and outlet diameters for solving the junctions, error messages become a rare occurrence.

Some common error messages relate to the capacity of the program, physical limitations or the available memory of the computer. Physical limitations occur when IRRICAD recognizes that there are more than four items at a junction, or that there is not an appropriate selection of fittings for the type of components being used in the design.

By understanding the rules by which the program chooses fittings, you can make it select the fittings required. For example, when selecting fittings for the junction of three pipes the computer will first search the Lateral Take Offs component group of the database for the cheapest single item (assemblies are counted as a single item) which will fit. If it can not find anything to fit between the two pipes being connected, it will then search for the cheapest set from the Lateral Take Offs and Coupler groups. Then the Tee group is searched, the same rules applying. If there is a preferred assembly, enter it in the Lateral Take Offs group. Disable (type N in the usage box) any Lateral Take Offs that have the right fitting size at both ends, and may be chosen before the preferred item is chosen.

A temporary way of fixing fittings errors is to select a junction and use the *Modify|Change* (or *Modify|Change Type*) tool to edit the fittings. Click on the [Show Fittings] button in the dialog. Note that any changes made are lost if *Computer Selection of Fittings* is re-run.

2.10.2.2 FITTINGS FOR VALVE-UNDER-HEAD SYSTEMS

Care must be taken in special cases where a separate control valve and an outlet are positioned together to form a valve-under-head system.

When the fitting selection routines encounter a control valve, they assume the valve is part of a normal zone configuration and select the fittings accordingly. For a valve-under-head system this results in the correct selection as long as the outlet is placed within a straight section of pipe. For outlets at the end of a pipe or located at a change of direction the appropriate bend to place the valve and outlet in the vertical position will not be selected.

Two solutions are possible. The first is to create an assembly using the appropriate control valve plus the necessary bend and fittings. This assembly is then selected for use at the appropriate place in the design. Alternatively the required additional fittings can be added after fitting selection by using the *Modify|Change* or *Modify|Change Type* tools.

See also:

Fitting Selection Details	Section *6.8*
Pipe Fitting Matching Table	Section *5.13.17*
Manually Adjusting Fittings	Section *2.6.8.1*
Creating Assemblies	Section *3.7.3.2*

2.10.3 LP DESIGN ERRORS

The main problems experienced with *LP Design* are the error messages similar to 'Fixed pipe sizes too small' or 'Fixed pipe sizes too big'.

To avoid these problems, look for the following:

- Make sure that the elevation data is correct and that there are adequate contours or spot heights in and around the design.
- Fixed pipe sizes – revert to **Computer Selected** pipe until an answer is achieved.
- Leave the number of submain pipes as zero in *Design|Zone Design Configuration* so as not to limit the number of pipes that IRRICAD can choose for the system.
- Leave the valve pressure as zero so as not to limit *LP Design* by a valve pressure to work to (or the Water Supply pressure as zero if sizing Mainline pipe).
- Make sure that all possible pipes (lateral, zone and mainline) are enabled in the database editor and that all information entered for these pipes is correct.
- If *LP Design* is having trouble, then adjust the maximum allowable velocity to 30ft/s (10m/s) and try again. This means that the velocity will not be a limitation as *LP Design* tries to find a pipe size. This does not necessarily mean that the resulting velocity in the pipes will be excessively high in the system.
- Allow 2 or 3 lateral sizes to be used in *Design|Zone Design Configuration*
- Increase the tolerances on the outlets.
- Add a very small pipe e.g., 0.2” (5mm) and a very large pipe e.g., 3ft (1m) to the database so IRRICAD will find a solution and the position of the problem can be seen. Make changes to the design manually.

2.10.3.1 Common Error Messages Relating to LP

- Maximum number of iterations for LP exceeded.
- LP sizing failed - unbounded objective function.
- LP sizing failed because of the constraints given.
- Constraint counts do not match in input data to LP solver.
- Negative values appear in LHS of array passed to LP solver.
- Only use LP with single water supplies and branched systems.
- The design is too big to use LP pipe sizing.
- Large enough pipe not enabled - LP may not achieve solution.
- User selected pipe diameter too small - headloss too high.
- Use selected pipe diameter too large - headloss too low.
- No pipe sizes have been enabled for:
- Solution not found - fixed pipe sizes too big in path:-

- Solution not found - fixed pipe sizes too small in path:-

The error messages are to give some idea why LP failed. While some messages are self-explanatory, following the checklist above (LP Design Errors, Section 2.10.3) will solve most.

Others, however, are a little more complicated and may stem from memory limitations, program limitations or some form of corruption to the Linear Program solver. An error message may also occur if, for a particular design configuration, the Linear Program solver is not converging towards a solution. In this case, *Velocity Design* should be used, or the design layout changed in some way.

2.10.4 DETAILED ANALYSIS ERRORS

Before running detailed analysis on zones (*Design|Zone Design|Detailed Analysis*) the valve pressures need to be set in *Design|Zone Design Configuration*. When running *Design|Mainline Design|Detailed Analysis*, pressures must be set for each water supply.

Detailed Analysis can fail if it is diverging rather than converging (getting further from than answer, rather than closer to it). To avoid this happening, there are several things that can be changed in *Design|Design Parameters|Analysis Parameters*:

Flow Close Factor: This determines the accuracy of the required answer. Setting this to a larger value may help *Detailed Analysis* to converge.

Maximum Iterations: Some systems may require more iterations to reach a solution. Increase this number.

Convergence Ratio, Detailed Analysis Factor: The larger the number (closer to 1) the slower the process. Increasing this number may help with convergence problems.

Make a better guess at the nominal pressure for the sprinklers as this may give *Detailed Analysis* a better starting point.

2.10.5 DATABASE ISSUES

2.10.5.1 OPENING DATABASES IN MICROSOFT ACCESS

It is very dangerous to play around with an IRRICAD database in Microsoft Access.

The main problem with users in this respect is if they create a 'Replica' of the database. A replica cannot have new items added and IRRICAD does not like the database in this form either. Once a replica is created and the master (original) is moved or deleted there is no going back. Start again with a normal database. If a lot of product has been edited and added to the database, this can be an exceedingly frustrating loss of work.

2.10.5.2 UPDATING PRICING / DATABASE REPORTS

Across the board price increases from particular supplies can be updated in one go in the Database Editor by using the *Query* options.

1. Open the database editor and the database to update.
2. Go to Query tab.
3. From the drop-down box select Update Wholesale and Retail Prices of SUP1 Pipes, increasing by 6%.
4. Once the query has been selected, the formula will be displayed in the lower field. See Figure 2-85.

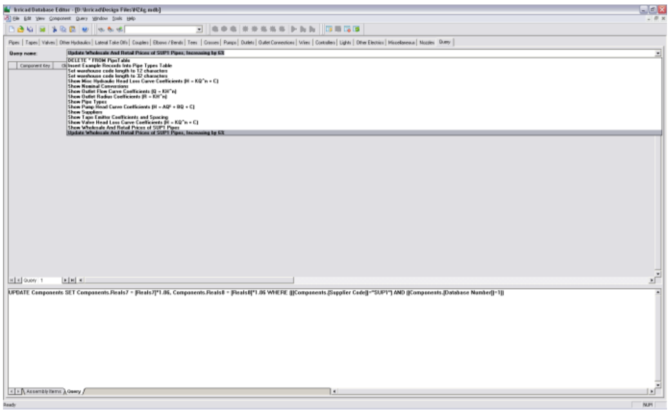


Figure 2-85

5. If required, change the details to suit. E.g.: 1.06 = a 6% increase so change according to the percentage increase required; SUP1 can be changed to the required supplier code; the Database number for Pipes is 1 which can be changed to any required component group.
6. Once you are ready to run the query, select *Query|Execute Query*.
7. If you wish to save the edited query for use another time, in the "Query name" field (at the top of the screen) enter a new name and then select *Query|Save Query*.

2.10.5.3 READ ONLY FILES

IRRICAD cannot open a design if the working database is read only, the internal database is read only, the .des or .vcd files are read only or if any of the temporary files in the computer's Temp folder are read only.

The main reason that this problem arises is when a design is being accessed on the CD or when the files have been copied to the hard drive from a CD. CDs are read-only by definition so when files are copied off a CD the properties must be changed so that the file(s) are not read only. Highlight the file or files in Windows Explorer or My Computer. Right-click and select Properties. Uncheck the "Read Only" check box.

2.10.5.4 SKELETON.MDB

The Skeleton.mdb is required when running IRRICAD or starting a new design. If it is not in the IRRICAD folder or is Read Only, IRRICAD will not be able to run. Make sure the file is present, or if it is not, either re-install IRRICAD or email AEI Software for a new one.

2.10.5.5 MERGING DATABASES

Select *File|Merge* in the Database editor. In the first field select the database which is not the working database. This database stays the same. In the second field select the working database. This database is updated with the new product from the database in the first field. IRRICAD generates a text file to tell to list the items not added to the working database. Items will not be added if they have the same name and same warehouse code as an existing item.

2.10.5.6 Getting Designs from Someone

If a design is sent to a user the minimum files required are the .DES, .VCD and .MDB for that design name. If the working database is very different from the database the design was created with, the appropriate the working database will also be needed if continuing analysis or design on the system.

A problem may arise if the design was created using IRRICAD.mdb on another machine. The databases could be quite different but with the same name. Upon opening the design IRRICAD will find the local IRRICAD.mdb (if it is in the same place as the one used to create the design). If aware of this and the IRRICAD.mdb which belongs to the design has been sent and it is saved elsewhere, select *Settings|Irrigation – Design Specific* and browse for the required database. Save the design and re-open it. It will remember which database it is to use.

To avoid confusion it is a good idea to re-name this database before setting it as the database to be used with the design.

2.10.5.7 Changing Hydraulic Item Drawing Properties

In *Settings|Irrigation Items* there is a check box named "Update Entities From Database". If a symbol, colour or line type for a database item is changed e.g., pipe, valve, outlet, etc., re-load the design (select *File|New*, then *File|Open*) for these visual changes to take place. However, if this check box is not checked, the existing items in the design will not be updated with the changes. All new items placed, however, will have the new colours, symbols or line type.

2.10.5.8 Updating Internal Database

When making a change to the working database while doing a design, the internal database (where all the items in that design are stored) needs to be updated also.

If the database editor is open when a design is loaded, it will automatically update the internal database.

The design keeps a time / date stamp of the working database so if the time / date stamp on the working database is now newer than the one the design remembers, the internal database will be updated.

If the design (and hence the internal database) is open at the time, the internal database will be updated during Design.

2.10.6 Management Issues

Management is the process of assigning run times to zones, assigning zones to system flows or assigning run times to water supplies.

2.10.6.1 What Can I Do If Management Has Become Confused?

If multiple changes are made to the water supplies, valves or mainline outlets (changing zone names, water supply names or deleting items) it is possible that the internal management structure has become corrupt. If running Management again (*Assign Zones*… or *Other Management Options*) does not resolve the problem then the Management files must be deleted and re-created. Select *Design|Clear Management* and re-enter the required operation.

Run Management again before re-running Design and saving the file.

2.10.7 Connectivity Problems

If there are problems connecting pipes, outlets and other items consider the following:

2.10.7.1 Mainline or Zone Items

Check that zone items are trying to connect to zone items only, and mainline items to mainline items only. The only exception is Control Valves. Use *Object Info* (highlight the item using *Tools|Object Info*). The layer will specify if the pipe is MAINLINE_PIPE or ZONE_PIPE, or the object definition as SIMP MNLN MCNT (Mainline Misc. Hydraulic), SIMP ZONE MCNT (Zone Misc. Hydraulic), SIMP MNLN OUTL (Mainline Outlet) or SIMP ZONE OUTL (Zone Outlet). It is an easy mistake to make if you are not aware of which menu the existing item was selected from.

2.10.7.2 The Default Snap Mode

Check that the snap mode in *Settings|Snap* is set to "Connect". If the snap mode is "Place", a hydraulic item will never connect to an exiting hydraulic item. If the snap mode is "Snap to Grid" a hydraulic item will not connect to an exiting hydraulic item unless *Cut Pipe* is used.

2.10.7.3 Limit of Four Items Connecting at a Junction

Check that there are not more than 4 items already connecting to the item you are trying to connect to. Check this by using *Modify|Select Window* to highlight the items and immediately surrounding area, then *Right-click|Object Info* to view the highlighted items.

If the item is a junction:

SIMP ZONE JUNC
Object ID=5 Elevation=NONE Connections=1,6,4,8, Depth=0.00 m

This junction has four pipes connecting here. Each item has an Object ID or UID. The four pipes connecting at this junction are 1, 6, 4 and 8.

If there are other items included in the *Object Info* dialog, they might be a small length of pipe or something else. Reselect these items and press the <Delete> key, this will delete everything within the select window except for the junction connecting the existing pipes. Remember that an item has to be completely with the select window to be highlighted and deleted, and pipes cannot exist with their end junctions. If the item at this point is not a junction but a valve or outlet, the item may need to deleted to fix the problem and then re-insert the item.

Note: *Connections can also be displayed in the "Info" panel of the status bar (the third panel from the right), and/or highlighted using the Select|Connected tool (<Ctrl>+<Shift>+C).*

2.10.7.4 SNAP TOLERANCE

You may not be clicking close enough to the existing item for IRRICAD to connect to it. Zoom in closer or further away. In *Settings|Snap* alter the snap tolerance and the minimum and maximum tolerances. Do not alter these unless required.

3 IRRICAD Database Editor Manual

Databases have three primary functions:

1. To define the range of components and their sizes for use in a design;
2. To provide technical information, allowing IRRICAD to calculate pressure losses, outlet flows, radius of throw for sprinklers etc; and
3. To provide unit prices that can be used to select components when cost is a consideration or to produce bills of materials with prices.

The databases are fundamental to the operation of IRRICAD. Every care should be taken to ensure they are accurate and contain sufficient information to complete designs.

It is recommended that only items used in most designs be in the database. Although there are no limits on the number of items that can be entered, including items that are not likely to be used clutters up the database. This makes updating more difficult and slows IRRICAD operation.

Users are advised to take advantage of the "Usage" facilities in the database screens. These determine whether a particular item may be employed in a design and, in the case of assemblies, whether or not they are reported as a single item or as a list of components.

A good example of the application of "Usage" fields concerns Outlets. Having a large number available will have two consequences. The design process will be slowed down when IRRICAD searches through the different outlets. Also when selecting outlets for inclusion in a design, it will take longer for the dialog to appear, and a large amount of scrolling may be required to scroll down through a large number before reaching the required outlet.

When databases are modified, a dated copy should be taken. The name of the database used for a design is automatically saved with the design.

3.1 Using the Database Editor

The editor allows the user to add and delete items create assemblies, and change symbols, line types and colors.

If IRRICAD is installed in the default folder, the shortcut to the database editor will be found in *Start|All Programs|Irricad Pro|Irricad Databases*.

Alternatively, if a shortcut has been placed on the desktop, double-click on the icon and the database editor window will appear. It shows the current default database. The default database can be changed in the main IRRICAD program by selecting from the menu: *Settings|Irrigation – Design Specific*.

In order to change the default, select the database of choice and save the setting by clicking the [Save As Defaults] button. If the chosen database is not saved as the default, the Database Editor will not open with the desired database. However, the user can close the default database and open one of their choice by selecting *File|Open* in the database editor menu.

At the top of the screen is a series of tabs. These tabs are labeled according to the component group associated with the tab. There are eighteen component groups that make up the entire database. These component groups hold all the technical and physical descriptions of the items used for designing and analyzing the irrigation system.

Component groups consist of a complete list of all items and the characteristics for each item entered in the database. The tabs will list all the items in the group, the item descriptions, warehouse codes, supplier code, and usage. The usage field enables or disables use of the item in IRRICAD.

At the bottom of the description list there is a field indicating the line number where the cursor is (a small arrow is placed in the margin of that line, indicating the selected item). If line number 250 is required, and is currently on line number 40, simply highlight the line number in this field and type the required number. The cursor will automatically find the line required. If a number greater than the number of items available in the list is entered, the cursor will simply stop at the end of the list. Arrows on either side of this field can be clicked to move up and down the screen as required. It is possible to also move through the list by using the up /

down arrow keys and the scroll bar on the right hand edge of the main list.

Underneath the item descriptions is a table labeled Assembly Items. If an item in the list is an assembly, the components will be listed in this table when the assembly is selected.

On the right-hand-side of the window the Curve Fitting Utility can be seen. This extra window can be turned off if desired (click the “x” at the top right-hand corner) and on again by selecting *View|Curve Fit* or by <Ctrl> + <T>.

3.2 DATABASE STRUCTURE

The following component groups are available in the database editor:

Pipes:	All descriptive, technical and price data for the types and classes of pipe used in IRRICAD.
Tapes:	Contains all descriptive, technical and price data for all driptapes used in IRRICAD.
Valves:	All descriptive, technical and price data for items used as zone control valves. These may be automatic or manually operated.
Other Hydraulics:	Is similar in structure to the Control Valve component group and contains information describing technical specification and price for in-line valves and on-line items such as air release valves. Can contain Pressure Reducing Valves in this group.
Lateral take off:	All descriptive, technical and price data for connectors used to join laterals to submain pipes or outlets to lateral pipes.
Couplers:	Any fitting used to join pipes, components or other fittings in a straight line.
Elbows / Bends:	Used where any two pipes or components to be joined are not in a straight line.
Tees:	Used to join three pipes or components regardless of the angles between the items.
Crosses:	Any fitting which is used to join four pipes or components together at a junction.
Pumps:	All descriptive, technical and price data for pumps. The performance of pumps is automatically calculated from this data.
Outlets:	Along with the associated nozzle component group, this contains descriptive, technical and price data for items used as outlets. The performance of outlets is automatically calculated from this data.
Outlet Connections:	Items or assemblies of items used to connect outlets to a pipeline. Swing joint assemblies and riser pipes are common examples.
Wires:	The descriptive, technical and price information for electric cable. Any wire types

	may be entered. There is no distinction between wire used for electrical control or for lighting and other applications.
Controllers:	Descriptive and price information for any type of controller.
Lights:	Garden or landscape lighting in a design.
Other Electrics:	Electrical components that do not fall into one of the other electrical group categories. Examples are transformers and circuit breakers.
Miscellaneous:	Items that do not belong in other component groups, but may be required for other purposes, such as components of assemblies.
Nozzles:	Along with the associated outlet component group, this contains descriptive, technical and price data for items used as outlets. The performance of outlets is automatically calculated from this data.

3.3 File Menu (Database)

Figure 3-1

3.3.1 New

Select *File|New* to create a new database.

A message will appear to help outline the steps required – the steps are listed below.

To create a new database:

1. Select *File|New*.
2. A message will appear instructing to add pipe types and supplier codes. Click the [OK] button. The database will be saved into the same fodler as the current default database with the name NewDatabase001.mdb.
3. Close the new database and run IRRICAD. Select the newly created database in *Settings|Irrigation - DesignSpecific*.
4. Select *Design|Pipe Fitting Matching Table*. Enter pipe types and the necessary characteristics. (See Section 5.13.17)
5. Select *Reports|Supplier Code Multipliers* and enter supplier codes and the necessary characteristics (see Section 5.14.16).
6. Exit IRRICAD.

7. Re-open the new database using *File|Open* and select the database just created.
8. Enter the components. See Using the Database Editor, Section 3.1, Database Structure, Section 3.2, Database Details, Section 3.7 and Irrigation Components – Details of Individual Groups, Section 3.8.

3.3.2 OPEN

Select *File|Open* to open a database of choice.

To open a database:

1. Select *File|Open*.
2. Browse for the required database.
3. Click the [Open] button.

Notes:

More than one database can be open at the same time. See the Window menu for the list of open database and display options.

To set the Database Editor to automatically open the default, or last used, database see Tools|Options - Application, Section 3.11.4.2.

3.3.3 CLOSE

To close the currently viewed database without saving any changes:

1. Select *File|Close*.
2. Select [Yes] to close all databases, saving changes or [No] to close all databases without saving or [Cancel] to not close the Database Editor.

3.3.4 SAVE COPY AS

To save a copy of the datybase under a different name:

1. Select *File|Save Copy As*.
2. Change the name of the database.
3. Click the [Save] button.

3.3.5 Merge (Databases)

The *File|Merge* option allows one database to be added to another. The merge function checks for matches before adding any items.

To merge a database:

1. Select *File|Merge*.
2. Select the database to have items added from - this database is opened but will remain as it is (the 'Source' database).
3. Select the database to add items to - this database will have items added (the 'Destination' database). If a copy of the original database is required, make a copy in Windows Explorer or My Computer before merging.
4. Click the [Merge] button.

A file is created (DBMergeReport.txt) in the \Irricad folder directory. Check this file to see a report on the components that were merged.

3.3.6 Recent File List

Recently used databases are listed under the *File* menu for ease of re-opening. Simply click on the name of the database the user wishes to reopen.

Note: *The file name in the MRU list may be abbreviated, but the full path and file name can be seen in the application status bar.*

3.3.7 Exit

To save the changes to the database select *File|Exit*. If the changes are not required to be saved, click the [No] button to close the current database without saving. If the changes are to be saved, click the [Yes] button.

Note: *If a component is deleted and this component is part of an assembly, the component will also be deleted from the assembly. A warning will appear asking for confirmation before deleting this item.*

3.3.8 X

This is located at the top right hand corner; it is the same as selecting *File|Exit*.

3.4 EDIT MENU (DATABASE)

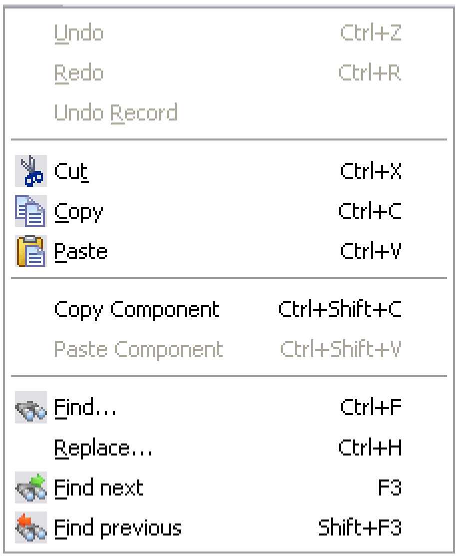


Figure 3-2

3.4.1 UNDO

Select *Edit|Undo* to undo the last action.

3.4.2 REDO

Select *Edit|Redo* to repeat the last action which was undone (see above).

3.4.3 UNDO RECORD

If multiple fields have been changed in the same record, e.g., description, warehouse code and supplier, *Undo Record* will undo all changes to that record.

3.4.4 CUT

To cut out part of a description, warehouse, supplier code, etc on to the clipboard to be used at a later time.

3.4.5 COPY

To copy a description, warehouse, supplier code, etc on to the clipboard to be used at a later time.

3.4.6 PASTE

To paste from the clipboard into the currently selected field.

3.4.7 COPY COMPONENT AND PASTE COMPONENT

Complete components can now be copied and pasted into the current database or other databases. Multiple components can be copied and pasted in one action.

To copy a component(s) to be pasted into another open database:

1. Select the component(s) to be copied by clicking on the grey box the left of the component name. This will highlight the whole line associated with the component.
2. Select *Edit|Copy Component*.
3. Open or select the required database from the *Window* menu.
4. Place the cursor where required for the new record(s), in the required component group.
5. Select *Edit|Paste Component*.

Notes:

The Copy Component function differs from Copy in that it will completely copy all the fields of a component, including assembly items or nozzles.

The copied component, or groups of components, will be pasted into the correct component group regardless of the current group.

You can copy a component into the same database. This is useful if you need to create an item, or set of items, very similar to an existing one.

To maintain uniqueness between records, IRRICAD will automatically add a ~ to the name of each copied item. The combination of name and warehouse code will then be able to be differentiated from other similar items in IRRICAD and the Database Editor.

3.4.8 FIND

To search the database for particular words or phrases use the *Find* tool. *Find* only looks in the current field (column) and tab.

1. Select the required component group to search.
2. Select *Edit|Find* and type in the required word or phrase.
3. Click the [Find Next] button until the required entry is found.

Note: "Match Case" and "Up" or "Down" options may be selected as required.

Find Next:	This action will move to the next record which contains the keyword.
Cancel:	[Cancel] will stop the search and close the *Find* dialog.
Match Case:	If checked, the only items which the search will find will be those with the correct case e.g., ANGLE if typed in upper case in the "Find" field.
Direction:	The direction of the search can be specified as above the current cursor position ("Up") or below the current cursor position ("Down").

3.4.9 REPLACE

To search and replace specific words or phrases with a new word or phrase, use the *Replace* tool. *Replace* only looks in the current field (column) and tab.

1. Select the required component group to search.
2. Select *Edit|Replace* and type in the required keyword to find and the required word to replace.
3. Click the [Find Next] button until the required entry is found.

4. Click the required action button for the current record.

Replace:	Clicking this button will replace the keyword or phrase in the "Find what" field with the word or phrase in the "Replace with" field for the current record.
Replace All:	Clicking this button will replace the keyword or phrase in the "Find what" field with the word or phrase in the "Replace with" field for all records containg the keyword or phrase as per the "Find what" field.
Cancel:	[Cancel] will stop the search and close the *Replace* dialog.
Match Case:	If "Match Case" is checked, the only items which the sercah will find will be those with the correct case e.g., ANGLE if typed in upper case in the "Find" field.

3.4.10 FIND NEXT

The *Find Next* option will continue the search as per the current *Find* dialog settings.

3.4.11 FIND PREVIOUS

Find Previous will find the previous records found in the search one at a time.

3.5 VIEW MENU (DATABASE)

Figure 3-3

3.5.1 CURVE FIT

The *Curve Fit* window is displayed on the right-hand-side of the screen and can be turned of via *View|Curve Fit*. *Curve Fit* is provided to allow the user to calculate the necessary constants, coefficients and exponents for entering in the databases. These numbers are used by IRRICAD to determine outlet flow and radius for any pressure, pressure loss for valves and other hydraulic items at a given flow, and the pressure / flow relationship for pumps.

The parameter values generated can be inserted into the required component group, which is then used by IRRICAD to calculate the hydraulic characteristics of the item. This information is rarely provided by manufacturers in the required form, most of the data that is available will be presented in graphical or tabular form.

In the case of miscellaneous hydraulic items or valves, where the resulting pressure / flow curve does not pass through (0,0) (i.e., requires a startup pressure), then an intercept is also calculated. (Select **Valve pressure loss from flow, with intercept** or **Miscellaneous pressure loss from flow** option).

Options are available for the following component groups:

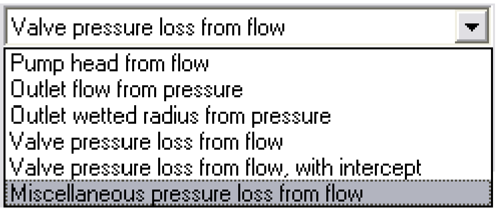


Figure 3-4

Although default units for pressure and flow or pressure and radius are shown in the table headings, these can be altered by the user to match the particular data available.

The options are:

Pressure	Meters Feet Kilopascals Kilograms/centimeter^2 Pounds/square inch Atmospheres Bars
Flow	Litres/second Litres/minute Litres/hour Cubic meters/hour US gallons/minute US gallons/hour Imperial gallons/minute Imperial gallons/hour
Radius	Meters Millimeters Feet Inches

Having selected the required units at least three pairs of values must be entered to allow IRRICAD to fit the data to the appropriate equation.

For accuracy, select a range of values that represent the likely operating range of the device. Do not use extreme values if the device will never be required to operate at those values.

Negative data values cannot be used. Zero entries for pressure and flow will be ignored. If either pressure or flow (or radius) is zero, the entry is not valid (put in 0.01 or something instead of zero). Warning messages will inform the user of these conditions.

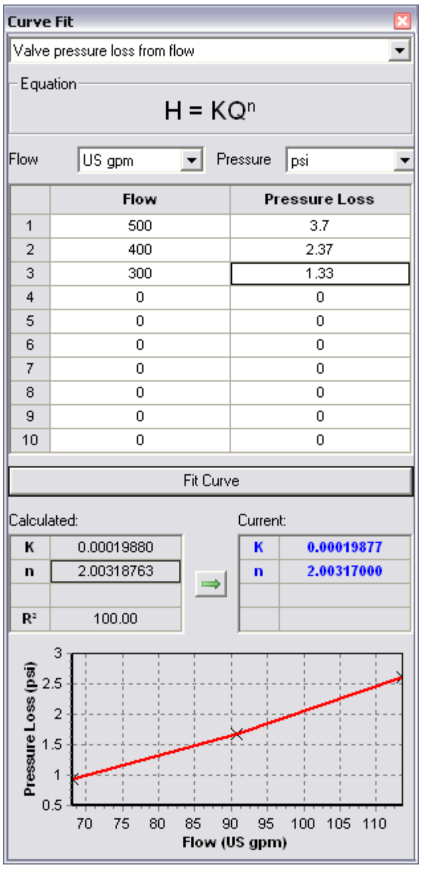


Figure 3-5

Click [Fit Curve] after the required data has been entered. The parameters required by IRRICAD will now be calculated and displayed at the bottom of the dialog.

The value of r^2, which is an indicator of the accuracy of fit of the calculated equation to the data, is also displayed.

If the value of r^2 is less than 90% for the outlet or radius power curve, IRRICAD attempts to fit a horizontal straight line to the data. If the r^2 for the straight line is greater than 90%, then the straight line option is used and the index is set to zero. If the r^2 for the straight line is less than 90%, then the type of curve used is that which gives the best fit. The straight line option gives better results for outlets that are pressure compensated.

If the final value of r^2 is less than 90% for any of the options, a warning will be displayed. Usually this is caused by errors in data entry, although for some radius calculations irregular data will sometimes result in a poor fit. If r^2 is less than 90% Do Not use the results in IRRICAD unless it is known why the fit is poor and it is understood the consequences of using the results in the design.

To calculate the required constant, index and intercept or in the case of pumps the H/Q Curve factors A, B & C:

1. If the Curve Fit is not showing on the right-hand side of the database window, select *View|Curve Fit*.
2. Select the type of item to calculate the Constant, Index and Intercept for from the drop down list. The equation for the type of item will appear.
3. Select the correct units for the flow and pressure out of the drop down lists to match the data being reading off a curve or table of technical data.
4. Enter at least 3 sets of data from the table or curve of technical data.
5. Click the [Fit Curve] button.

The constant, index and possible intercept calculated (or H/Q Curve factors A, B & C for pumps) along with R^2 (line or curve of best fit as shown in the diagram) will be displayed in the left hand table labelled “Calculated”.

6. Click the arrow button to copy the calculated vales into the relevant fields on the current record.

3.5.2 Status Bar

The status bar is located at the bottom of the drawing screen. It can be switched on or off by checking or unchecking the *View|Status Bar* option.

The status bar can allow you to resize the window to a required size when not full screen size.

To hide the status bar, select *View|Status Bar* and click to uncheck the option.

To show the status bar if it is off, select *View|Status Bar* and click to check the option.

3.6 Component Menu

These commands are common to all component groups.

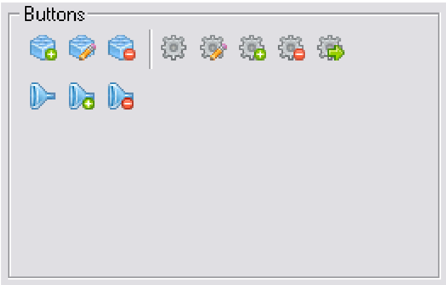


Figure 3-6

3.6.1 Add Item

This option allows a new item to be added to the component group. Initially the new item will be added at the end of the list, but after the list has been refreshed, it will appear in order, along with the other components.

1. Select *Component|Add Item*. A details dialog will appear in which data is entered. The dialog may be different from one component group to another.
2. Select a "Usage" code. This is a **Y** for yes, to be able to use the item in a design. For Pipes and Assemblies the "Usage" codes are:
   – L, Z, F or M or any combination for pipes
   – X and A have been added to the Assembly usage for the type of listing in the reports
3. Enter a name / description for the item.
4. Enter a warehouse code – this can be up to 12 characters.
5. Select a supplier cost code from the dropdown list.
6. Select a plotting line type from the drop down list or enter the symbol size required (see Database Codes, Symbols Line Types, Section 3.7.2 for more information).
7. Click on the plotting color field to change the plotting color of the item from the default plotting color (black) if desired.
8. When all fields are filled in to the satisfaction, click the [Save] button. If the item is not to be inserted, click the [Cancel] button.

9. To save the changes to the database click the [Save Changes] button on the main screen. If the changes are not to be saved, click the [Cancel] button to exit the current database.

3.6.2 Edit Item

Allows viewing and, if necessary, editing of the characteristics of an existing item.

1. Highlight the item to edit and select *Component|Edit Item*. Edit as necessary.
2. See *Component|Add Item* description for instructions.

3.6.3 Delete Item

Allows the deletion of any existing item. If the item is part of an assembly, warning messages will be given before the item is deleted from the database.

1. Highlight the item to delete.
2. Select *Component|Delete Item*.
3. A warning message will appear, asking for confirmation that this item is to be permanently deleted from the database.
4. Click the [Yes] button to proceed, or the [No] button to delete the item. If [Yes] is clicked, this command cannot be undone.

3.6.4 New Assembly

Used when creating a new assembly.

1. Select the item to create an assembly with, e.g., Gate Valve 50mm and select *Component||New Assembly*.
2. Edit the details in the dialog, particularly the name and warehouse code, e.g., Gate Valve 50mm Assembly. Select a "Usage" code (**Y**, **X**, **A**).
3. Click the [Continue] button, or, if not proceeding with creating an assembly, click the [Cancel] button.
4. Select the component the assembly is based on, e.g., Gate Valve 50mm. Remember that when beginning to create an assembly, the item initially selected to begin the assembly is ***not*** automatically selected as part of the assembly, but is the item the details are copied from. Select this item if required either by

clicking the grey box to the left of the item name or by double-clicking on the item name.

5. Enter the number of the item in the assembly, e.g., for 1 Gate Valve 50mm in this assembly, type 1 in the highlighted field in the pop-up dialog.
6. Select the component group tab required, and select the item to add to the assembly either by clicking the grey box to the left of the item name or by double-clicking on the item name.
7. Enter the number of the item in the assembly, e.g., for 3 x 10mm joiners in this assembly, type 3 in the highlighted field in the pop-up dialog.
8. Repeat steps 7 to 9 as needed, until all items have been selected for the assembly.
9. Select *Component|Finish Assembly*.

The screen will return to the database in which the assembly was created. When an assembly is highlighted, the assembly items will be listed in the table at the bottom of the screen.

3.6.5 EDIT ASSEMBLY

When in edit mode, double clicking on an item in the assembly grid will allow editing of the number of items.

This tool is to be actioned before adding items to or removing items from an existing assembly.

To edit an assembly:

1. Select the assembly in the component group by clicking on the name.
2. Select *Component|Edit Assembly*.
3. Now select *Component|Add to Assembly* or *Component|Remove from Assembly*.

3.6.6 ADD TO ASSEMBLY

For adding items to an existing assembly:

1. Select *Component|Edit Assembly*.
2. Select *Component|Add to Assembly*.
3. Select the component group tab required, and highlight the item to add to the assembly.

4. Select this item if required either by clicking the grey box to the left of the item name or by double-clicking on the item name.
5. Enter the number of the item in the assembly, e.g., for 3 x 10mm joiners in this assembly, type 3 in the highlighted field in the pop-up dialog.
6. Repeat steps 4 to 6 as needed, until all items have been selected for the assembly.
7. Select *Component|Finish Assembly*.

The screen will return to the component group in which the assembly belongs. When an assembly is highlighted, the assembly items will be listed in the table at the bottom of the screen.

Tip: *When selecting items, click on* the *left-hand margin, to automatically pop up* the *dialog box for* the *number of items.*

3.6.7 Remove From Assembly

Used to remove the selected item from an existing assembly.

1. Select *Component|Edit Assembly*.
2. Click on the item to be removed from the assembly.
3. Select *Component|Remove from Assembly*.
4. Select *Component|Finish Assembly*.

3.6.8 Finish Assembly

Select *Component|Finish Assembly* to finish creating, adding to or removing items from an assembly.

3.6.9 Edit Nozzles

This tool is to be actioned before adding nozzles to or removing nozzles from an existing outlet.

To edit an outlet:

1. Select the outlet in the outlet component group by clicking on the name.
2. Select *Component|Edit Nozzles*.
3. Now select *Component|Add Nozzles* or *Component|Remove Nozzles*.

4. To finish adding or removing nozzles, select *Component|Edit Nozzles*.

3.6.10 Add Nozzles

Used to add existing nozzles to an outlet. After invoking this tool, the view is taken to the nozzles component group.

After adding a new outlet to the database, select the *Component|Edit Nozzles* and then *Component|Add Nozzles* to select existing nozzles for the new outlet. This will open the nozzle tab. Note that new nozzles must be added to the nozzle component group prior to adding nozzles to an outlet (see Nozzles, Section 3.8.12).

1. Click on the required Outlet.
2. Select *Component|Edit Nozzles*.
3. Now select *Component|Add Nozzles* and select the required nozzles for this outlet either by clicking the grey box to the left of the item name or by double-clicking on the item name.
4. To finish adding nozzles, select *Component|Edit Nozzles*.

Tip: *Quickly select a nozzle by clicking on* the *gray box at* the *left of* the *nozzle description.*

3.6.11 Remove Nozzles

Used to remove selected nozzles from an existing outlet. Highlight the required nozzle in the Nozzles area at the bottom of the Outlets group dialog.

1. Click on the required Outlet and then the required nozzle to be deleted.
2. Select *Component|Edit Nozzles*.
3. Now select *Component|Remove Nozzles*.
4. To finish removing nozzles, select *Component|Edit Nozzles*.

3.7 DATABASE DETAILS

This chapter looks at the fields within the database especially those that are common throughout the component groups. It also looks at creating and modifying assemblies.

3.7.1 DATA COMMON TO ALL COMPONENT GROUPS

The different types of components have a number of common entries. These are:

- item number
- item description
- warehouse code
- supplier cost code
- label
- usage
- wholesale cost
- retail price

These items are described below. Any exceptions are explained under the description of the particular component type.

3.7.1.1 ITEM DESCRIPTION

Each item requires a description. It might include one or more of the manufacturer's name, model, size and any special characteristics.

The item description is the primary means of identifying an item during the design process, in costing reports, in bills of materials and on the plot layout legend. For this reason, it is important that the item is adequately described. Please note that abbreviated descriptions may not be suitable for the customer. Up to 40 characters may be used.

3.7.1.2 WAREHOUSE CODE

This is a user-defined code. It is usually a part number used in a manufacturer's catalog or the company's stock accounting system.

The warehouse code has no design function, and can be left blank. However, it is used by IRRICAD to identify items during the design process. For this reason, it is recommended that warehouse codes, whether actual codes or not, be used for all items.

Warehouse codes can now be 32 characters. The previous number of characters allowed was 12. Note a database created in the Pro Version 11+ Database Editor cannot be used with older versions of IRRICAD unless it is reverted to 12 characters. This can be done by running the **Set warehouse code length to 12 characters** query.

To enable 32 character warehouse codes in existing databases, run the **Set warehouse code length to 32 characters** query.

3.7.1.3 SUPPLIER CODE

This is a user-defined, four-character code that allows the designer to group items from a common supplier and to distinguish that group of items from other groups. It may be desirable to subdivide item groups further, if, for example, items from the same supplier require different price multipliers.

The Supplier Code is used to modify item prices using the supplier code multipliers. These can be accessed in IRRICAD through the Reports menu. Retail or wholesale prices can be entered as the base price. This will make the supplier code multipliers act on the wholesale (or retail, if selected) cost for the selected suppliers.

The Supplier Code also allows a bill of materials to be produced on a supplier code basis. Supplier codes must be inserted into the Supplier Code Multiplier table in IRRICAD before they are available to the database editor.

The Suppliers list can be edited or added to in *Reports|Supplier Code Multipliers*. For the *Supplier Code Multipliers* to be used in the *Costing Reports* and the *BOM with Costs* report, set the “Default Pricing Type” to **Multipliers** in *Design|Design Parameters|Economic Parameters*.

See also:

Supplier Code Multipliers Section *5.14.16*

3.7.1.4 Label

This label can be used for labeling (key word #LABEL# instead of the item description (#DESC#) when labeling the plan.

See also:

Labels Section *5.10.10*

3.7.1.5 Usage code

This code tells IRRICAD whether an item is available for use. The options are (in most cases) a **Y** for Yes, meaning the item can be selected or specified, or **N** (or blank), meaning the item cannot be selected or specified.

If an item has been enabled for use in a design, it will appear in IRRICAD in the dropdown list from which items are selected in the dialog relating to that component group. For example if the 50mm Gate Valve has been enabled in the Control Valve component list in the database, this control valve can be selected from the dropdown list when using *Zone|Control Valve* in IRRICAD. For fittings, if an item has been enabled, the item can be selected during Computer Selection of Fittings.

The "Usage" codes are different for pipes and assemblies. For pipes the "Usage" codes are **L**, **Z**, **F** and **M**. **L** refers to a lateral pipe (placed using the *Zone|Sprayline* or *Zone|Block* options) and **Z** to other Zone pipes (downstream from a control valve). **F** refers to flushing pipes that are not available for selection as zone pipes duing LP or velocity design but are available in the drop-down boxes for manual selection. **M** refers to mainline pipes (upstream from a control valve). Each pipe can have one "Usage" code or a combination of any or all three "Usage" codes assigned. If no "Usage" code is assigned to a pipe it can not be selected or used in the design. For assemblies two extra "Usage" codes have been assigned - **X** and **A**. These describe the type of listing required in the *Costing/BOM Reports*. See About Assemblies, Section 3.7.3.1.

3.7.1.6 Wholesale Cost

This is the wholesale or cost price of the item. This can be set to be the base price through the IRRICAD menu *Reports|Supplier Code*

Multipliers. This will make the supplier code multipliers act on the wholesale cost for all the selected suppliers.

The **Wholesale** cost can be set to be the cost used in the *Costing Reports* and the *BOM with Costs* report by setting the "Default Pricing Type" in *Design|Design Parameters|Economic Parameters*.

3.7.1.7 RETAIL PRICE

The retail or selling price of the item, before any discounts or cost multipliers have been applied. This can be set to be the base price through the IRRICAD menu *Reports|Supplier Code Multipliers*. This will make the supplier code multipliers act on the retail cost for all the selected suppliers.

The **Retail** price can be set to be the cost used in the *Costing Reports* and the *BOM with Costs* report by setting the "Default Pricing Type" in *Design|Design Parameters|Economic Parameters*.

3.7.2 DATABASE CODES, SYMBOLS & LINE TYPES

The database editor uses codes for pipe types, and inlet and outlet connection types in order to determine the fittings required at a junction.

3.7.2.1 PIPE TYPES

These are chosen from the dropdown list that is available from the Pipes, Tapes and Lateral Take Offs details dialogs. The list of pipe types can be edited in the *Design|Pipe Fitting Matching Table* in the main IRRICAD program. However, a pipe type that is in use in the database cannot be deleted.

Any consistent set of pipe codes can be used. Any code containing up to four characters may be entered in the Pipe Fitting Matching Table, Section 5.13.17 for use in the pipe database. A "Pipe Type" can only be entered once, but a "Connection Code" can connect to more than one "Pipe Type".

See also:

Pipe Fitting Matching Table Section *5.13.17*

Connection Codes	*Section 3.7.2.2*
Gender Codes	*Section 3.7.2.3*
Connection Types	*Section 3.7.2.4*

3.7.2.2 Connection Codes

These consist of a four-letter type code, a gender code, and a connection type. Common type codes used in the IRRICAD supplied database are:

LDP:	polyethylene fittings
PVC:	PVC fittings
COMP:	compression fittings
NPT:	national pipe thread
FLA:	flanged
NONE:	no fitting required (Outlets and Outlet Connectors only)
BSP:	British standard pipe thread nts regardless of the angles between the items.

Connection codes are used to inform IRRICAD which fittings can be connected to which "Pipe Type". This means that if a fitting has the "Connection Code" **FLA** it cannot be selected to connect to a PVC pipe. To connect to an item the "Connection Code" and "Connection Type" need to be the same and the "Gender Code" needs to be opposite. The fitting will not be selected if the connection codes are not the same as the item it is being selected for.

3.7.2.3 Gender Codes

There are only two choices in the dropdown list in the component dialog – male and female (**M**, **F**). For IRRICAD to select a fitting it must have the opposite gender to the item it is being selected for.

3.7.2.4 Connection Types

These specify how items are joined together. Any "Connection Type" required can be entered. Common fitting types are:

S:	slip connection
T:	threaded connection
B:	barbed or if used with FLA (flanged) - bolted
F:	flanged

For IRRICAD to select a fitting it must have the same "Connection Type" as the item it is being selected for.

3.7.2.5 Database Symbols

The default set of database symbols are stored in a folder called database. Typically this is installed as C:\Program Files\AEI Software\Irricad\symbols\database. Currently there are 124 symbols to choose from for hydraulic items. Symbols for hydraulic items can only be changed or specified in the Database Editor, not through IRRICAD.

When selecting or changing the symbol, choose from the dropdown list or click the browse button ([…]) to select a new symbol from the symbols\database folder. When creating a new database symbol it must be saved in the symbols\database folder in order to be selected for use in the database (see Creating New Database Symbols, Section 2.7.7). Click the "Database" option in the *Tools|Create Symbol* dialog.

> Note: *Create* new *database symbols in IRRICAD by using* the *Create Symbol command in* the *Tools menu; it is important to create* the*m 100 x 100 inches (2.54m x 2.54m) in dimension for* the *symbol sizes to remain consistent. IRRICAD saves* the *symbols using* the *.vcs file format. O*ther *.vcs files (Visual CADD symbol files) can also be used as database symbols.*

Symbol sizes range from 1 to 9. These numbers are relative to each other, e.g., size 6 is larger than size 5. When used in IRRICAD, a size 5 symbol has the world size designated in *Settings|Miscellaneous* - "Design Size". If the "Base Database Symbol Size" here is 5ft (5m) a size 5 symbol will be displayed on the screen with a diameter of 5ft (5m).

3.7.2.6 Symbol and Pipe Colors

In the item dialog there is a "Color" field for the hydraulic item. This "Color" can only be edited in the database editor, and not through "Properties" in IRRICAD as for geometric items.

By clicking on the default or current "Color" choose any color or shade from the pop-up screen.

3.7.2.7 LINE TYPES

"Line Types" can be chosen for line hydraulic items. From the drop down list select the desired line type. There are 50 line types to choose from for line hydraulic objects. (See Available Line Types, Section 6.6).

3.7.3 ASSEMBLIES

3.7.3.1 ABOUT ASSEMBLIES

An assembly is a set of components grouped together to function as a single entity.

IRRICAD uses assemblies as if they are a single component with the characteristics given in the database.

Assemblies are commonly used in situations where:

- IRRICAD requires more than three fittings to solve a direct connection. An example is a large reduction in pipe size where the number of standard reducers required is greater than three.
- To enter components that individually have no particular purpose for a design, but together provide a distinct function. Swing joint connectors that are made up of a range of fittings, provide an example of this.
- To include associated items with a component and have all components listed separately, e.g., stake, tube and take-off with a minisprinkler.
- A component requires additional items to change its orientation, connection type or diameter.
- Require a particular set of items to be selected during fittings selection.

An assembly can be created in all component groups except the pipe, tape and wire groups. Components for the assembly can be selected from any component group.

Assemblies can be made up of other assemblies. The assembly being created must not be selected as part of itself.

The reporting of assemblies is controlled by the usage codes given to the assemblies in the database.

- Where the "Usage" code **Y** is used, any assemblies in a design will be broken down into their individual components and these components will be listed in the reports.

- Where the "Usage" code **A** is used, the assemblies will be listed in the reports as an assembly description and not be broken down into individual components.
- Where the "Usage" code **X** is used, the assemblies will be listed in the reports as in A above but will also be listed at the end of each report with a list of their components.
- Where the "Usage" code is **N** (or blank), the assembly cannot be selected.

Details of how to create assemblies is given in the Database Details / Assemblies section. (See Creating Assemblies, Section 3.7.3.2).

3.7.3.2 Creating Assemblies

Select the tab associated with the type of assembly to create, e.g., Valve.

In the *Component* menu the available tools are:

- New Assembly
- Edit Assembly
- Add to Assembly
- Remove from Assembly
- Finish Assembly

3.7.3.3 Example of Assembly Construction

To further illustrate the creation of assemblies, a step by step description of how to construct a valve assembly is presented.

The Rainspray 40mm Model 6 QCV Assembly will consist of the following items:

- 40mm Class 9 PVC Pipe
- Rainspray 40mm Model 6 QCV
- 40mm x 1 ½" Valve adapter
- 40mm PVC plain 45 Elbow
- 250mm round valve box
- Twist lock gel connector 1.0, 1.5, 2.5

Note: This assembly is to demonstrate the *construction of assemblies and should not necessarily be used as a final design for a valve assembly.*

1. As the required assembly performs the function of a valve, select the Valve component group.
2. Find and highlight the existing Rainspray 40mm Model 6 QCV. Select *Component|New Assembly*.
3. In the Valve Description edit box change the name to Rainspray 40mm Model 6 QCV Assembly. Select a "Usage" code (**Y**, **X**, **A**).
4. Enter a warehouse code. Make one up if an actual code does not exist.
5. If the inlet and outlet diameters and the inlet and outlet types are correct for the assembly, leave these entries as they are. Make sure the inlet and outlet reflect the items which will be on either end of the assembly. If they are not, change them as required. As costs will automatically be calculated for the assembly, make no changes to the costs.
6. Click the [Continue] button, and select the Rainspray 40mm Model 6 QCV valve to include one valve in the valve assembly by double-clicking on the name or click once on the grey box to the left of the name.
7. Select the Pipe component tab. In this group, select the 40mm Class 9 PVC. Enter 1 into the pop-up dialog to select a 1ft (1m) length of pipe for the assembly. Click the OK button.
8. From the Coupler component group, select the 40mm x 1½" valve adapter and enter 2 in the pop-up dialog.
9. From the Elbows / Bends component group, select three of the 40mm PVC plain 45 elbow by entering 3 in the edit box in the pop-up dialog after selecting the item.
10. Select the Miscellaneous components group and select a 250mm Round Valve Box.
11. Still in the Miscellaneous component tab, select 2 Twist Lock Gel Connector 1.0, 1.5, 2.5.
12. Select *Component|Finish Assembly*.

This completes the construction of the assembly. The items selected for the assembly, and the quantities of each are displayed at the bottom of the screen. To delete items from the assembly, highlight the item and select *Component|Edit Assembly* and *Component|Remove from Assembly*

An important point to remember when creating an assembly is to select the initial item the assembly is based on (e.g., in a valve assembly, select the valve required, as a valve is not automatically entered as an assembly item).

It is important to note that although IRRICAD does not connect together fitting types of the items within the assembly; it is beneficial to make sure that all the items can be connected. Hence, selecting the correct fittings, such as adapters and couplers, will ensure that this assembly can be installed.

3.8 Irrigation Components – Details of Individual Groups

This chapter looks at each component group and the specific fields for each type of hydraulic item.

3.8.1 Pipes

The pipe group consists of a list of all pipes and their characteristics. For pipes, the main dialog lists the pipe descriptions, warehouse codes, supplier codes and usage for all pipes in the database.

3.8.1.1 Pipe Usage codes

The "Usage" field enables or disables use of pipes. To enable a pipe for use the choices are **L**, **Z, F** and **M**.

L means that the pipe can only be selected for use as a lateral for a sprayline and will appear only in the dropdown list when *Zone|Sprayline* or *Zone|Block* is selected

Z enables the pipe for use as a zone pipe only, and will appear in the dropdown list when *Zone|Pipe* or *Zone|Cut Pipe* is selected.

F stands for flushing. Pipes marked with this code are treated the same as those marked with **Z** except that they are not available for automatic selection during Zone LP or Velocity design. Note that a pipes' usage should not include both the **Z** and **F** codes.

M enables the pipe for use as a mainline pipe only, and will appear in the dropdown pipe selection list when *Mainline|Pipe* or *Mainline|Sprayline* is selected.

A pipe can be enabled for more than one option if required. For example, enable a pipe for use as **LZ** or for use in all three fields (**LZM** or **LFM**). Pipes can be disabled by selecting the blank option in the dropdown list or, deleting the current "Usage" code so that this field is empty.

Beneath the pipe table is a table labeled Assemblies. This table will remain blank when in the pipe tab, because pipe assemblies are not permitted.

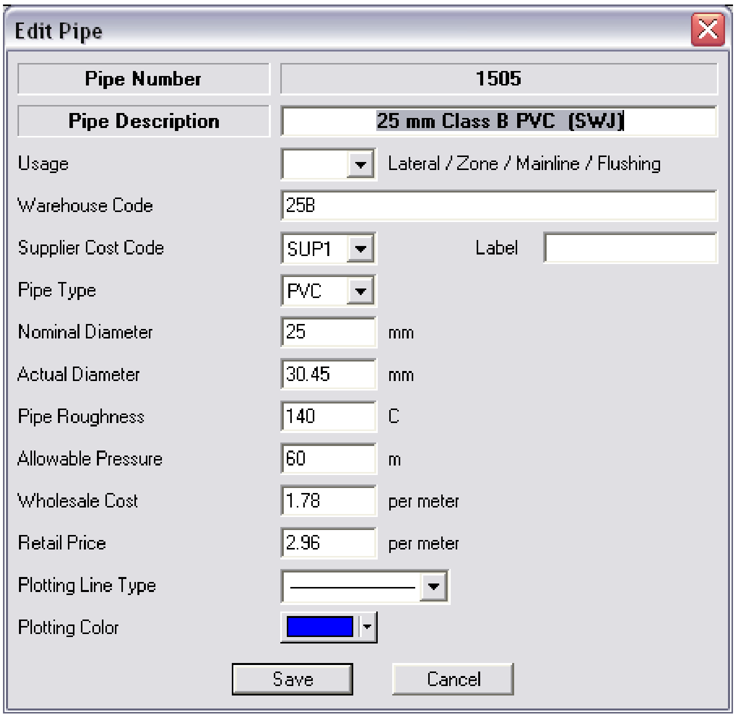


Figure 3-7

Common buttons are explained in Component Menu, Section 3.6 and Database Details, Section 3.7. Some fields are particular to pipes or have a specific explanation when used in the Pipes dialog.

Nominal Diameter:	Enter a “Nominal Diameter” for the pipe. This diameter is used for fitting selection and is usually used in the name of the item e.g., ½” (16mm)
Actual Diameter:	Enter the “Actual Diameter” (internal diameter) for the pipe. This is the diameter of the pipe used in the hydraulic calculations. For example, a nominal 50mm diameter pipe may have an actual diameter of 56.55mm.
Pipe Roughness:	Enter a “Pipe Roughness”. If unsure, see

	Appendix C: Hazen-Williams C Values, Section 6.4. The "Pipe Roughness" is used in the hydraulic calculations for friction loss in the pipe.
Allowable Pressure:	Enter in the "Allowable Pressure" as the maximum working pressure rating for the pipe, e.g., for PVC Class B, 60m, Class C, 90m, Class D, 120m etc.

See also:

Line Types *Section 3.7.2.7*

3.8.2 TAPES

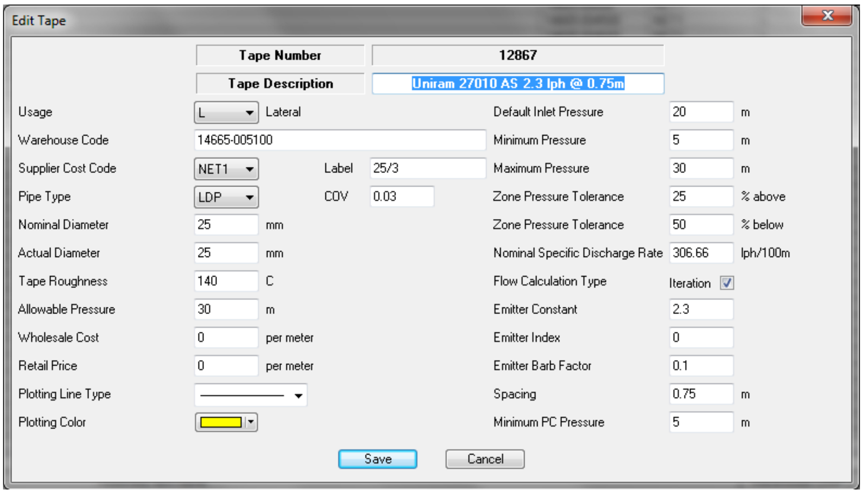


Figure 3-8

The tape component group consists of a list of characteristics for each tape. Laterals with built-in emitters are referred to as tapes and are treated as single items rather than as individual pipes and outlets.

The tape data required in the database is necessary for IRRICAD to calculate the friction loss in the tape as water flows through the tape, and past the emitters.

The main screen lists the item descriptions, warehouse codes, supplier codes, and usage for all tapes in the database. The "Usage" field determines whether a particular tape will appear in the dropdown list for selection in IRRICAD. The "Usage" code choices are **L** or blank.

Underneath the tape descriptions is a table labeled Assemblies. This table will remain blank when in the tape tab, as tape assemblies are not permitted.

Common buttons are explained in Component Menu, Section 3.6 and Database Details, Section 3.7. Some fields are particular to tapes or have a specific explanation when used in the Tapes dialog.

COV:	"COV" (CV_M) is simply entered as a number e.g., in Figure 3-2 the COV is 0.03 (3%)
Nominal Diameter:	Enter in a "Nominal Diameter" for the tape.
Actual Diameter:	Enter in the "Actual Diameter" (internal diameter) for the tape. This is the diameter of the tape used in the hydraulic calculations e.g., a nominal 13mm diameter pipe may have an actual diameter of 13.4mm.
Tape Roughness:	Enter in a "Tape Roughness". This is not actually used in the "Iteration" method but this box must have a number entered before proceeding.
Allowable Pressure:	Enter in the "Allowable Pressure" as the maximum working pressure rating for the tape as recommended by the manufacturer.
Default Inlet Pressure:	Enter a "Default Inlet Pressure" for the tape.
Minimum Pressure:	Enter a "Minimum Pressure" for the tape. This is the manufacturer's data for the minimum recommended operating pressure.
Maximum Pressure:	Enter a "Maximum Pressure" for the tape. This is the manufacturer's data for the maximum recommended operating pressure.
Tolerance % Above:	Enter the "Zone Pressure Tolerance % Above". This indicates the upper limit of the pressure window that the tape is to operate in.
Tolerance % Below:	Enter the lower limit of the pressure window the tape is to operate in ("Zone Pressure Tolerance % Below").
Nominal SDR:	Enter the "Nominal Specific Discharge Rate". This is calculated by dividing 100ft by the

	emitter spacing (ft) and multipliying this by the emitter flow rate (usgph) (dividing 100m by the emitter spacing (m) and multiplying this by the emitter flow rate (lph)). This is an indication of the flow out of the tape over any 100ft (m). This number is only used in the *Show Flow* function and in the *Management* reports.
Flow Calc. Type:	Check the "Flow Calculation Type" box for the "Iteration" method. This method is precise and requires values for the "Emitter Barb Factor", "Emitter Constant", "Emitter Index" and "Spacing" of the emitters.
Minimum PC Pressure:	For PC tapes this value is typically identical to the specified minimum allowable operating pressure. However for some types of emitters (e.g., non-leakage) this value may be different from the minimum allowable operating pressure and the tape manufacturer should be contacted for details of these. Note that this field is not applicable for non-PC emitters and can therefore be left at 0 for these types of components. See Flushing Calculations, Section 2.6.5.5 for details on where this value is used.

The values required for the "Iteration" flow calculation can be obtained from manufacturer's data or from the Technical Support. The previously used flow calculation type (leave the iteration check box unchecked) is valid only for DOS IRRICAD databases. Tapes should be updated to the new iteration method.

The "Iteration" calculation type is a very accurate method of calculating the friction loss in tapes. It requires what is called an "Emitter Barb Factor" (Kd). This value is normally between 0 and 2, and is a function of the headloss caused by the presence of the emitter in the tape wall.

An "Emitter Constant" (coefficient) is also required, along with the "Emitter Index" (exponent) and the "Spacing" of the emitters in the tape. The "Iteration" calculation type (when the "Iteration" check box is checked) is the default calculation type for entering new tapes.

If the “Iteration” check box is unchecked (as in the case of old IRRICAD tape databases), then the old method, which uses a constant, length factor, pressure factor and slope factor will apply. Do not use this method when entering new tapes into the database. Note that simply checking or unchecking the iteration check box does not change the values in the edit fields. The correct data will need to be used as supplied by the manufacturer.

The Kd, constant and index are supplied by the manufacturer, though if unable to secure this information, please contact the technical support person.

WARNING: DO NOT USE OLD TAPE DATA WITH THE ITERATION METHOD, AS THE RESULTS WILL BE INCORRECT.

3.8.3 VALVES

Valves are zone control valves - used to control the operation of the various zones. A control valve separates zone pipe from mainline pipes.

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to valves or have a specific explanation when used in the Valves dialog.

Inlet Diameter:	Enter an “Inlet Diameter” for the valve, i.e., the upstream end of the valve (nominal diameter).
Outlet Diameter:	Enter an “Outlet Diameter” for the valve, i.e., the downstream end of the valve (nominal diameter).
Constant:	Enter the value calculated from Valve Pressure Loss from Flow Curve Fit for the “Headloss Equation Constant”.
Index:	Enter the value calculated from Valve Pressure Loss from Flow Curve Fit for the “Headloss Equation Index”.
Intercept	Enter the value calculated from Valve Pressure Loss from Flow, with Intercept Curve Fit for the “Headloss Equation Intercept” if required.
Minimum Flow	Enter the “Minimum Flow” through the item. Obtain this from the manufacturer’s data for

	the item.
Maximum Flow:	Enter the "Maximum Flow" through the item. Obtain this from the manufacturer's data for the item.

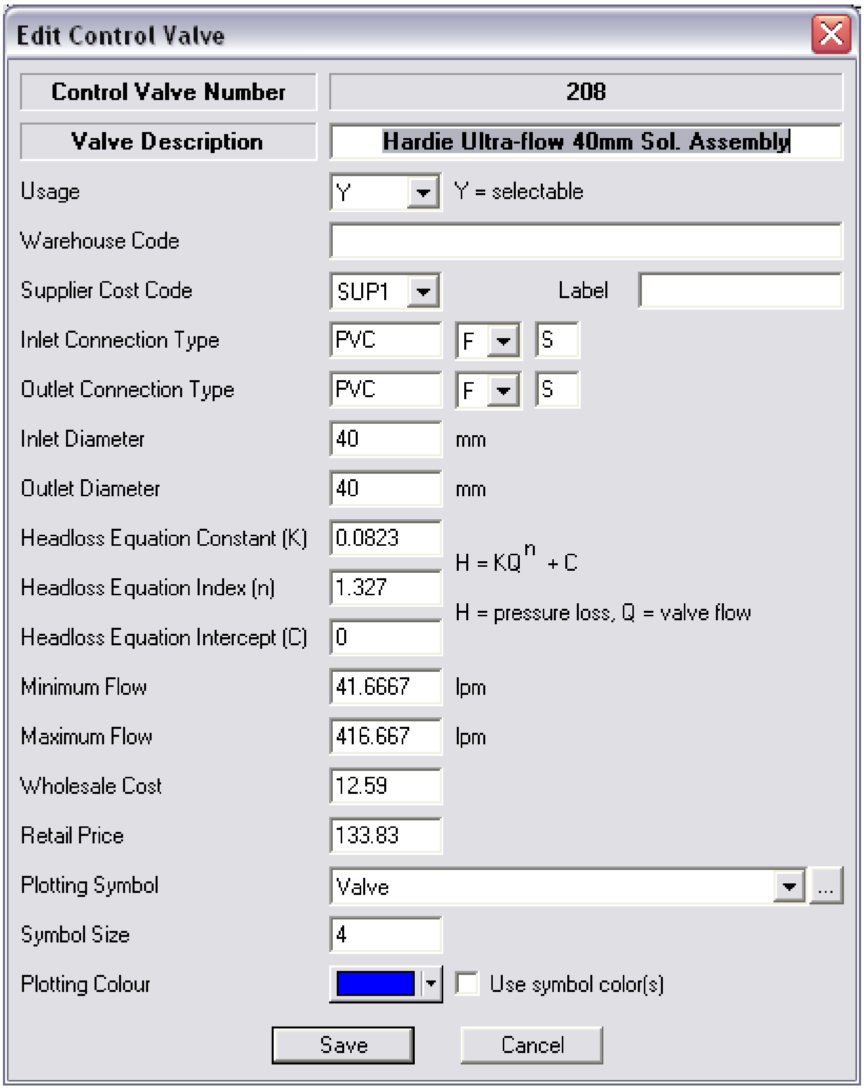


Figure 3-9

3.8.4 OTHER HYDRAULICS

Other Hydraulics are called *Misc. Hydraulic* items in the main IRRICAD *Zone* and *Mainline* menus. These items can be pressure regulating valves, valves to place on a mainline pipe or on a zone pipe, rising column losses, well drawdown, or any other minor losses that require calculation within a system.

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to other hydraulic items or have a specific explanation when used in the Other Hydraulics dialog.

Inlet Diameter:	Enter an "Inlet Diameter" for the item, i.e., the upstream end of the hydraulic item (nominal diameter).
Outlet Diameter:	Enter an "Outlet Diameter" for the item, i.e., the downstream end of the hydraulic item (nominal diameter).
Constant:	Enter the value calculated from Miscelleaneous Pressure Loss from Flow Curve Fit for the "Headloss Equation Constant".
Index:	Enter the value calculated from Miscelleaneous Pressure Loss from Flow Curve Fit for the "Headloss Equation Constant".
Intercept	Enter the value calculated from Miscelleaneous Pressure Loss from Flow Curve Fit for the "Headloss Equation Intercept".
Fitting Type:	For pressure reducing valves, to specify the downstream pressure of the valve, enter **PRV** in the "Fitting Type" field, otherwise leave this field blank.
Minimum Flow	Enter the "Minimum Flow" through the item. Obtain this from the manufacturer's data for the item.
Maximum Flow: Flow,minimum allowable	Enter the "Maximum Flow" through the item. Obtain this from the manufacturer's data for the item.

Note: For on-line components such as air release valves (as distinct from in-line components), the "Inlet Connection Type" and "Inlet Diameter" must be entered. The "Outlet Connection Type" must be left blank and the "Outlet Diameter" entered as zero.

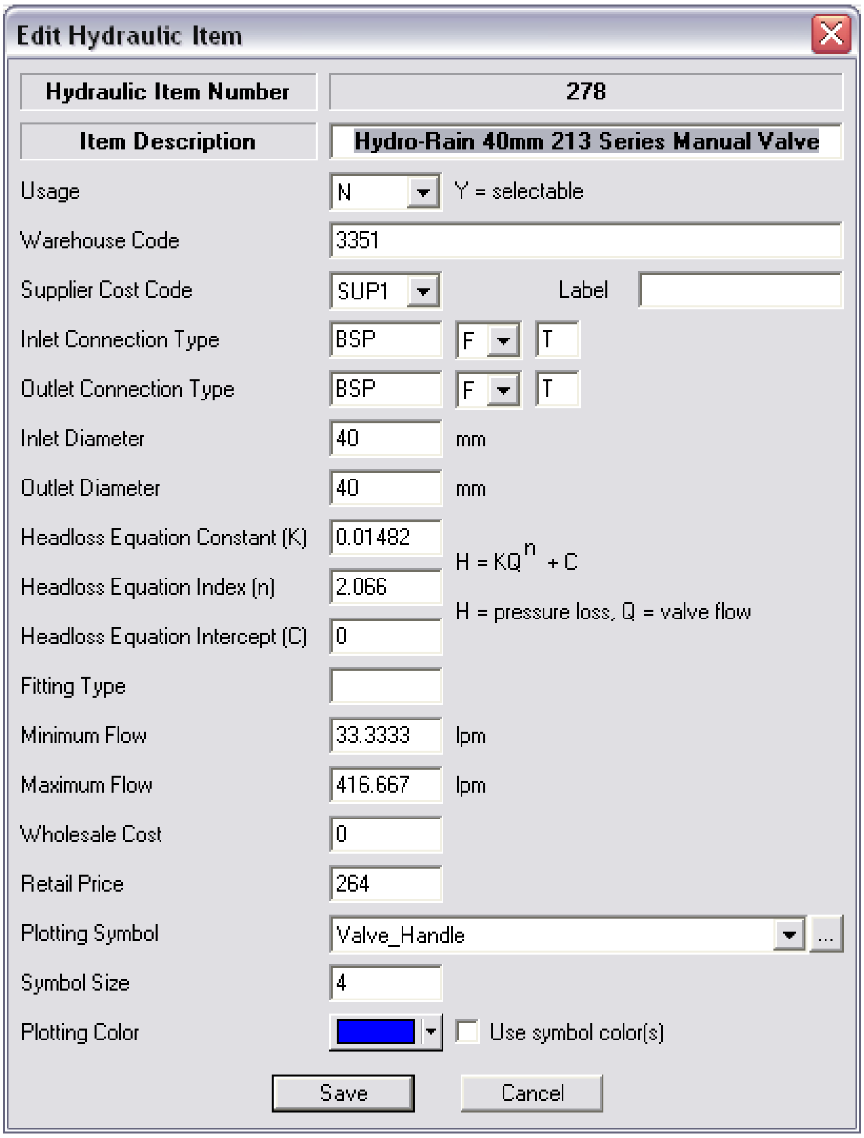


Figure 3-10

3.8.5 Lateral Take Offs

Lateral Take Offs are connectors that rely upon piercing submain or lateral pipes rather than cutting the pipe in half as a tee does. Lateral Take Offs are used to connect outlets to laterals and laterals to submains.

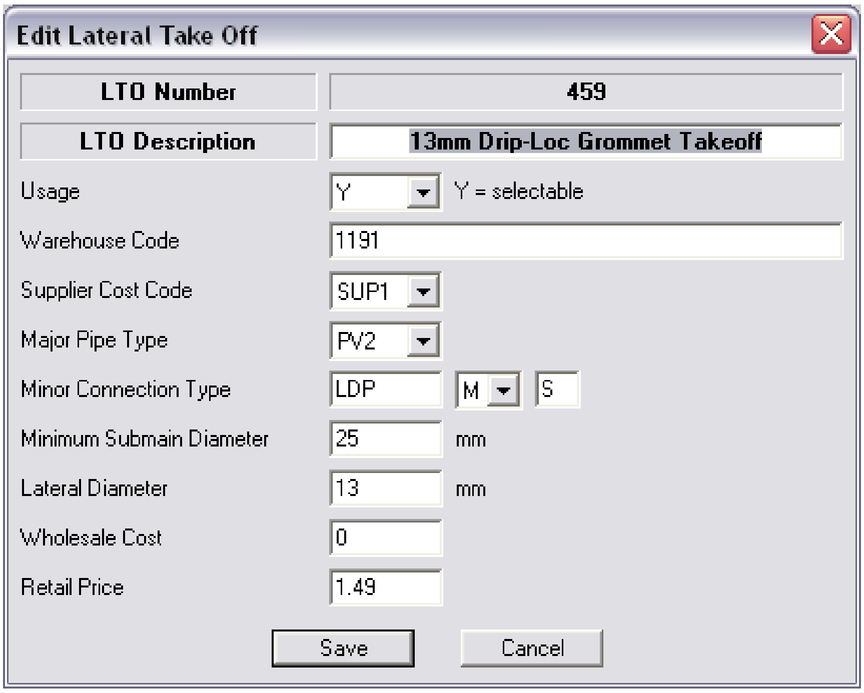


Figure 3-11

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to Lateral Take Offs or have a specific explanation when used in the Lateral Take Offs dialog.

Major Pipe Type:	Select the "Major Pipe Type" from the dropdown list to define the type of pipe the LTO can connect to on its largest end. Typically the major pipe is a submain for a submain / lateral connection or a lateral for a lateral / outlet connection.
Minor Connection	A three-element code (matching code,

Type:	gender, joint type) used to describe the connection on the small end of the LTO, i.e., the lateral end of a submain / lateral connection or the outlet end of a lateral / outlet connection.
Min Submain Diameter:	The minimum size of the major pipe the LTO can successfully connect to.
Lateral Diameter:	The nominal pipe or fitting size on the minor end of the LTO connection.

<u>*Notes*</u>*:*

When selecting fittings for a three pipe junction, IRRICAD first searches the *LTO component group for a suitable connector regardless of* the *sizes and types of pipes at* the *junction. If the required LTO cannot be found in* the *LTO tab, tees with* the *required reducers will be selected according to* the *three pipes routines described in* the *Technical Reference, Appendix G: Fitting Selection Details.*

If a Lateral Take Off is able to be connected to more than one pipe type, separate Lateral Take Offs must be entered for each type.

See also:

Fitting Selection Details *Section 6.8*

3.8.6 COUPLERS

Couplers are used to connect two hydraulic items together. Couplers may be reducers, adapters or plain connectors.

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to couplers or have a specific explanation when used in the Couplers dialog.

Major Diameter:	Enter the “Major Diameter” (nominal diameter).
Minor Diameter:	Enter the “Minor Diameter” (nominal diameter).

The terms major and minor are applied to both connector type and diameter. For couplers the major connection type and diameter can be applied to the larger diameter of the fitting, with minor referring to the smaller diameter.

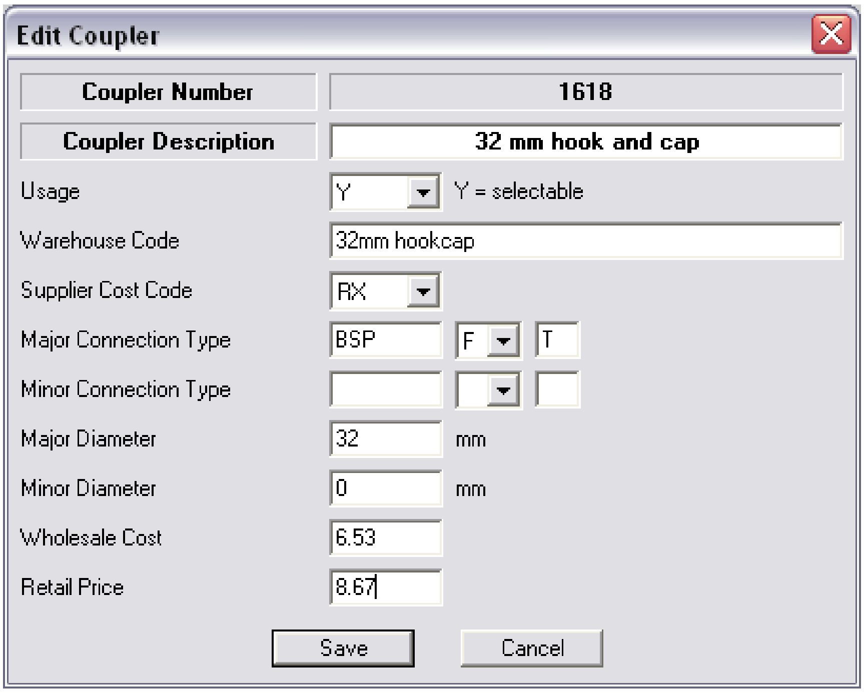


Figure 3-12

If all diameters in the fitting are the same, the data entry for the major and minor diameters will also be the same.

3.8.6.1 End Caps

In the IRRICAD program, *Computer Selection of Fittings* in the *Design* menu will automatically select end caps or end closers for pipes with open ends. Common uses include automatic selection of end closers with polyethylene laterals, or caps or flushing assemblies for PVC laterals or submains. These fittings are entered in the Coupler component group with a connection type and diameter specified for the first (or inlet) end only. The second connection type is left blank and the second diameter is entered as zero.

End assemblies may comprise of a number of fittings. This can be achieved by creating a suitable assembly in the coupler tab.

3.8.7 Elbows / Bends

IRRICAD uses elbows and bends when selecting Fittings. They can also be selected for use in user-created assemblies.

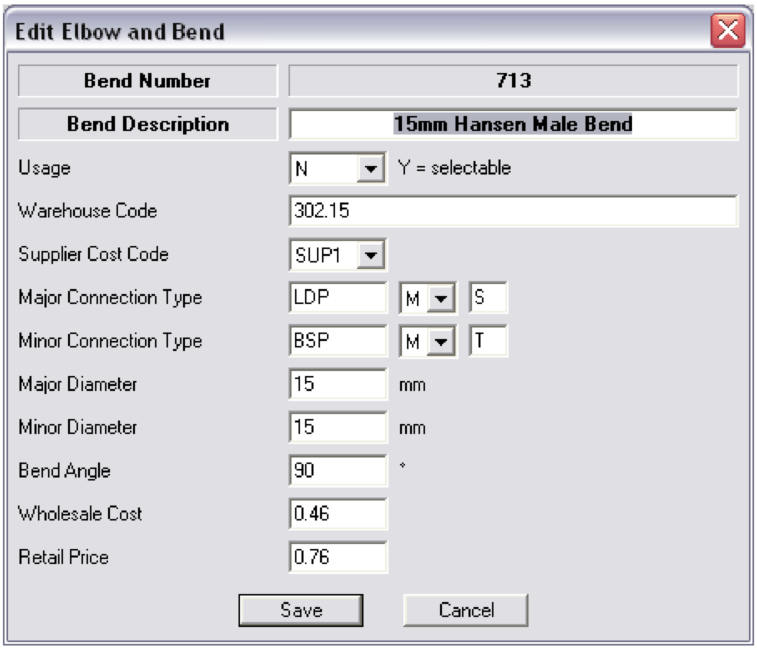


Figure 3-13

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to elbows and bends or have a specific explanation when used in the Elbows / Bends dialog.

Major Diameter:	Enter the "Major Diameter" (nominal diameter).
Minor Diameter:	Enter the "Minor Diameter" (nominal diameter).
Bend Angle:	The change in angle experienced by flow through the fitting (°).

The terms major and minor are applied to both connector type and diameter. For bends and elbows the major connection type and diameter can be applied to the larger diameter of the fitting with minor referring to the smaller diameter.

If all diameters in the fitting are the same, the data entered for the major and minor diameters will be identical.

3.8.8 TEES

Tees are used by IRRICAD to connect three hydraulic items together.

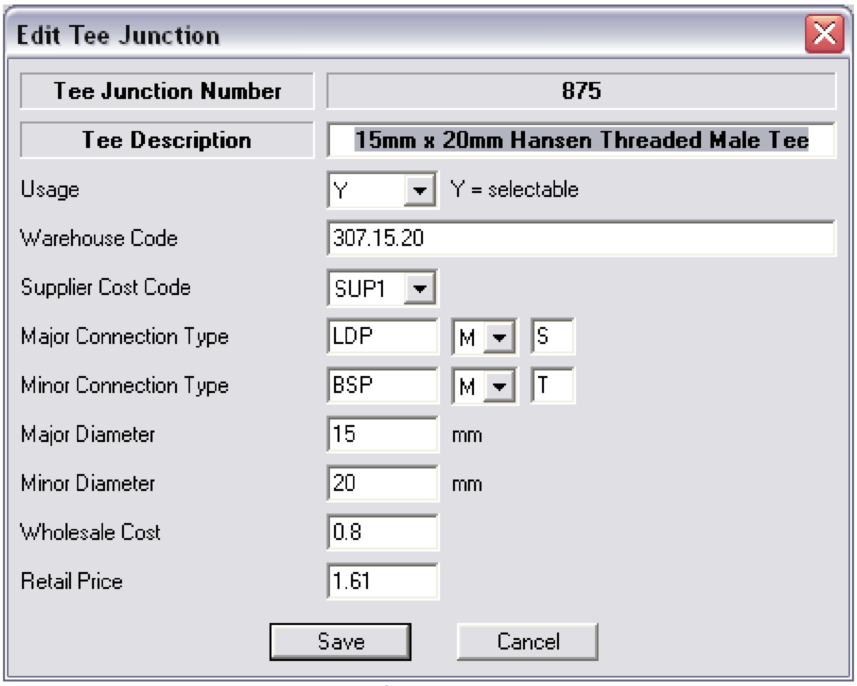


Figure 3-14

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to tees or have a specific explanation when used in the Tees dialog.

Major Diameter:	Enter the "Major Diameter" (nominal diameter).
Minor Diameter:	Enter the "Minor Diameter" (nominal diameter).

The terms major and minor are applied to both connection type and diameter. For Tees the major connection type and diameter is applied to the straight through section of the Tee and the minor is applied to the branch, regardless of diameter.

If all diameters in a fitting are the same, the data entered for the major and minor diameters will be the same.

3.8.9 Crosses

Crosses are used to connect four hydraulic items together.

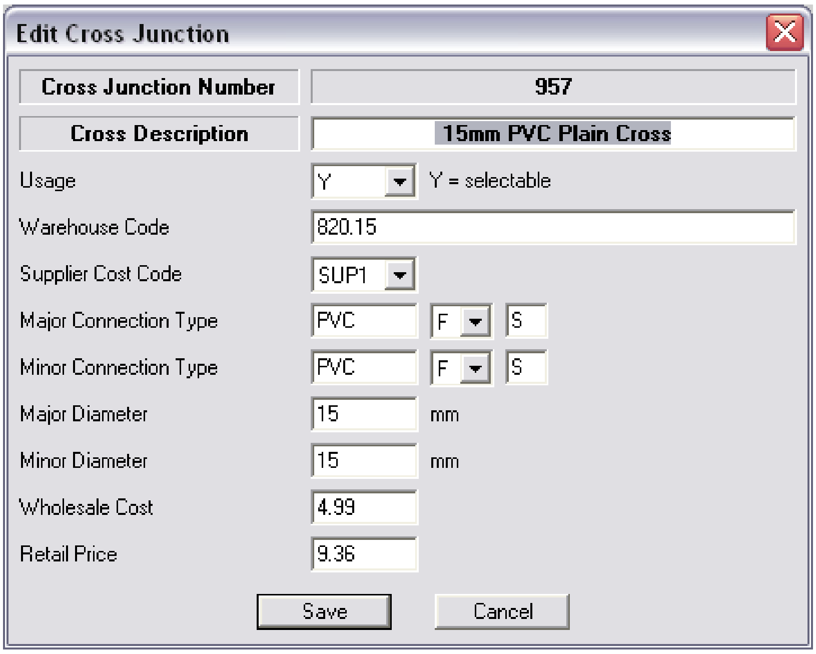


Figure 3-15

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to crosses or have a specific explanation when used in the Crosses dialog.

Major Diameter:	Enter the "Major Diameter" (nominal diameter).
Minor Diameter:	Enter the "Minor Diameter" (nominal diameter).

The terms major and minor are applied to both connector type and diameter. For crosses the major connection type and diameter can be applied to the larger diameter of the fitting with minor referring to the smaller diameter.

If all diameters in the fitting are the same, the data entered for the major and minor diameters will be the same.

3.8.10 PUMPS

The A, B and C coefficients that are calculated from the *Pump Curve Fitting* utility specify pump performance data. This information is used to determine the actual flow and pump pressures according to the hydraulics of the rest of the system.

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to pumps or have a specific explanation when used in the Pumps dialog.

Inlet Diameter:	Enter the nominal diameter of the inlet or suction side of the pump.
Outlet Diameter:	Enter the nominal diameter of the outlet or discharge side of the pump.
H / Q Curve Factors:	A, B and C are three numbers used to describe the pressure-discharge characteristics of the pump. These values are obtained from the *Pump Curve Fit* utility.
Minimum Flow	Enter the "Minimum Flow" through the pump. This can be obtained from the manufacturer's data for the pump.
Maximum Flow: Flow,minimum allowable	Enter the "Maximum Flow" through the pump. This can be obtained from the manufacturer's data for the pump.

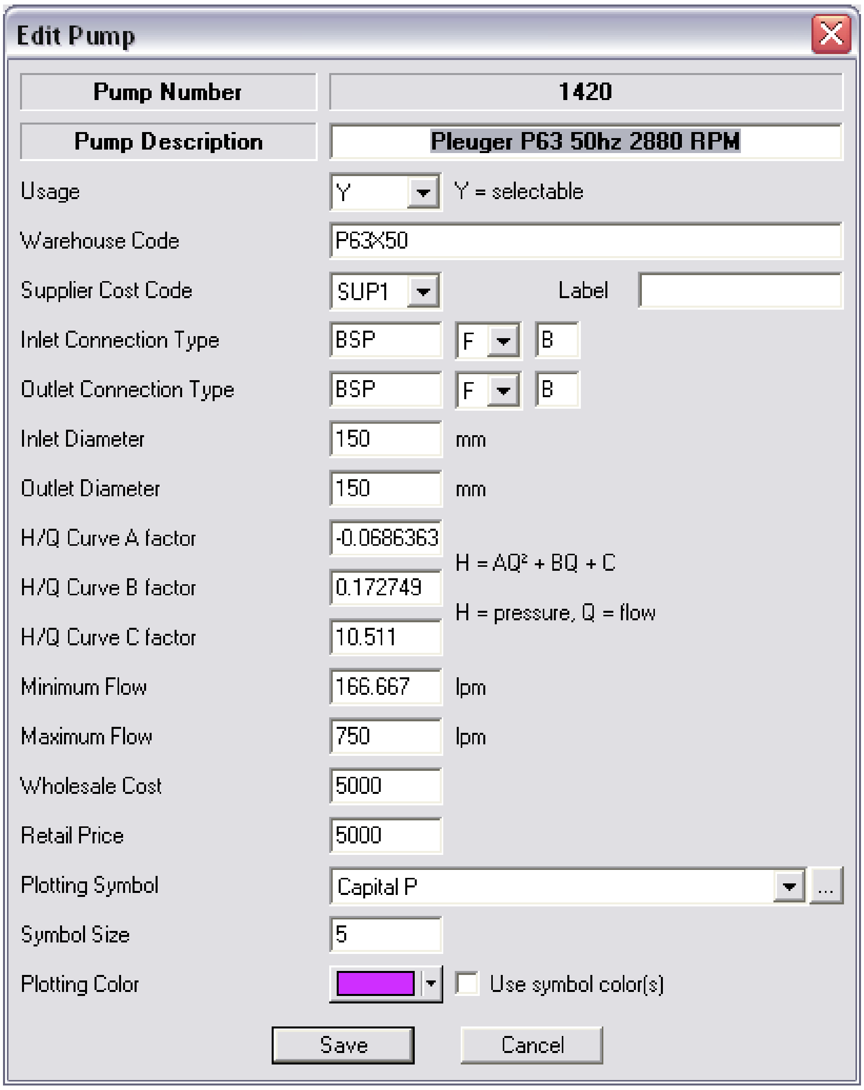

Edit Pump
Pump Number
1420
Pump Description
Pleuger P63 50hz 2880 RPM
Usage
Y
Y = selectable
Warehouse Code
P63X50
Supplier Cost Code
SUP1
Label
Inlet Connection Type
BSP
F
B
Outlet Connection Type
BSP
F
B
Inlet Diameter
150
mm
Outlet Diameter
150
mm
H/Q Curve A factor
-0.0686363
H = AQ² + BQ + C
H/Q Curve B factor
0.172749
H = pressure, Q = flow
H/Q Curve C factor
10.511
Minimum Flow
166.667
lpm
Maximum Flow
750
lpm
Wholesale Cost
5000
Retail Price
5000
Plotting Symbol
Capital P
...
Symbol Size
5
Plotting Color
Use symbol color(s)
Save
Cancel

Figure 3-16

3.8.11 OUTLETS

Nozzles and outlets are used together. Nozzles can be selected for a particular outlet from the Outlet tab. Note nozzles should be added to the nozzle component group prior to adding nozzles to an outlet.

The outlet group provides the technical and descriptive information related to outlets that IRRICAD requires for design and costing.

The database has been designed primarily for sprinklers with a range of nozzle sizes, but can be used equally well for other outlets such as drippers, constant flow outlets, demand points or irrigators.

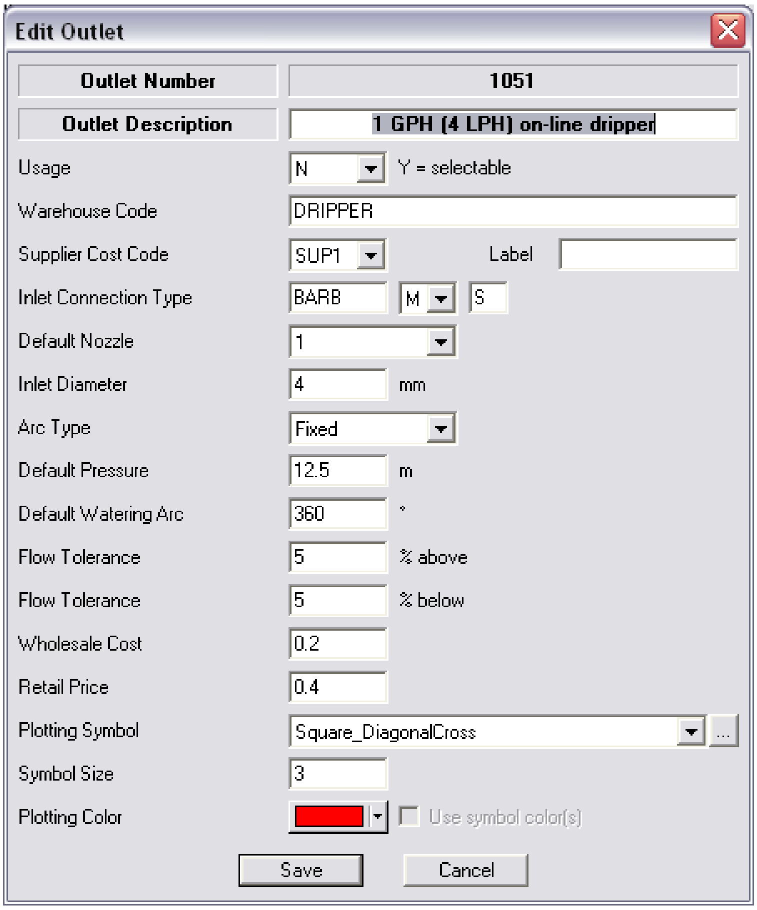


Figure 3-17

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to outlets or have a specific explanation when used in the Outlets dialog.

In the *Components* menu or on the top toolbar additional buttons available for use in the Outlets tab are:

- Edit Nozzles
- Add Nozzle
- Remove Nozzle

Inlet Connection Code:	A three-element code consisting of a matching code, a gender code and a joint type code. IRRICAD uses this code to determine which fittings, if any are needed to connect the outlet to other components. If the outlet is a sprinkler, it will often be connected to an outlet connector. If the outlet does not have a threaded connection and fittings are not required to connect the outlet to the pipe (such as for drippers or microjets connected directly to a lateral pipe), the NONE matching code should be used. The NONE code instructs IRRICAD not to select any connecting fittings. For most turf sprinklers, the connection type used is the NPT / BSP female inlet diameter.
Default Nozzle:	The first ten characters of the description of the nozzle that is most often used with this outlet. The "Default Nozzle" is automatically the first nozzle selected when [Adding Nozzles]. Any of the other nozzles may be selected to be associated with the outlet from a drop down list available in this field. A default nozzle cannot be selected for this field until nozzles associated with the outlet have been added - click [Save] when creating a new outlet and then proceed to add the required nozzles. After clicking [Finish Adding] for nozzles re-select the outlet and click [Edit / View Outlet]. Select a "Default Nozzle" and click [Save]. When an

	outlet is being selected for use in design, the default nozzle with its supporting information will be displayed on the screen first. This can save time when the same sprinkler / nozzle combination is used frequently. It should be noted that up to 40 characters might be used to describe the nozzle in the nozzle tab. The first 10 characters are used to match with the default nozzle. To be sure that the required default nozzle is selected, these 10 characters should be unique for any body / nozzle combination. If the 10 characters can be matched to more than one nozzle, the nozzle selected may not be the one expected.
Inlet Diameter:	The nominal diameter of the outlet inlet. For outlets that do not have a nominal diameter, a notional diameter is entered.
Arc Type:	Used to indicate whether the arc of the sprinkler is fixed or adjustable, or whether the outlet is a demand point: **Fixed**: fixed arc type, constant flow **Variable**: variable arc type, constant flow **Matched**: variable arc type, variable flow **Demand Point**: used for demand points
Default Pressure:	The operating pressure that is most often used for the particular outlet.
Default Watering Arc:	The most commonly used arc for the particular outlet. Enter as 360º for drippers.
Tolerance % Above:	The percentage allowable flow above the nominal flow for the outlet.
Flow Tolerance % Below	The percentage allowable flow below the nominal flow for the outlet.

Flow tolerance above and below the nominal flow for the outlet defines the range of flows within which the outlet should operate.

*Note: When entering outlet and nozzle data specify whether an outlet is **Fixed**, **Matched** or **Variable**. If **Fixed**, the arc cannot be changed because it is made to be a fixed angle. If **Variable** is* *selected, then the flow does not change as the arc changes i.e. the same flow is emitted regardless of the arc selected upon placement. However, for* ***Matched*** *outlets, IR*RICAD assumes that *the data inputted is for 360º. If the arc is changed, the flow is matched and is decreased accordingly. Therefore if 180º is used as the arc then half the flow will be applied. If the said outlet is indeed* ***Matched****, then enter the data for 360º so that when the arc is changed the correct flow according to the manufacturer's data will be achieved.*

3.8.11.1 DEMAND POINTS

Demand Points are pseudo outlets that require a user-specified pressure and flow at a particular location in a design. Typical examples of their use are designing mainlines with specified pressure and flow requirements at various locations; and to allow for additional flow in a zone or mainline which is not normally entered as an outlet. Demand Points are stored in the outlet tab as emitters without nozzles. To create a Demand Point, insert a new item in the outlet tab and change the Type to **Demand Point**. When the arc type is **Demand Point**, the "Default Nozzle" field becomes non-editable since it does not apply. The "Default Watering Arc" field becomes the "Default Flow" and the "Flow Tolerance" fields become pressure tolerances.

3.8.11.2 LINKING NOZZLES TO OUTLETS

To to add existing nozzles to an outlet use *Component|Edit Nozzles*. This tool is to be actioned before adding nozzles to or removing nozzles from an existing outlet.

To edit an outlet:

1. Select the outlet in the outlet component group by clicking on the name.
2. Select *Component|Edit Nozzles*.
3. Now select *Component|Add Nozzles* or *Component|Remove Nozzles*.
4. To finish adding or removing nozzles, select *Component|Edit Nozzles*.

Adding Nozzles

After invoking this tool, the view is taken to the nozzles component group.

After adding a new outlet to the database, select the *Component|Edit Nozzles* and then *Component|Add Nozzles* to select existing nozzles for the new outlet. This will open the nozzle tab. Note that new nozzles must be added to the nozzle component group prior to adding nozzles to an outlet (see Nozzles, Section 3.8.12).

1. Click on the required Outlet.
2. Select *Component|Edit Nozzles*.
3. Now select *Component|Add Nozzles* and select the required nozzles for this outlet either by clicking the grey box to the left of the item name or by double-clicking on the item name.
4. To finish adding nozzles, select *Component|Edit Nozzles*.

Tip: *Quickly select a nozzle by clicking on* the *gray box at* the *left of* the *nozzle description.*

3.8.12 Nozzles

In IRRICAD, any type of sprinkler, big gun, travelling irrigator or dripper is given an outlet body and a nozzle, even if the outlet does not physically have nozzles e.g., a dripper, or if the outlet we represent has many nozzles e.g., a travelling irrigator. The outlet body contains the description of the outlet, the arc type, price and some default values as those most commonly used when the outlet is selected. When an outlet is selected from the dropdown list, the default nozzle for that sprinkler (as specified in the database, normally the most commonly used) is initially selected. The required nozzle can be selected from the dropdown list. Other default values can also be changed depending on the arc type of the outlet.

The nozzle part of an outlet can be the actual nozzles supplied with an outlet body, or simply hold the technical data for the outlet, such as a dripper's hydraulic characteristics. Nozzles contain the minimum and maximum recommended pressures from the manufacturer, and parameters to calculate the flow and radius at a given pressure.

The manufacturer supplies data used to define nozzle performance. A *Curve Fit* utility is provided (see Section 3.5.1) to convert pressure and flow data for outlets into a coefficient and an exponent. These two numbers are used in the calculations IRRICAD undertakes internally for design and analysis. The *Curve Fit* utility is also used to convert pressure and radius of throw into a constant and index (K and n values) for the nozzle Outlet Radius. The Outlet Radius is the wetted radius of the nozzle for a given pressure.

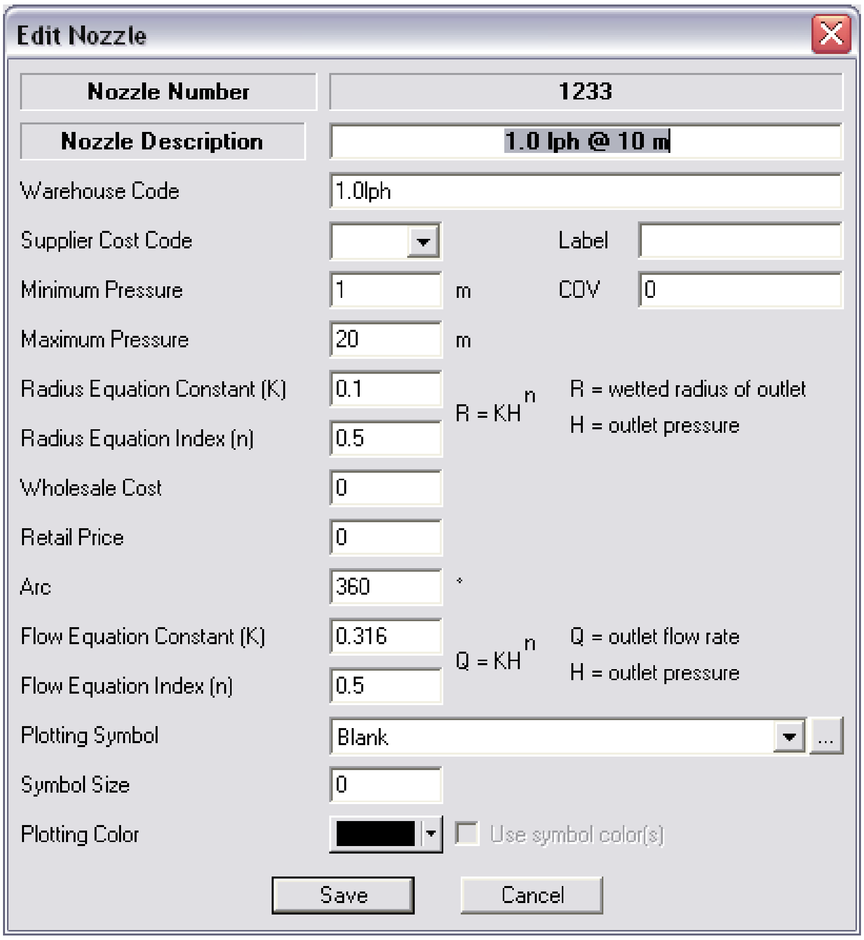


Figure 3-18

Common buttons are explained in Component Menu, Section 3.6 and Database Details, Section 3.7. Some fields are particular to nozzles or have a specific explanation when used in the Nozzle dialog.

Data required for nozzles has to be calculated from pressure / flow, and pressure / radius information supplied by the manufacturer. Use the *Curve Fitting* utility - *Outlet Flow* or *Outlet Radius* to calculate the Constant, Index, Radius Equation A and Radius Equation B.

The Constant and Index values are used to calculate the pressure-flow characteristics of the nozzle, where as Radius Equation A and B values are used to calculate the wetted radius of the nozzle at any given pressure.

COV:	"COV" (CV_M) is simply entered as a number e.g., in Figure 3-12 the COV is 0.03 (3%)
Minimum Pressure:	Enter the "Minimum Pressure" recommended for the nozzle.
Maximum Pressure:	Enter the "Maximum Pressure" recommended for the nozzle. This pressure range should not be confused with the pressures corresponding to the design flow tolerance. The range specifies the absolute minimum and maximum allowable operating pressure for the nozzle.
Radius Equation:	A and B - two numbers used to describe the pressure / radius characteristics of the nozzle. This allows calculating the maximum radius of throw (wetted radius) of the sprinkler for any pressure. The constants A and B can be obtained by using the *Outlet Radius Curve Fitting* utility. For each individual nozzle, the wetted radius / pressure relationship is assumed constant for all arcs.
Arc:	A number between 0 and 360 to describe the arc of the sprinkler. For fixed arc sprinklers a nozzle entry must be made for each arc, one of which must be selected as the default arc for the outlet.
Constant / Index:	Two numbers used to describe the pressure / flow characteristic of the nozzle at the given arc. These can be obtained from the *Outlet Flow Curve Fitting* utility by entering the flow at any given pressure as given with the manufacturer's data.

3.8.13 OUTLET CONNECTIONS

An outlet connector is a component or an assembly of components that is used to connect an outlet to a lateral or supply pipe.

Examples of outlet connectors are:

- Swing joints
- Risers - for overhead sprinkler applications
- Distribution tube and stake for micro-sprinklers

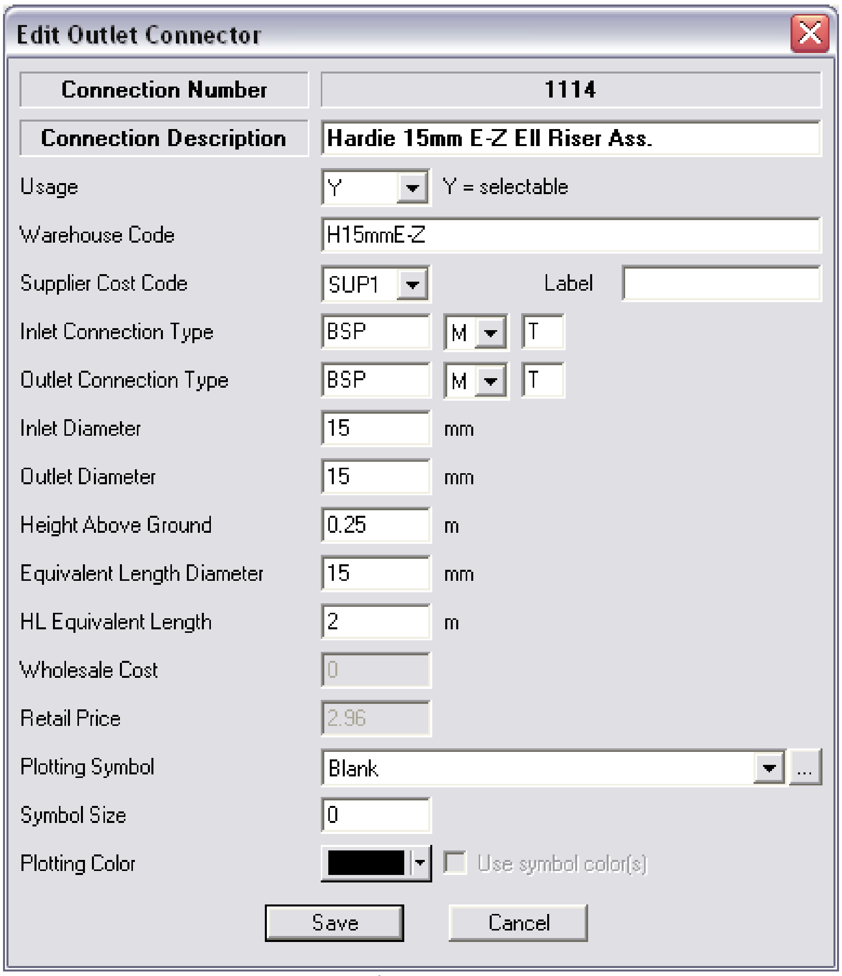


Figure 3-19

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to outlet connectors or have a specific explanation when used in the Outlet Connections dialog.

Inlet Diameter:	Enter an "Inlet Diameter" for the connector (nominal diameter). The diameter is used in the matching of fittings or components to the connector.
Outlet Diameter:	Enter an "Outlet Diameter" for the connector (nominal diameter). The diameter is used in the matching of fittings or components to the connector.
Height Above Ground:	The height of the outlet and the connector above ground level. Where the outlet is at ground level or close to ground level (as in most turf situations) the "Height Above Ground" can be zero. Where the outlet is significantly above ground level as in the case of sprinklers on riser pipes, the height of the sprinkler above ground level (which may be different to the riser length) should be entered.
Equiv. Length Diameter:	The "Equivalent Length Diameter" is the diameter of smooth pipe which together with the "HL Equivalent Length" is used to calculate the connector pressure loss. Do not include the pressure loss due to height above ground in this, as the loss due to change in height will be taken in to account elsewhere.
HL Equiv. Length (ft or m):	The length of smooth pipe of diameter equal to the equivalent length diameter of the connector that will result in a pressure loss (in feet or meters) equal to that of the connector.

IRRICAD determines whether or not the outlet connector will connect directly to the sprinkler and what fittings, if any, are required to make the connection.

If an outlet connector is not used, the fittings required to connect the sprinkler directly to the lateral will be selected. Note that a connection code of NONE can be used to connect an outlet connector to an outlet.

3.8.14 WIRES

The wire component group contains the descriptive, technical and price information for various types of electric cable used in designs. Any wire types may be entered. There is no distinction between wire used for electrical control or for lighting and other applications.

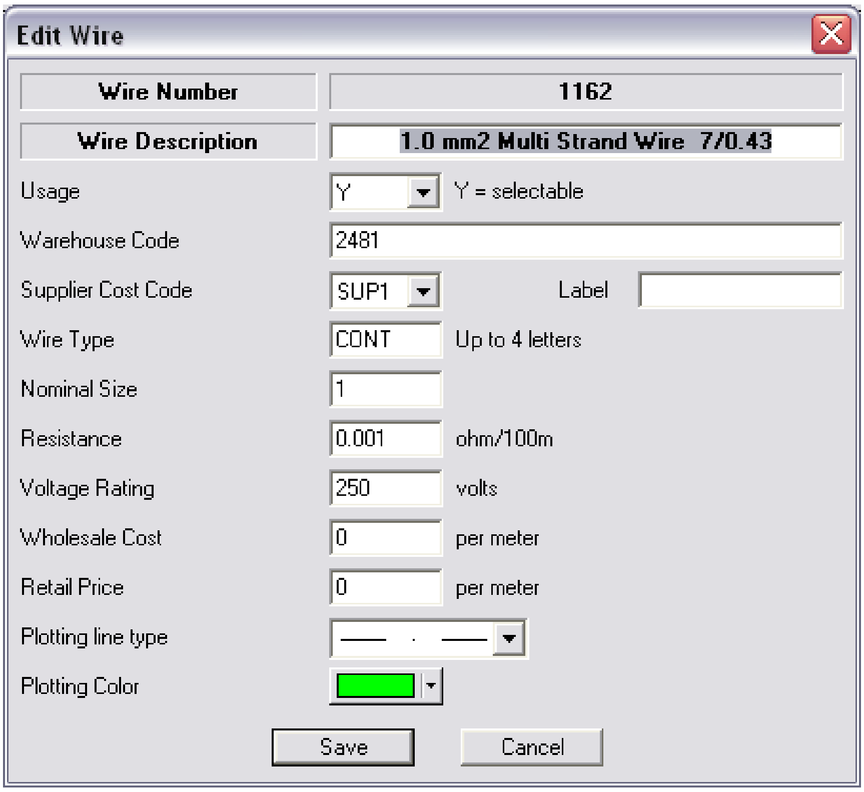


Figure 3-20

Common buttons are explained in Common buttons are explained in Component Menu, Section 3.6 and Database Details, Section 3.7. Some fields are particular to wires or have a specific explanation when used in the Wires dialog.

Wire Type:	A code containing up to three letters, similar to the pipe type code, which is used to identify particular kinds of wire.
Nominal Size:	The nominal or descriptive diameter of the wire.
Resistance:	The internal "Resistance" of the wire.
Voltage Rating:	The maximum "Voltage Rating" for the wire.

3.8.15 Controllers

Controllers are electrical items that program the sequence of operation of the electric solenoid valves that are used to control the flow into the various zones.

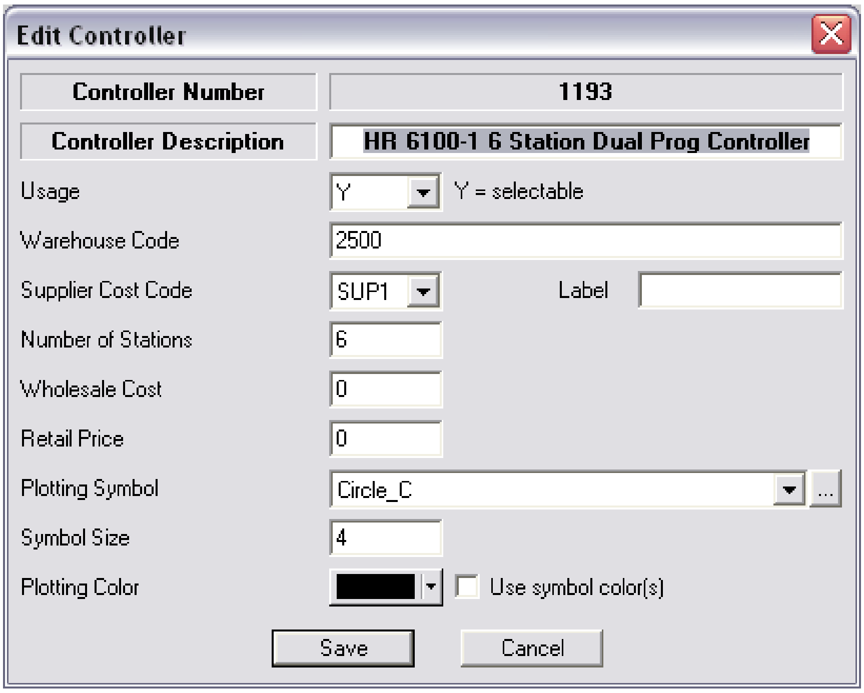


Figure 3-21

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to controllers or have a specific explanation when used in the Controllers dialog.

Number of Stations:	This refers to the maximum "Number of Stations" (or system flows) the controller can be wired to control. A station or system flow may consist of one or many electric solenoid valves.

This information is purely descriptive and is not used by IRRICAD in the design process apart from costing and bill of material reports.

3.8.16 LIGHTS

The lights component group contains items for garden or landscape lighting.

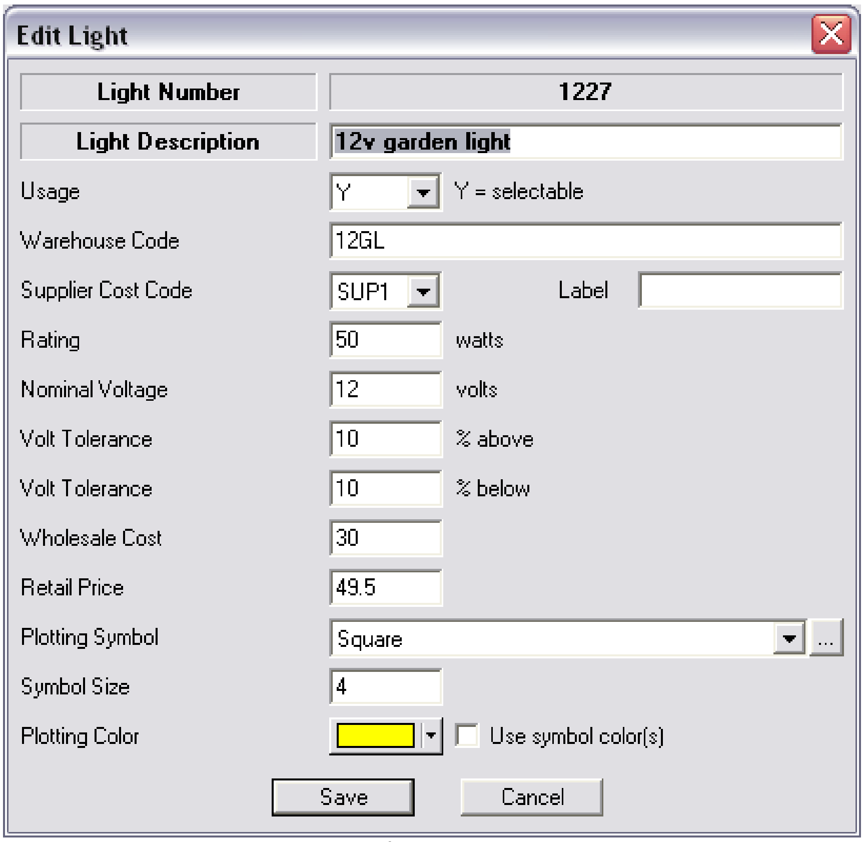


Figure 3-22

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to lights or have a specific explanation when used in the Lights dialog.

Rating:	The power “Rating” of the lights in watts.
Nominal Voltage:	The “Nominal Voltage” rating of the light in volts.
Volt tolerance % Above::	The percentage voltage increase above the nominal voltage allowed for the light.
Volt tolerance % Below::	The percentage voltage drop below the nominal voltage allowed for the light.

This information is purely descriptive and is not used by IRRICAD in the design process apart from costing and bill of material reports.

3.8.17 OTHER ELECTRICS

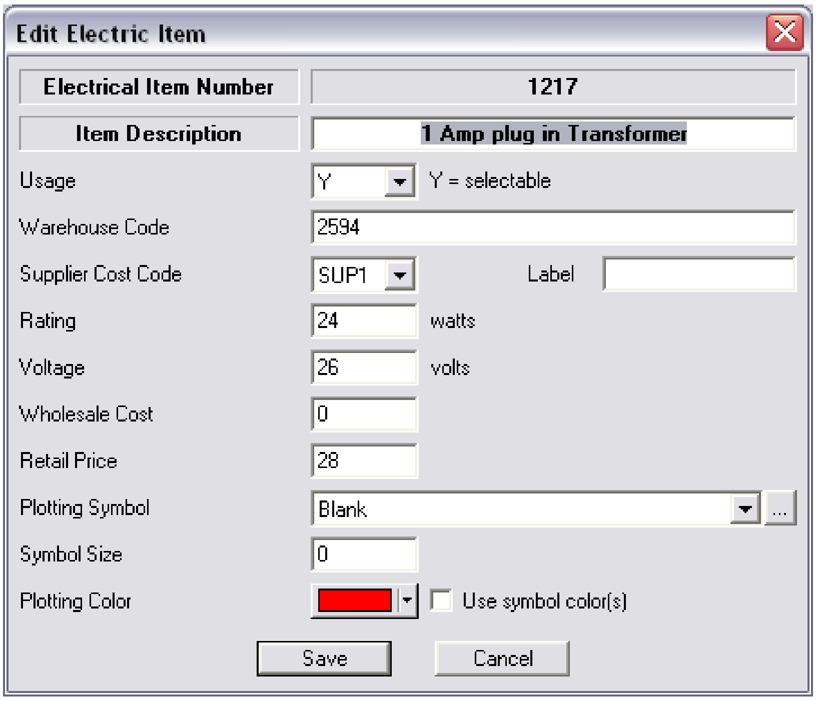


Figure 3-23

A miscellaneous Electrical component group contains items that are considered to be part of the electrical requirements, but do not belong in the wire, lights or controller component groups.

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to other electrics or have a specific explanation when used in the Other Electrics dialog.

Rating:	The power "Rating" of the item in watts.
Voltage:	The "Voltage Rating" of the item in volts.

This information is purely descriptive and is not used by IRRICAD in the design process apart from costing and bill of material reports.

3.8.18 MISCELLANEOUS

The Miscellaneous component group is used to store items such as concrete, locking clamps, sealing plugs, valve boxes etc. so that these items can also be included in the total cost of the project. To include these items in the reports, select from the database using the [Show Fittings] button found on the *Change* or *Change Type* dialog.

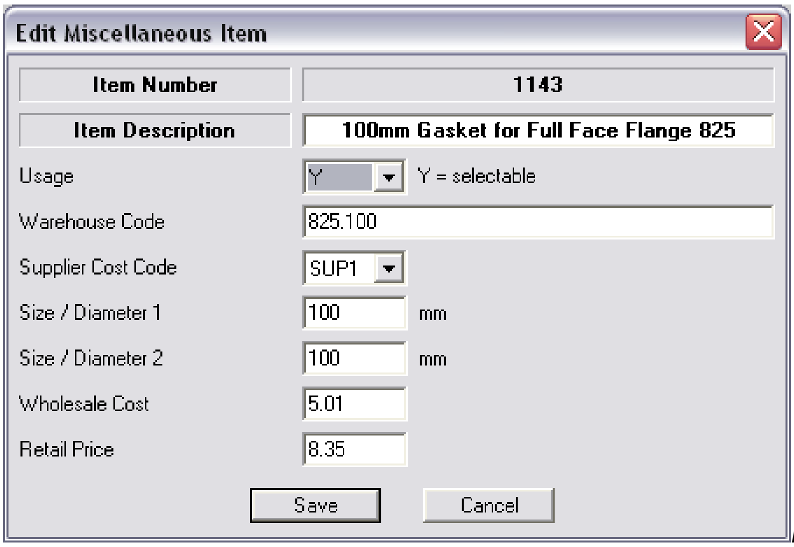


Figure 3-24

Common buttons are explained in Component Menu, Section 3.6, Assemblies, Section 3.7.3 and Database Details, Section 3.7. Some fields are particular to miscellaneous items or have a specific explanation when used in the Miscellaneous dialog.

Size / Diameter 1:	Where relevant, the size and / or diameter of the component.
Size / Diameter 2:	Where relevant, the size and / or diameter of the component.

This information is descriptive and only appears in the relevant reports.

3.9 QUERY MENU

The Query function allows low level access to Irricad databases via Microsoft® Jet SQL. Using this facility could cause corruption of databases and therefore creating new queries shouldn't be attempted without a reasonable knowledge of both SQL and the structure of Irricad databases.

IRRICAD Pro comes equipped with pre-set queries, which can be used to view or update various database tables. Examples include:- showing the Pipe Table (this also allows you to add or edit pipe codes); and an example of increasing pipe prices for a particular supplier.

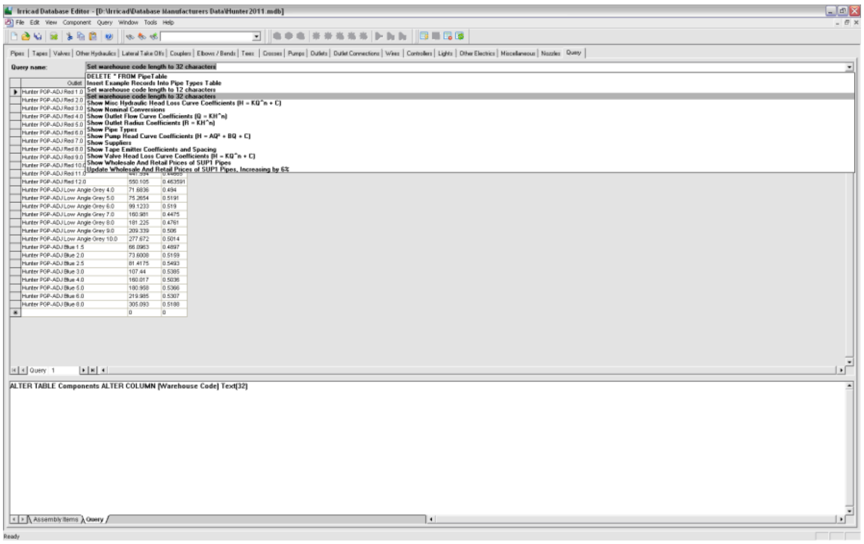


Figure 3-25

The Query tab is only visible if "Show Query tab" is checked in *Tools|Options*.

The tools are available from the *Query* menu or short cut icons on the toolbar:

Figure 3-26

3.9.1 Execute Query

This option executes the current query (the SQL code for this is shown in bottom pane of the query tab). Results of the query are shown in the main grid pane of the Query tab.

An option is available (*Tools|Options*) that will execute SELECT queries automatically when they are selected.

To execute a query:

1. Choose the required query from the dropdown list on the tab.
2. Select *Execute Query* from the menu or toolbar.

3.9.2 Save Query

This saves the current query with the title as specified in the "Query name" combo box. Note that all queries are saved in a text file, Queries.irq, located in the main Irricad Pro folder.

To save a query:

1. Select *Query|Save Query*.

If a query with that name already exists, the user will be prompted to over-write it.

3.9.3 Delete Query

This option removes the current query from the query configuration file.

To delete a query:

1. Select the query to be deleted.
2. Select *Query|Delete Query*.

3.9.4 Reload Query

Select this option to reload all queries and redisplay the current query. This is useful if the user wishes to "undo" the modification to a query, or if the query file has been updated externally.

3.10 Window Menu

The options in the *Window* menu control how the open databases can be displayed.

3.10.1 Cascade

An option for displaying multiple databases in a cascading fashion i.e. each next window displayed below the previous title bar. Found in *Window|Cascade.*

3.10.2 Tile

An option for displaying two databases one below the other on the screen found in *Window|Tile.*

3.10.3 Arrange Icons

In the event that many windows are open but minimised, *Window|Arrange Icons* will arrange the minimized window icons in the left-hand corner.

3.10.4 Open Databases List

Lists all databases that are open and indicates which one currently has the input focus. Found in *Window|Open Database List*.

3.11 Tools Menu (Database)

3.11.1 Clean Fields

The *Clean Fields* utility is used to ensure the consistency of any data that is directly imported, via MS Access, into the IRRICAD databases. It essentially does what the database editor does and makes sure that character fields are the correct length, and that real fields have suitable values.

To use the utility simply:-

1. Close the current database.
2. Select *Clean Fields* from the *Utility* menu.
3. Choose the database and click the [Clean] button.
4. When the progress bar stops the operation is complete.
5. [Cancel] exits from the utility.

A backup of the original database will be created (~tmp then the database name) this may be deleted when required.

3.11.2 Delete Orphan Nozzles

Select *Tools|Delete Orphan Nozzles* to delete any nozzles which are no longer attached to an Outlet.

3.11.3 Units

These settings control the units used for display and entry for each type of quantity.

To set units:

1. Select *Settings|Units*.
2. Edit each measurement as required.
3. Click [OK].

Note: The units set here will also change the default units in IRRICAD.

IRRICAD, but can also be set in IRRICAD for use in Database Editor.

3.11.4 Options

3.11.4.1 Warnings and Errors

Options allow the choice whether or not the database editor displays some warning messages.

Display warning messages when changes to a component have not been updated:
When this option is checked, a message will appear when editing a component (e.g., on the main dialog screen) and attempt to select another function (e.g., [New]). The message will ask if the changes are required to be saved. Answer [Yes], [No] or [Cancel].

If this option is not checked, the message does not appear and the changes are automatically saved.

Display warning messages before editing a component:
When this option is checked a message is displayed when an item is selected and the [Delete] button is clicked. The message is a check to make sure the item is to be permanently deleted. This allows time to check the correct item is selected.

If this option is not checked, the selected item will be deleted without displaying a message.

Show errors in the internal structure when they are noticed:
This option should always be checked. A message will be displayed if errors in the internal structure are encountered.

3.11.4.2 Application

Maximize application on start-up
When checked, the database editor will open full screen.

Maximize database window on open
When checked databases will open full screen within the main pane of the Editor.

Open database on start-up
When checked, select the default database or last opened database to open on start-up.

Show Query tab
When checked, the Query tab will be visible after the Nozzles component tab.

Execute SELECT queries automatically
When checked, the query will run automatically when selected.

Supplementary Character set

This accesses the same setting as in IRRICAD and needs to be set to enable Left to Right languages or East Asian languages to display correctly in the "grid" views. For more information on using this feature refer to the V11 release notes.

3.11.5 Customize

Toolbars can be customized and their viewing controlled through the *View|Toolbars* menu. A shortcut is also available by right-clicking on any toolbar. The operation of this facility is described below.

3.11.5.1 Toolbars Tab

The display of individual Toolbars may be toggled using the check boxes provided. At any time when the Toolbar "Customize" dialog is open buttons may be 'dragged' from one toolbar to another, dragging a button onto the main view area or any other area that is not a Toolbar will remove a button.

New Button:	IRRICAD contains a set of default Toolbars (Design, Dimension, Drawing, Electric, File, Hydraulic, Modify, Select, Snap, Tool, and Zoom). It is possible to add new blank Toolbar by clicking the [New] button.
Reset Button:	When one of the default IRRICAD toolbars is highlighted the reset button is available. Clicking this will repopulate the current Toolbar with its default buttons. If any buttons have been previously moved to other Toolbars then copies

	of these buttons will be retained in those Toolbars.
Delete Button:	User defined Toolbars (created with [New]) can be removed by selected the desired Toolbar and clicking the [Delete] button which will be available. Note that it is not possible to remove the default IRRICAD Toolbars although they can be depopulated or hidden.
Show ToolTips:	Controls whether tooltips are displayed when the mouse cursor is paused above a Toolbar button.
Cool Look:	This check box changes the appearance of the Toolbars to a 'flat' style.
Large Buttons:	This button will increase the size of the buttons on the screen.

3.11.5.2 Commands Tab

This tab contains the commands that can be represented by a button; they are grouped in a way that matches the default Toolbars. Clicking on a category shows the buttons that are available; these buttons can then be dragged onto any existing Toolbar (default or user defined). Note that the same command/button can exist in more than one Toolbar.

3.11.5.3 Winicad.ini and Irribase.ini

The current Toolbar configurations for IRRICAD and the Database Editor are stored in initialization files called Winicad.ini and Irribase.ini in the Irricad folder (normally C:\Program Files\AEI Software\Irricad Pro\config).

3.11.6 Language

Select *Tools|Language* to change the language as required and restart the Database Editor.

3.12 HELP MENU (DATABASE)

The Help menu contains the options:

- Contents
- About Irribase

3.12.1 CONTENTS

Help|Contents opens the database editor manual on-line help. It is the same as the printed manual.

The help file can be loaded as HTML Help or WinHelp. Internet Explorer is required for HTML Help. If it is not available, WinHelp will automatically open. Microsoft Office is required for WinHelp.

3.12.1.1 HTML HELP

This window can be resized as required. Click the maximize button (middle button at the top right of the dialog window) or move the cursor to any edge until the cursor becomes a two-headed arrow and drag the dialog to the required size. The right hand side of the dialog adjusts the text to fit the right hand window.

At the top of the help dialog are icons: Hide, Back, Print, and Options.

Hide / Show

If the left hand side of the help dialog, containing the contents, index and search option is visible; clicking Hide will hide the left hand side. If the left hand side is hidden, clicking Show will show the left hand side of the dialog.

Contents

If this tab is selected, the manuals content page is displayed. Each heading with a + sign can be opened to reveal its sub-headings. The sub-headings can be hidden by clicking on the - sign.

Clicking any heading will open that section of the manual. The text is displayed on the right hand side of the help window.

Index

Use the Index tab to select an indexed keyword. These words have been selected to aid in finding topics. Select a topic and click the Display button.

Search

Use Search to find a topic. Search lists all the places the word is found in the on-line help.

To use Search:

1. Enter the word required to find. Make the word as specific as possible e.g., enter X to find the meaning of this "Usage" code for assemblies.
2. Click the [List Topics] button.
3. Select a topic from those listed.
4. Click the [Display] button. The selected topic will be displayed on the right hand side.

Back

Back to the last topic accessed, whether the topic was selected by using Contents, Index or Search or used the yellow arrows at the end of each topic to navigate.

Click Back as many times as required - this function will move back through all the previous selections.

3.12.2 About Irribase

This option shows the version of the database editor.

To find the version of the database editor:

1. Select *Help|About DB Editor*.

The dialog shows the version number of the database editor and the year copyright was registered.

3.13 ADVANCED KNOWLEDGE

3.13.1 DEFAULT DATABASE ORDER

The databases have an in-built ordering system that determines the order items are displayed in the Database Editor and drop down list in IRRICAD. This is set out in Default Database Order, Section 6.5 to help understand the ordering of items in each component group. Items in each component group are ordered alphabetically or numerically in ascending order based upon each of the fields below in turn. For example, Controllers are ordered numerically by the [Order] field then alphabetically by [Description] and so on.

Note that the [order] field is an internal one that is not available in the IRRICAD Database Editor. It can, however, be accessed via Microsoft Access. By default, the order field for all items is the same and therefore has no effect. If the order field is required to have another number to change the ordering, this can be done in the column labeled Order Number.

To do this, follow the steps below:

1. Open the database in Microsoft Access (MS Access must be installed). This can be done by double-clicking on the .mdb file in Explorer.
2. Select Components and click [Open]
3. Scroll to the right-hand side. This last column is titled Order. All items have the same order number (10,000).
4. Find the item required to be at the top of the items in the component group. Give this item an order number less than 10,000 (e.g., 1, 2, 3 etc). The same re-numbering can be started for each of the component groups.
5. Close the database and exit MS Access.

The order of the fields can be changed in the registry of IRRICAD.

1. Select Start|Run and type Regedit. Open HKEY_CURRENT_USER and then Software. Open AEI Software and then IRRICAD. Open Database Settings and double-click on Sort Order.

2. On the right-hand side will be the component groups and their ordering. Double-click on the icon to the right of the component group and a dialog will appear and the fields can be re-ordered. Be careful to retain the square brackets and commas in the correct place when moving the fields.

For example Pipes are ordered by:

“[Order],[Major1],[Reals1],[Reals4],[Description]”

The order number is the same for all items unless the number has modified in MS Access. It is recommended that the [Order] is left in first place. However, if pipes are to be ordered on Description next, copy and cut the [Description] (Ctrl+X) and paste (Ctrl+V) after [Order] so now the value will read:

[Order],[Description],[Major1],[Reals1],[Reals4]

3. Click [OK] and close the Registry Editor.

3.13.2 GLOBALLY UPDATING PRICES IN THE DATABASE

Across the board price increases from particular supplies can be updated in one go in the Database Editor by using the *Query* options.

1. Open the database editor and the database to update
2. Go to Query tab.
3. From the drop-down box select Update Wholesale and Retail Prices of SUP1 Pipes, increasing by 6%.
4. Once the query has been selected, the formula will be displayed in the lower field. See Figure 3-27.
5. If required, change the details to suit. E.g: 1.06 = a 6% increase so change according to the percentage increase required; SUP1 can be changed to the required supplier code; the Database number for Pipes is 1 which can be changed to any required component group.

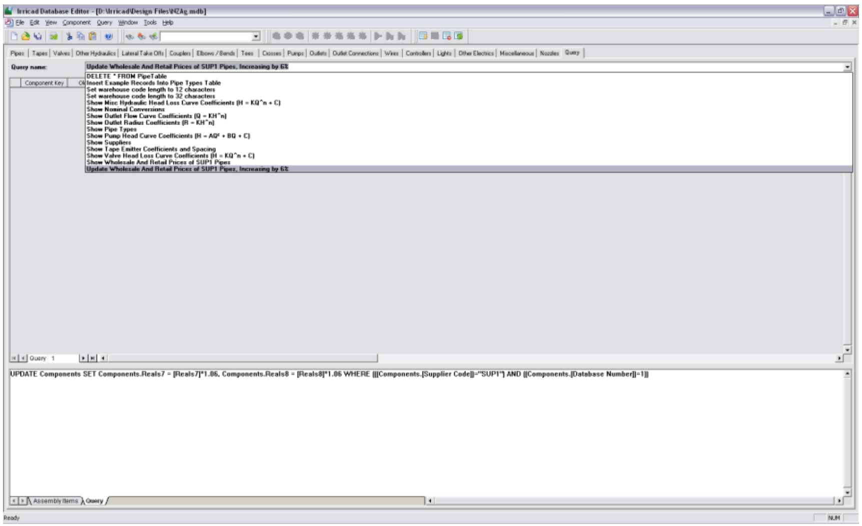


Figure 3-27

6. Once you are ready to run the query, select *Query|Execute Query*.
7. If you wish to save the edited query for use another time, in the "Query name" field (at the top of the screen) enter a new name and then select *Query|Save Query*.

3.13.2.1 FIELDS:

Major1	pipe type (pipes) or inlet / major connection type
Minor1	outlet / minor connection type
Reals1	nominal diameter, min submain diameter (LTOs), inlet / major diameter (valves, misc. hyd., couplers, tees, pumps, outlets), radius equation constant (nozzles), size/diameter 1 (misc. items)
Reals2	actual (internal) diameter, lateral diameter (LTOs), outlet / minor diameter (valves, misc. hyd., couplers, tees, pumps) bend angle (elbows & bends), radius equation index (nozzles), size/diameter 2 (misc. items)
Reals3	pipe roughness or constant (valves, misc. hyd,) minor diameter (elbow & bends), A factor (pumps), arc (nozzles)
Reals4	allowable pressure (pipes, tapes) or index (valves, misc. hyd,) B factor (pumps), constant (nozzles)

Reals5	intercept (valves, misc. Hyd,) C factor (pumps), index (nozzles)
Reals7	wholesale cost
Reals8	retail price
Rextra1	minimum flow m^3/h (valves, misc. hyd., pumps), default pressure (outlets), minimum pressure (nozzles)
Rextra2	maximum flow m^3/h (valves, misc. hyd., pumps), default watering arc (outlets), maximum pressure (nozzles)
Rextra3	flow tolerance above (outlets)
Rextra4	flow tolerance below (outlets)

4 Tutorials

The purpose of these tutorials is to have you enter a small, yet complete irrigation system, have it designed and costed, and the plans prepared. You will simply be asked to do things, explanation as to ‘why?’ will be limited - enough to show the process without getting involved in possible alternatives. The intention is to illustrate how IRRICAD works and to do this as simply as possible. Consequently, the system layouts used have been devised with this in mind and the siting of some componentry may not be ideal from an irrigation designer's viewpoint.

4.1 Introduction to Design Tutorials

The types of tutorials are listed:

There is no rigidly prescribed method of carrying out IRRICAD designs; you should use these examples as a guide only and try to develop a procedure which best suits your situation.

Only those options needed to produce these designs are described. References to the Help Topics are made where appropriate.

The exercises in this manual are set up to show specific features of IRRICAD, so please complete each section even if the type of design is not in your general line of work. Work through the exercises at your own pace and please feel confident with each exercise before moving on to the next one. These exercises can be completed at an IRRICAD training course or at your own computer in your office.

The database that is necessary for the tutorials is supplied with the program.

When directed to select a command from a menu, the menu name, menu option and sub menu option (if applicable) will be listed. For example, select *Settings|Digitizer|Scale*. This refers to selecting the Scale option from the Digitizer submenu that is found in the Settings menu. The Settings menu is found on the Menu bar at the top of the IRRICAD window. All button names will be displayed with square brackets such as [OK] etc and all dialog field names will be displayed with double quotation marks such as "Description". All entries you need to enter, select or are editable if automatically entered for you are in bold such as 'Enter the "Width" as **32** and the "Height" as **50**.'

4.1.1 Helpful Hints

Before you begin any designs on your own, please note the following:

4.1.1.1 Terminology

Designs in IRRICAD consist of Mainline Pipes (pipes connecting a water supply or water supplies to Zone Valves), Zone Pipes (pipes connecting Zone Valves to laterals or outlets, e.g., submains), and Spraylines/Tapes (equivalent to laterals).

Spray Block and *Tape Block* (options in the *Zone* menu) are options for laying out an area of equally spaced spraylines or tapes, nothing more. Use of Block does not define an irrigation block.

A Zone becomes defined when a Zone Control Valve is entered and Zone Pipes, Spraylines and / or Outlets are connected to it, i.e. it depends on what is connected downstream of the Zone Control Valve.

This means that Block may be used to layout all of the spraylines for a design at one time. The Spraylines may then be modified using *Tools|Cut Lasso* to remove areas that are not required, *Modify|Delete* to take out unwanted rows and so on. The Zones only become defined when these Spraylines are connected to Zone Control Valves.

A *Tape Irrigation Block* or *Spray Irrigation Block* does define an irrigation block. These are dealt with as a complete entity and can be subdivided using the *Tools|Sub-Divide Block* option.

4.1.1.2 On-Line Help

The on-line Help is available through the Help menu, select *Help Topics*. It contains all the topics and chapters available in the manual and is divided into five main divisions:

- The Overview contains information about using Help and comments and tips for new users.
- The User Manual describes how to approach a particular task, using IRRICAD tools and options.
- The Database Editor section describes the function of the database and how to enter hydraulic items into the database.
- Tutorials – this section.
- The Tool and Command Reference describes each menu item and describes how to mechanically use the tool.

In addition the *Help* menu also contains a *Release Notes* section which chronologically lists new features added and also details addenda to the manuals.

Use Search or Find to enter a key word and find the sections the key word appears in.

4.1.1.3 Mouse Operation

IRRICAD uses the mouse installed with Windows operating systems.

Clicking the left mouse button selects or places. Clicking the right mouse button will bring up additional menus of choices for aiding or finishing tasks when using tools.

In most circumstances do <u>not</u> hold down the left mouse button after placing the first click of a line, pipe, select window or similar. Simply left-click then move the mouse and left-click again.

4.1.2 THE FIRST STEPS

To start a design:

1. Select *Settings|Company* and enter your company details. To avoid having to re-enter your company information, in future designs, click the [Save As Defaults] button.

2. Set display properties for hydraulic items. Select *Settings|Irrigation - Design Specific* to customize pipe line widths. Again click the [Save As Defaults] button to retain these settings for all future designs Select *Settings|Irrigation Items* to customize the display properties for other hydraulic symbols. These are contained in the "Lines" and "Symbols" sections of this tab.

3. Select *Settings|Units* to select the units to use for each type of value.

4. If you know approximately what size your design will be, you can select a "Design Size" from *Settings|Miscellaneous*. This option makes the symbols, on the screen, an appropriate symbol size relative to the area the design covers. It can be altered at any time by selecting another "Design Size" or typing in a "Base Database Symbol Size". Note if the "Update Database Symbols" checkbox is checked, all hydraulic symbols, currently in the design, will be updated to the new size.

5. Design headings can be entered at any time. However, it is advantagous to specify these at the beginning to avoid any confusion if several copies of the base design are made. Select *Settings|Design Details*.

6. You are now ready to enter your design. Note that all Management and Design options are available from the *Design* menu and all Zooms are available from the *View* menu. Remember that if you cannot find a particular menu item or tool, the Find or Search functions in *Help|Help Topics* can be used to locate it.

Remember that you can enter items and information at any time and in any order. Make sure only *Mainline* items are used upstream from a control valve, and only *Zone* items are used downstream from a control valve.

7. Design the zones first (*Design|Zone Design|...*) to be able to use actual flows in the management process (step 8).

8. You must tell IRRICAD how the system is to operate before you can design the mainline. Select one of the management options from the Design menu: Assign Zones to System Flows (or one of the two partly automated options) or Zone Operating Times before designing the mainline (*Design|Mainline Design|...*).

Happy Designing!

4.1.3 IMPORTANT RULES TO REMEMBER

There are two main rules for IRRICAD. Neither can be broken, and if you remember them then designing with IRRICAD is made easier.

- You cannot connect zone items to mainline items. Only a control valve can join zone and mainline
- The order in which you draw items is flexible but Design is not. You must first tell IRRICAD how the system is to run (Management), then design the zones, analyze the valves and then design the mainline as listed below:

Process List for Designing with IRRICAD

1. Enter background information

2. Layout the irrigation system

3. Design / Analyse the Zone

4. Management – tell IRRICAD how the system is to run – what zones are operating when

5. Design / Analyse the Mainline

6. Reports

7. Finalise Design

8. Computer Selection of Fittings and Bill of Materials Report

9. Place a Plot Layout and then Print.

4.2 BASIC START

4.2.1 VERY BASIC DESIGN

Tasks covered in this tutorial:

- Entering Zone and mainline items
- Drawing a simple system
- Turning valves on
- Sizing pipes based on required pressures
- Reading reports

This design illustrates the very basic concepts entailed in an IRRICAD design . Understanding these concepts and principles will allow them to be applied to larger and more complex designs.

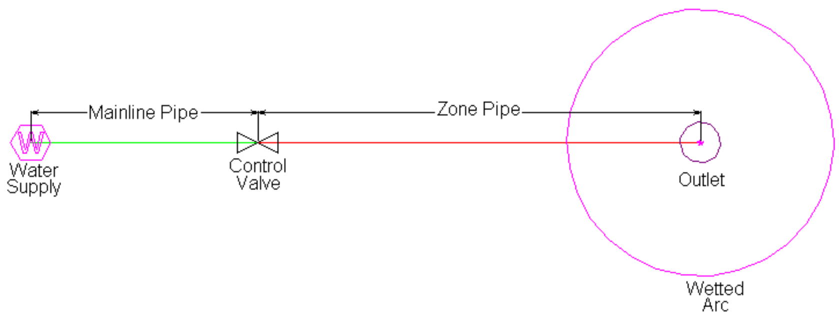


Figure 4-1

4.2.1.1 STARTING THE TUTORIAL

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD|IRRICAD Pro* to start IRRICAD. If IRRICAD is already running, select *File|New* to start a clean design.

2. Go to *Settings|Irrigation - Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open].

3. Go to the Units tab and click the [US] ([Metric]) button to restore the default units for this tutorial. These settings can be retained for each design by clicking the [Save As Default] button.

4. Select the Misc tab (*Settings|Miscellaneous*) and select the "Medium Design Size" (center of dialog). Click [OK].

4.2.1.2 DRAWING THE LAYOUT OF THE SYSTEM

5. Select *Mainline|Water Supply* and place a water supply on the screen, near the left-hand side. Leave the entries as **0**, so that IRRICAD will calculate the system duty for the system you draw. Click [OK] to accept and close the dialog.

6. Select *Mainline|Pipe*. Leave the pipe as **Computer Selected** so that IRRICAD will size the pipe for you. Click [OK] and click in the center of the water supply to place the start point of the pipe (left-click on the screen). The pipe will rubberband with the cursor until you place the end point or next point of a pipe (if the pipe is bent). The pipe tool is like a continuous line tool and will rubberband between points until you end the pipe by *Right-click*ing and selecting Restart (*Right-click|Restart*).

7. Between mainline and zone items there always needs to be a control valve. Items upstream from the control valves are always designated as *Mainline* whilst items downstream of a control valve are always designated as *Zone* items. You can select a control valve from both the Mainline and the Zone menu (*Mainline|Control Valve* or *Zone|Control Valve*). Select the **¾" (20mm) Electric Valve**, Click [OK] and place it on the black junction (square) at the end of your mainline pipe. Once placed, IRRICAD will assign a default name of **Zone no. 1** to this control valve. This is because valves need to be identified so they can be reffered to later in the design process. Click [OK], the black junction will disappear when the control valve connects to the pipe.

8. Now select *Zone|Pipe*. Leave the pipe as **Computer Selected**, Click [OK] and place the start point on the control valve. Click to place the end point of the zone pipe. When you have completed your zone pipe, *Right-click|Restart*.

9. Select *Zone|Outlet*. Select the **Big Impact Drive Sprinkler**. In the "Nozzle" field you can select the nozzles associated with this sprinkler. Select the **4.9mm** nozzle. Leave the "Pressure" and "Flow" as the default values. Click [OK] and place the outlet on the end of the zone pipe in the center of the black junction. The black junction will disappear when the outlet connects to it.

We have drawn the layout of the system (see Figure 4-1), selected valves and sprinklers and allowed IRRICAD to select pipe sizes and calculate the required system duty.

4.2.1.3 CHECKING CONNECTIONS

10. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. (These can be removed by selecting *Design|Clear Connectivity Marks*.)

11. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is an indication that the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is set to "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

4.2.1.4 ZONE DESIGN

12. Now we can size the pipes for the zone. You will see that the Zone Design menu has four options. *Analyze* is used when you

have selected the pipe sizes or after you have made further changes to the design. *LP Design* is used when you wish to size zone pipes based on the pressure required at the outlets. *Velocity Design* is used when you wish to size pipes based on a maximum velocity or when the pipe system is looped. *Detailed Analysis* is normally used at the completion of design and iteratively adjusts the flow at each sprinkler based on the calculated pressures giving a more accurate analysis than that based on nominal flows. Select *Design|Zone Design|LP Design*. You should now see the pipe change colour. The colours assigned to various pipes are stored in the database.

IRRICAD also checks that the flow through the valve is within the manufacturers' specification and calculates the valve headloss.

4.2.1.5 ENTERING MANAGEMENT REQUIREMENTS

13. IRRICAD needs to know how the system will be operated, we call this Management and there are several ways to accomplish this task. Management gives us the ability to specify when control valves are on and off. In our simple example there is only one valve so the simplest method is to select *Design|Assign All Zones to One System Flow*. This option automatically assigns "Zone no. 1" to operate on **System Flow 1**. Click [OK].

4.2.1.6 MAINLINE DESIGN

14. We can now size the mainline. You will notice that the four options here are the same as were available in the *Zone Design* submenu. The only differences are that *LP Design* will size pipes based on the pressure required at the control valve and that *Velocity Design* must be used if the system has more than one water supply connected. Select *Design|Mainline Design|LP Design*. You should see the pipe change colour. Again the colour for pipes is stored in the database.

4.2.1.7 REPORTING

15. Select *Reports|Zone Design Reports|Zone Design Summary*. This report summarizes what is happening in the zone – from the outlets to the control valve as seen in Figure 4-2.

Zone Name :	Zone no. 1		**Valve Description :**	3/4" (20mm) Electric Valve		
Zone Head (D/S) :	54.77	**(psi)**	**Zone Head (U/S) :**	56.89	**(psi)**	
Total Zone Flow :	7.46	**US gpm**	**Valve Headloss :**	2.12	**(psi)**	

	Allowable Flow	**Actual Flow**	**Allowable Pressure**	**Actual Pressure**
	US gph	US gph	(psi)	(psi)
Minimum Outlet	425.17	427.08	44.77	45.19
Maximum Outlet	469.93	427.08	55.07	45.19
Outlet Variation (%)	9.52	0.00	18.70	0.00
Oulet Locations (X,Y)	Minimum :	123.0 , 50.5	Maximum :	123.0 , 50.5

Figure 4-2

16. Possibly the most useful reports are the Full and Pipe reports. The Full report will tell you the length of a pipe, its head difference and its velocity (as seen in Figure 4-3) whereas the Pipe report will tell you the pressure in the pipe and elevation of the start and end point. Both reports will tell you the pipe size and flow.

Zone Name :	Zone no. 1		**Valve Description :**	3/4" (20mm) Electric Valve		
Zone Flow :	7.46	US gpm				
Zone Head (D/S) :	54.77	**(U/S) :**	56.89	**Valve Headloss:**	2.12	(psi)

Pipes

From X (ft)	Y (ft)	**To** X (ft)	Y (ft)	**Size**	**Code**	**Flow1**	**Flow2** US gpm	**Max. Vel** (ft/s)	**Length** (ft)	**Headloss** (psi)
73.9	165.7	403.4	165.7	0.75	PV2	7.5	7.5	3.5	329.5	9.58

Outlets and Inflows

Location (x,y,z) (ft)				**Out Loss** (psi)	**Flow** US gph	**Pressure** (psi)	**Min Pressure** (psi)	**Max Pressure** (psi)
403.4	165.7	0.0	Outlet	0.0	427.1	45.2	44.8	55.1
73.9	165.7	0.0	C.valve	0.0	-447.6	54.8	0.0	0.0

Figure 4-3

17. Now open the *Reports|Mainline Design Reports|System Duty Report*. Here we see the system duty required to run the system you have designed (Figure 4-4).

Water Supply : Supply no. 1

Duty Number	**On time**	**Off time**	**Pressure** (psi)	**Flow** US gpm
1	1: 0: 0	1 : 1 : 0	58.32	7.46

Figure 4-4

4.2.2 A Simple Turf Design

Tasks covered in this tutorial:

- Entering Zone and mainline items
- Drawing simple background information
- Setting pipe line widths
- Drawing a simple turf system
- Setting required outlet pressures
- Selecting outlet connectors (risers)
- Resizing database symbols to suit design size
- Using the Change tool
- Orientating arcs manually
- Turning valves on
- Sizing pipes based on pressure
- Reading reports

This tutorial shows a simple method for laying out several sprinklers and connecting them to the water supply. It is for demonstration purposes only and hence is of a relatively small size.

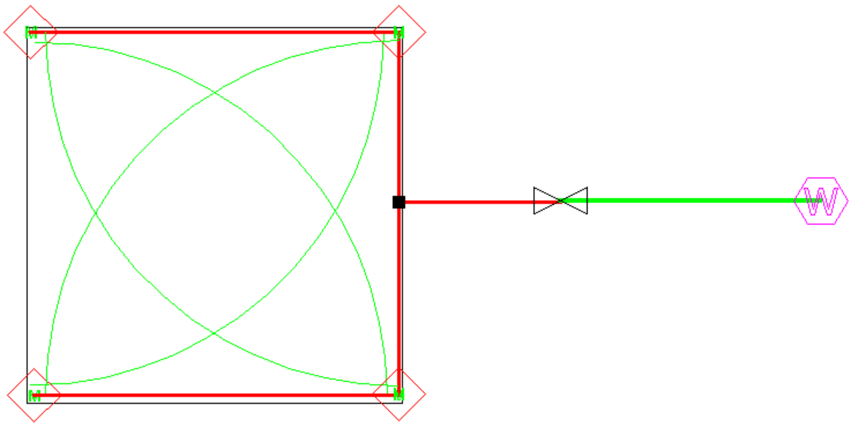


Figure 4-5

4.2.2.1 Getting Started

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD|IRRICAD Pro* to start IRRICAD. If IRRICAD is already running select *File|New* to start a clean design.

2. In *Settings|Irrigation – Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open]. Change the "Zone Pipes Line Width" to **2** and the "Mainline Pipe Line Width" to **3**.

3. Go to the Units tab and click the [US] ([Metric]) button to restore the default units for this tutorial. Note - Metric measurements are displayed in brackets. These settings can be retained for each design by clicking the [Save As Default] button.

4. In the previous tutorial we did not draw in any background information. This is not usual, since in most cases you need to have the area, fence lines etc laid out before you can draw in the hydraulic system. We will enter some basic background information in this design. Select *Draw|Rectangle|2 Point* and place the first point on the screen by left-clicking. Move the cursor and click again to place the opposite corner of the rectangle (the second point). Select *Modify|Change* and click on the boundary of the rectangle. In the dialog change the "Width" and "Height" to **11.5ft** (**3.5m**) as in Figure 4-6. Click [OK].

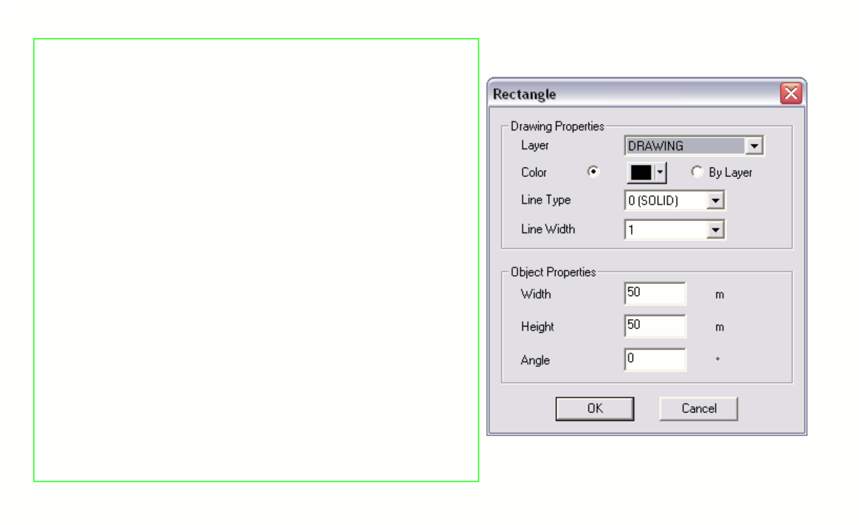


Figure 4-6

5. Select *View|Zoom All* then *View|Zoom Out*.

4.2.2.2 LAYING OUT THE SYSTEM

6. Select *Mainline|Water Supply* and place the water supply to the far right of the square, some distance away (left-click to place). In the dialog leave all the fields as **0**. Click [OK].

7. Select *Settings|Miscellaneous* and type in **1.6** (**0.5**) for the "Base Database Symbol Size", make sure that "Update Database Symbols" is checked. Click [OK]. The hydraulic symbols on the screen will now appear smaller.

8. Select *Zone|Outlet*. In the dialog select the **Garden Spray Sprinkler** by clicking on the down arrow and highlighting the required item. The "Nozzle" field will show the **10 garden** Nozzle. Change the "Pressure" to **28psi** (**20m**) and the arc to **90º**. In the "Riser" field select the **½" x ½" Flexible Swing Joint** (the riser determines how the sprinkler is connected to the pipe). Click [OK].

9. Place an outlet at each corner of the square by left-clicking. You will notice that the arcs are not oriented to water inside the square. We will manually fix this by selecting *Modify|Change* and clicking on a wetted arc. In the dialog change the "Start Angle" to be **0**, **90**, **180** or **270** as required (bottom left = 0, top left = 270, top right = 180 and bottom right = 90) as in Figure 4-7. Click [OK].

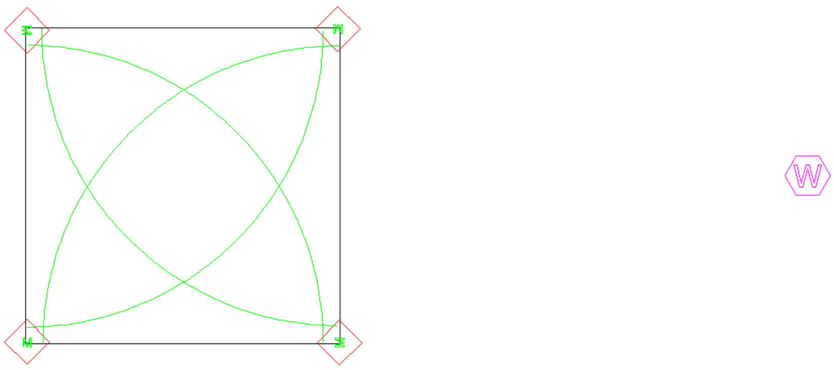


Figure 4-7

10. Repeat for each arc.

11. Connect the outlets by selecting the *Zone|Pipe* tool (**Computer Selected** pipe) and clicking on each item to connect to the pipe. Start at the top left outlet then the top right, then the bottom right and last the bottom left. *Right-click|Restart*. *Right-click|Snaps|Midpoint* and click on the pipe joining the top right sprinkler and the bottom right sprinkler. Draw this pipe out a little to the right about half way towards the water supply. Left-click to place the end point of this pipe then *Right-click|Restart.*

12. Select *Zone|Control Valve* and select the **1" (25mm) Electric Valve**. Place the valve on the zone pipe end. Select *Mainline|Pipe* and left-click on the valve, then left-click on the water supply. *Right-click|Restart*. See Figure 4-8.

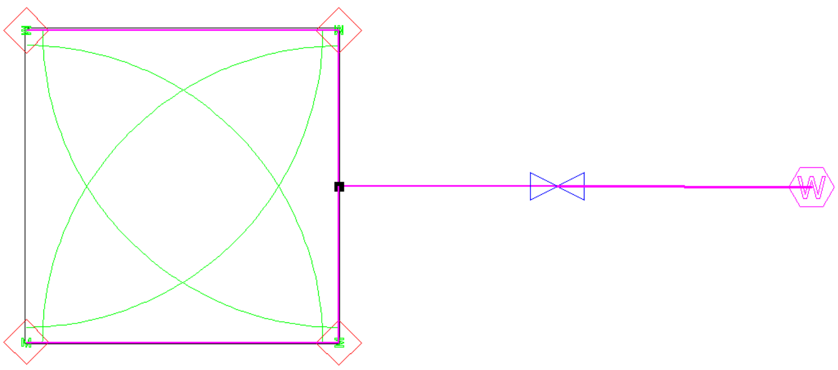


Figure 4-8

4.2.2.3 Checking Connections

13. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks.*

14. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

4.2.2.4 Zone Design

15. Now we can design the zone. Select *Design|Zone Design|LP Design*. You should see the pipe change colour. The colour for pipes is stored in the database. Note that if the pipe selected has the same colour as the computer selected pipe you will not see a colour change.

4.2.2.5 Entering Management Requirements

16. Once again IRRICAD needs to know how the system will be operated. We call this Management and there are several ways to accomplish this task. Management gives us the ability to specify when control valves are on and off. In our simple example there is only one valve so the simplest method is to select *Design|Assign All Zones to One System Flow*. This option is automatic, IRRICAD assigns "Zone no. 1" to operate on **System Flow 1**. Click [OK].

4.2.2.6 Mainline Design

17. We can now design the mainline. Select *Design|Mainline Design|LP Design*. You should see the pipe change colour. Again the colour for pipes is stored in the database.

4.2.2.7 Reporting

18. Select *Reports|Zone Design Reports|Zone Design Summary*. This report summarizes what is happening in the zone – from the outlets to the control valve as seen in Figure 4-9.

Zone Name :	Zone no. 1		**Valve Description :**	1" (25mm) Electric Valve	
Zone Head (D/S) :	27.80	**(psi)**	**Zone Head (U/S) :**	28.53	**(psi)**
Total Zone Flow :	1.83	**US gpm**	**Valve Headloss :**	0.72	**(psi)**

	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure
	US gph	US gph	(psi)	(psi)
Minimum Outlet	26.09	26.30	26.64	26.92
Maximum Outlet	28.83	26.30	30.27	26.92
Outlet Variation (%)	9.52	0.01	11.99	0.01

Oulet Locations (X,Y)	Minimum :	4.0 , 53.6	Maximum :	7.4 , 50.1

Figure 4-9

19. The total zone flow is reported. The minimum and maximum allowable outlet pressures are calculated based on the pressure entered in the Outlet dialog and the flow tolerance specified for the Garden Spray Sprinkler in the database. This tolerance allows a pressure variation of 12.8%. The actual outlet pressure variation in this system is 0%. IRRICAD calculates the required downstream valve pressure and the resulting minimum and maximum outlet pressures in the zone.

4.2.3 Methods to Lay Out Sprinklers

These tutorials illustrate the different methods available to lay out sprinklers. There are three main methods:-

- Placing sprinklers individually (as shown in the previous tutorial Section 4.2.2)
- Placing sprinklers at a fixed or even spacing along a pipe length – see Section 4.2.3.2 and Section 4.2.3.3
- Automatically placing sprinklers in irregular areas Section 4.2.3.4

Before we look at these different methods it is useful to note that you do not need to orientate the arcs, of part circle sprinklers, manually. The previous tutorial detailed the manual method since there were few sprinklers and the required orientation was easy to determine. The *Area* tool (short for Irrigation Area) is used to automatically orientate arcs.

This tool will be explained when we look at the different ways to layout sprinklers.

4.2.3.1 Getting Started

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD|IRRICAD Pro* to start IRRICAD. If IRRICAD is already running select *File|New* to start with a clean design.

2. In *Settings|Irrigation – Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open]. Change the "Zone Pipes Line Width" to **2** and the "Mainline Pipe Line Width" to **3**.

3. Go to the Units tab and click the [US] ([Metric]) button to restore the default units for this tutorial. Note that Metric measurements are displayed in brackets. These settings can be retained for each design by clicking the [Save As Default] button.

4.2.3.2 Placing Sprinklers at a Fixed Spacing – 1st Method of Placing Sprinklers at a Fixed Spacing

Tasks covered in this tutorial:

- Drawing simple background information
- Orientating arcs automatically
- Adding pipe and fixed spaced sprinklers in one action
- Snapping to a point

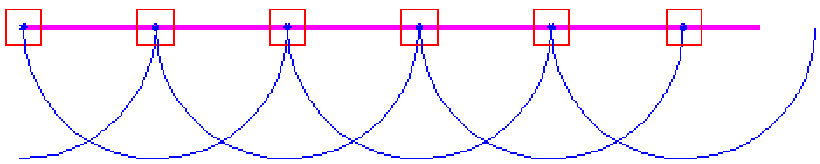


Figure 4-10

1. This method allows pipe and sprinklers, at a fixed spacing, to be placed in one action.

2. Draw a rectangle **82 x 49ft** (**25 x 15m**) on the screen using *Draw|Rectangle|2 Point*. You can draw out the rectangle any size and then select *Modify|Change* and click on the border of

the rectangle. Change the "Width" to be **82ft** (**25m**) and "Height" to be **49ft** (**15m**).

3. Select *Mainline|Water Supply* and place the water supply to the right of the rectangle. Leave all fields set to **0**. Click [OK]. Select *View|Zoom All*.

4. Select *Zone|Area* and draw a lasso around the outside of the rectangle by clicking at each point that you wish to change direction. To close the boundary *Right-click|Close*. In the dialog make sure the "Set Arc Orientation Using Area" check box is checked. See Figure 4-11.

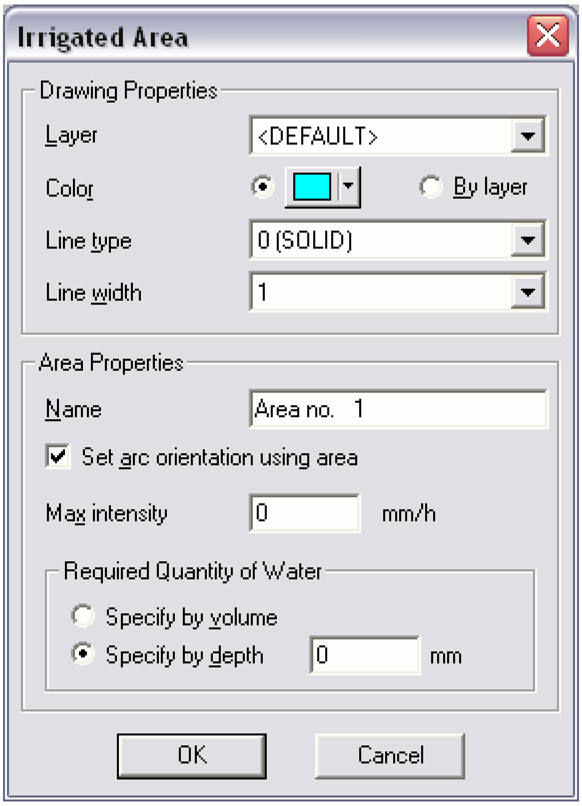


Figure 4-11

5. Select *Zone|Sprayline* and leave the pipe as **Computer Selected**. Select the **Low Flow Garden Sprinkler** as the sprinkler. This sprinkler has only one nozzle (**Low Flow Nozzle**)

which will automatically appear in the "Nozzle" field. Leave the "Pressure" as the default pressure of **29.869psi** (**21m**). Leave the "Riser" field as **No Component Selected** and enter **14.5ft** (**4.5m**) as the "Outlet Spacing" (for head-to-head spacing). Uncheck the "Connected" check box, as we want these items to be treated as separate outlets and pipes. Click [OK].

6. *Right-click|Snaps|Endpoint* and click on the top left corner of the rectangle. *Right-click|Snaps|Endpoint* again and click on the top right corner of the rectangle. *Right-click|Restart*. A line of pipe has been drawn with the sprinklers at fixed spacing.

7. Starting from the left-hand side, draw another line so that the pipe will touch the extents of the wetted radii from the previous line of outlets as in Figure 4-12.

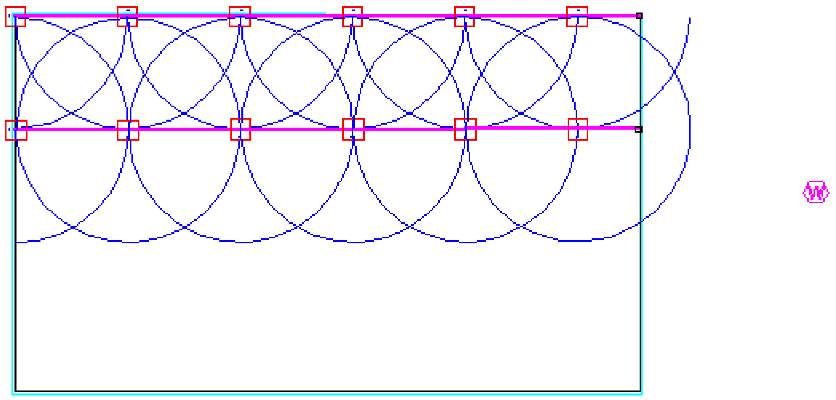


Figure 4-12

4.2.3.3 Even Spacing Along a Pipe Length – 2nd Method of Placing Sprinklers at a Fixed Spacing

Tasks covered in this tutorial:

- Drawing simple background information
- Orientating arcs automatically
- Adding pipe and evenly spaced sprinklers in one action
- Snapping to a point

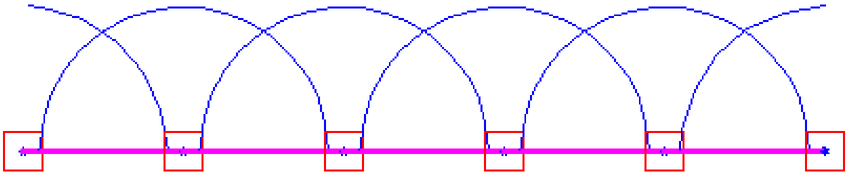


Figure 4-13

This method is similar to the one above but uses the length of the sprayline drawn (i.e. the length of pipe) and places sprinklers at the start and end of the line. Sprinklers, at approximately the spacing you have specified, are then placed evenly between the start and the end.

1. Do the above tutorial (Placing Sprinklers at a Fixed Spacing – 1st Method of Placing Sprinklers at a Fixed Spacing). Now select *Zone|Sprayline*. This tool should remember the sprinkler, nozzle, pressure and outlet spacing from before. Click the [Options] button and uncheck the "Fixed Spacing" check box. Click [OK] on both dialogs.

2. *Right-click|Snaps|Endpoint* and click on the bottom left corner of the rectangle. *Right-click|Snaps|Endpoint* again and click on the bottom right corner of the rectangle. *Right-click|Restart*. A line of pipe has been drawn with the sprinklers at fixed spacing.

3. Starting from the left-hand side, draw another line so that the pipe will touch the extents of the wetted radii from the previous line of outlets as in Figure 4-14.

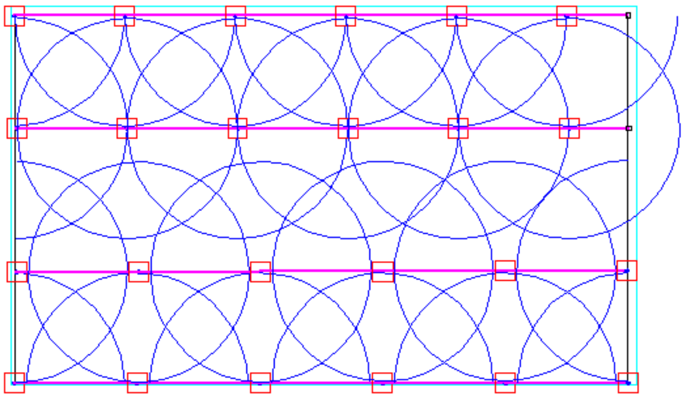


Figure 4-14

4. IRRICAD determines that the sprinklers should only water within the *Area* lasso, which is just outside the rectangle boundary. The appropriate arc will be selected in most cases, depending on placement of the sprinkler. Any arcs outside the Area can be altered by using *Modify|Change.* Click on the wetted radii and adjust the "Include Angle" as described in the above tutorial (A Simple Turf Design).

5. Connect the spraylines together with zone pipe on the right-hand end of the laterals using *Zone|Cut Pipe*. This pipe tool will connect to any zone item it crosses so that you do not have to click on pipe you want to connect to. Simply start the pipe at the top junction and finish the pipe after clicking on the bottom junction.

6. Select a **1" (25mm) valve** and connect the valve to the zone pipe end. Select *Mainline|Pipe* and connect the valve to the water supply to complete the system. See Figure 4-15. Follow the same design procedure as in the previous tutorials.

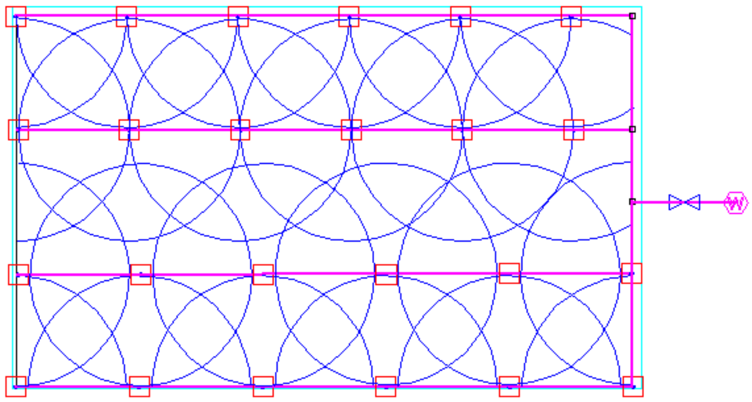


Figure 4-15

The sprayline tool can be used to place sprinklers evenly and the pipes subsequently deleted when the pipes need to be connected in a different way. This tool can also be used without the *Area* tool, without having the arcs or wetted radii showing, without using *Snaps* and can be used in any application where even spacing or fixed spacing of outlets is required. It can be used in conjunction with "Grid", "Snap to Grid" or "Circular Cursor" as placement aids. See Figure 4-16 for the difference of having “Fixed Spacing” on and “Fixed Spacing” off on the same length of pipe.

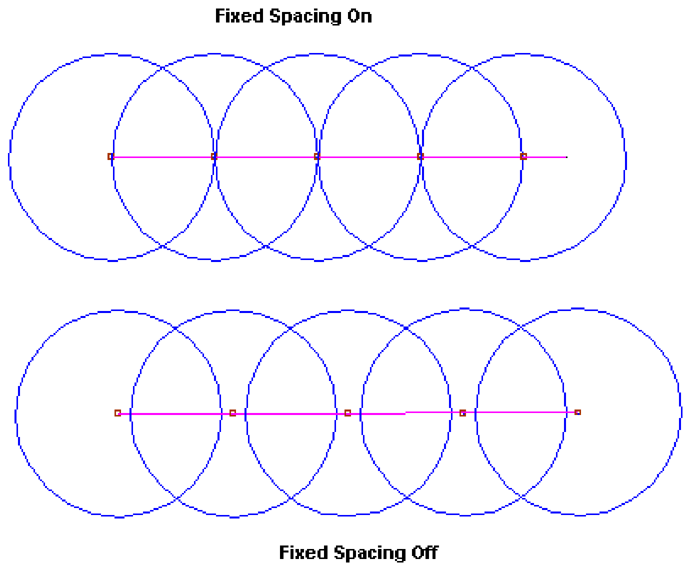


Figure 4-16

4.2.3.4 Automatically Placing Sprinklers in Irregular Areas

Tasks covered in this tutorial:

- Drawing simple background information
- Orientating arcs automatically
- Automatically determining spacing and arcs in an area
- Moving an item
- Connecting pipe to more than one item quickly

The third method used for placing sprinklers is a tool called *Autohead*. Note that *Autohead* is normally used for small irregular areas.

Autohead attempts to maintain a uniform precipitation over the area. Because of this best results are achieved when matched precipitation sprinklers or fixed sprinklers with a combination of nozzles for the different arcs that are used. *Zone|Area* is used alongside *Autohead* to orientate the wetted arcs.

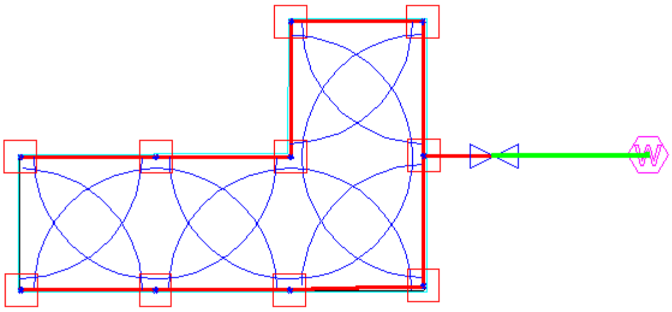


Figure 4-17

1. Select *Draw|Polygon|Irregular*. Place the first point in the lower left of the screen. Hold the <Control> key down and move the cursor upwards. Let go of the mouse and type **16** (**5**) on the keyboard and press <Enter>. Now hold the <Control> key down again and move the cursor to right to achieve a straight horizontal line. Let go of the mouse and type **33** (**10**) and press <Enter> on the keyboard. Using this method continue to draw another line upwards for **16ft** (**5m**), to the right for **16ft** (**5m**), down for **33ft** (**10m**). Now select *Right-click|Done* to finish the polygon. Select *View|Zoom All*.

2. Select *Zone|Area* and draw a lasso around the outside of the rectangle by clicking at each point you wish to change direction. To close the boundary *Right-click|Close*. In the dialog make sure that "Set Arc Orientation Using Area" is checked. It should look something like Figure 4-18. *Select View|Zoom Out.*

3. Select *Mainline|Water Supply* and place the water supply to the right of the polygon. Leave all fields in the dialog as **0**. Click [OK].

4. Select *Zone|Autohead* and select the Sprinkler as the **Low Flow Garden Sprinkler**. This sprinkler has only one nozzle (**Low Flow Nozzle**) which will automatically appear in the "Nozzle" field. Leave the "Pressure" as the default pressure of **29.869psi** (**21m**). Leave the "Riser" field as **No Component Selected**. Click [OK].

5. Draw the Autohead lasso around the inside border of the polygon. To close the lasso *Right-click|Close*. Once the polygon

has been closed it will be filled with sprinklers. See Figure 4-19. (*Note*: if the *Area* lasso is on the polygon boundary and so is the *Autohead* lasso, you may find that some arcs do not orientate inside the area. Simply move the sprinkler by selecting *Modify|Select Object* and then *Modify|Move* and move the sprinkler slightly inside the boundary and left-click to place. This method can also be used for moving any sprinkler to a more appropriate place.)

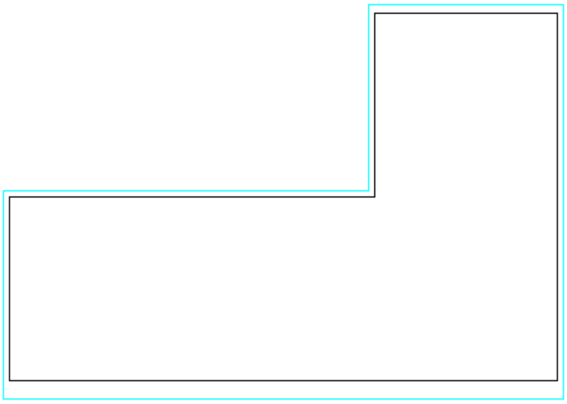


Figure 4-18

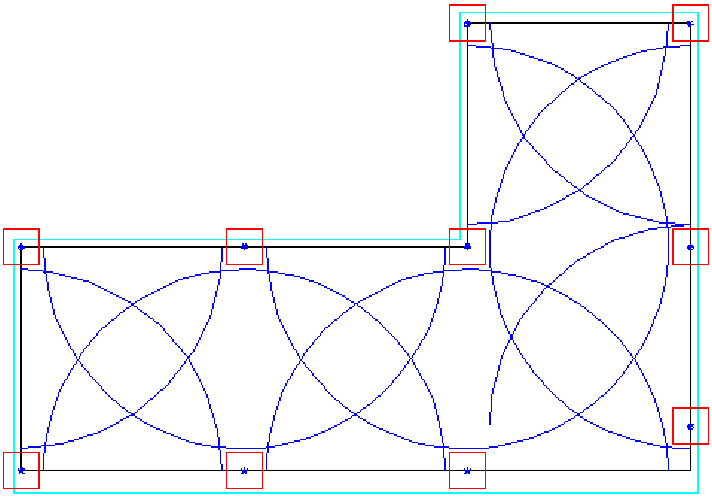


Figure 4-19

6. Select *Modify|Move* and click on the bottom right sprinkler. To move the sprinkler click to place it in its new position in the bottom right corner.

7. Select *Zone|Cut Pipe*. This tool is similar to *Zone|Pipe* and is a tool to put in a straight pipe with quick connections to each zone item the pipe crosses without having to click on each item to connect to it. Click on the top far left sprinkler. Now click on the sprinkler where the area goes upward. Click on the top left sprinkler then the top right sprinkler. Now click on the bottom right sprinkler and then the far-left sprinkler. *Right-click|Restart*. Your design should look like Figure 4-20.

8. Follow the same design procedure as in the previous tutorials.

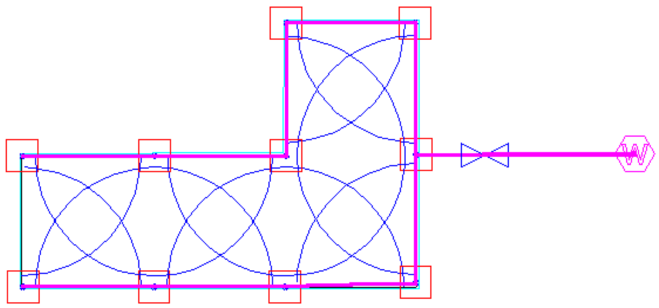


Figure 4-20

4.2.4 Applying a Specific Amount of Water to an Area

Tasks covered in this tutorial:

- Changing an item
- Using Irrigation Areas
- Determining run times
- Determining water application

In many cases a specific amount of water is required. This may differ depending on the type of plants or soil, and whether the location is lawn, garden, shady or sunny.

Previously we have used the Irrigation Area tool (*Zone|Area*) to simply orientate wetted radii within a boundary. This same tool allows us to specify the amount of water we wish to apply and subsequently calculate the run time. The Area tool has two purposes that are unrelated. You do not need to have arcs to use the Area tool for water requirements.

An *Area* lasso can be drawn around an entire section which has the same water requirements even if there are different sprinklers or several zones (control valves) in this section.

If you have not completed the above tutorial (Automatically Placing Sprinklers in Irregular Areas) do so now. If you have, open the saved design.

1. Double-click on the Area lasso (double-clicking does the same as *Modify|Change*). The *Area* dialog will appear. See Figure 4-21.

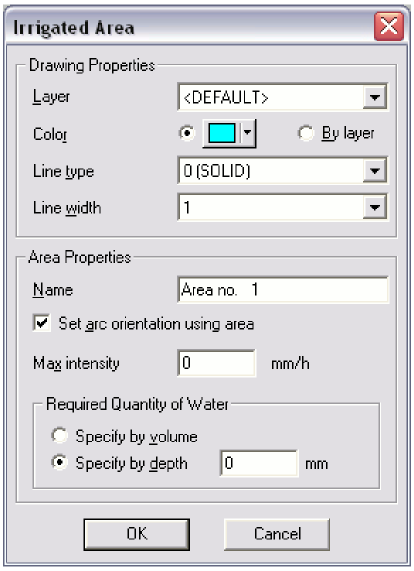


Figure 4-21

4.2.4.1 The Area Dialog

2. The maximum intensity can be specified in in/hr (mm/hr). This is the maximum amount of water per hour that can be applied to

that area or soil type. Enter **0.2** (**5**) as the "Maximum Allowable Intensity".

3. The required quantity of water to be applied can be expressed by volume (US gallons or litres) or depth (inches or mm). Select "Depth" and enter **0.08in** (**2mm**). See Figure 4-21. Click [OK].

4.2.4.2 Calculating Zone Run Times

4. When Areas are used you can still use the default running time of 1 hour in *Design|Assign Zones to System Flows* options (Management).

5. After management has been completed the Zone Flows report (*Reports|Management Reports|Zone Flow Report*) will specify the time we need to run the zone in order to achieve the required depth or volume entered in the Area dialog. This report has 26 minutes as the required running time. The *Zone Flow Report* will report the run time and the applied precipitation to the area per zone. The *Water Requirements* report will list the applied volumes and depths based on the <u>current</u> run time (which is 1 hour). See Figure 4-22 (*Zone Flow Report*) and Figure 4-23(*Water Requirements* Report).

Cycle Time is 1 day Times are per cycle

Zone Name	Number of Outlets	Flow US gpm	Operating Time dd:hh:mm	Precipitation Rate (in/h)	Max. Precipitation Rate (in/h)
Zone no. 1	10	2.018	0: 0: 26	0.18	0.20

Figure 4-22

Zone/Area Name	Flow US gpm	Area acres	Depth Applied (")	Depth Required (")	Vol. Applied US gal	Vol. Required US gal
Zone no. 1	2.018	0.02	0.1804	0.08	121.06	52.83
Area no. 1	2.018	0.02	0.1804	0.08	121.06	52.83

Figure 4-23

You can set the run time in *Assign Zones to System Flows* to be that which is reported in the *Zone Flow Report* (26 minutes). Open the *Water Requirements* report with the updated run time of 26 minutes.

6. Complete Mainline Design.

4.3 DESIGN TUTORIALS

4.3.1 SIMPLE DRIP TAPE DESIGN

Tasks covered in this tutorial:

- Drawing a block of tapes
- Changing symbol size on the screen
- Connecting to multiple zone items quickly
- Snapping to the midpoint of an object

This tutorial shows the steps required for drawing and designing a drip tape irrigation scheme. Read the notes below and then proceed with the exercise. This exercise designs a drip tape block with no pressure regulation within the block.

4.3.1.1 TAPES - AN OVERVIEW

A drip tape is a thin walled pipe tube with emitters built into the wall of the pipe. Tapes are treated differently in IRRICAD because their hydraulic characteristics are different to a standard pipe with a sprinkler or dripper attached. Reasons for this are primarily because of the low operating pressures and the extent of flow variations down a tape run with varying lengths and input pressures. Some hard wall tubing products are also treated as tapes because of these reasons.

4.3.1.2 STARTING THE TUTORIAL

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD|IRRICAD Pro* to start IRRICAD. If IRRICAD is already running select *File|New* to start with a clean design.

2. In *Settings|Irrigation – Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open]. Change the "Zone Pipes Line Width" to **2** and the "Mainline Pipe Line Width" to **3**.

3. Go to the Units tab and click the [US] ([Metric]) button to restore the default units for this tutorial. Note Metric measurements are

displayed in brackets. These settings can be retained for each design by clicking the [Save As Default] button.

4. Select the Misc tab and click the “Medium Design Size”. Change the “Base Database Symbol Size” to **10ft** (**3m**). This determines the size of the symbols according to the size of the design. When you are finished click [OK].

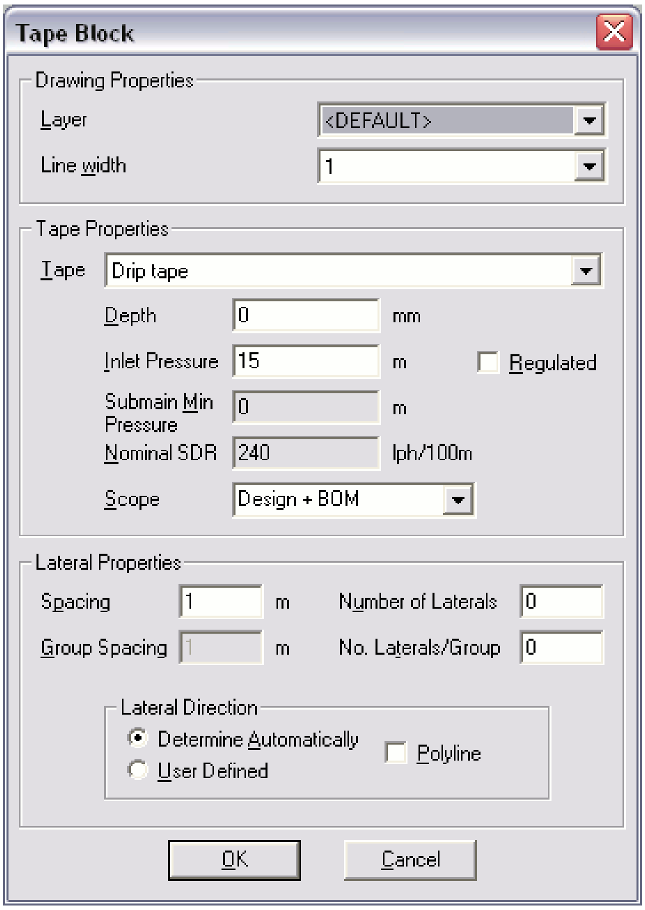


Figure 4-24

5. Select *Zone|Tape Block* and select the **Drip tape** from the dropdown list of tapes. Leave the depth as **0**, as the tapes will be at ground level. Leave the default “Inlet Pressure” as **12psi** (**8.5m**) and make sure that “Regulated” is unchecked. Checking

this option would mean that you have PRVs at the start of each tape, which we do not have in this case. Type in **6ft** (**2m**) for the "Lateral Spacing" and leave the "Number of Laterals" as **0**. Make sure the "Determine Automatically" option for the "Lateral Direction" is selected as in Figure 4-24. Click [OK].

6. Now move the cursor to the bottom left of the screen and draw the outline of the block: left-click then draw a line upwards for **165ft** (**50m**) as seen on the status bar d=**165** (**50**) (approx.). Left-click the mouse to place the line at this point, and then continue drawing the block area by going **200ft** (**60m**) to the right and left-click. Now proceed downwards for **165ft** (**50m**) left-click then *Right-click|Close* after the third point has been placed. This will close the lasso, and complete the tape block. The block will automatically fill with tapes **6ft** (**2m**) apart. Select *View|Zoom All*. The block should look similar to Figure 4-25.

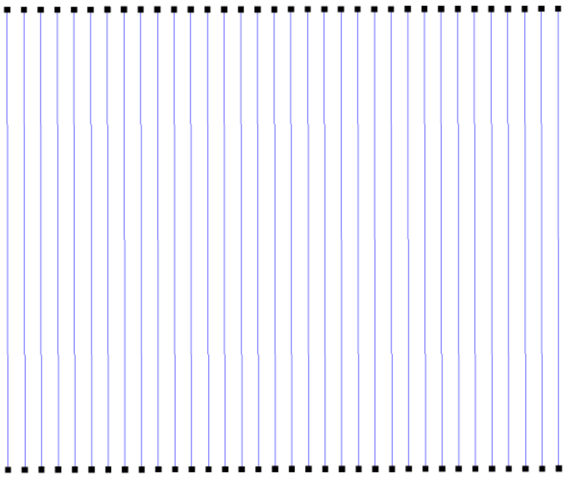


Figure 4-25

7. Now select *Settings|Snap* and then click the [Running Snaps] button. Check the "RN Snaps On" option and check the "Show Preview" option. Click the [Enable All Snaps] button. Now click [OK] and [OK] on the *Settings|Snap* dialog to close it.

8. Now select *Zone|Cut Pipe*. We wish to place a submain through the middle of the block. In the *Cut Pipe* dialog leave the "Layer" as **[DEFAULT]**. Make sure the pipe selected is **Computer Selected**. Leave the "Depth" as **0**, and click [OK].

9. Click near the middle of the left outer lateral (the preview of the Running Snaps should show you when you are in the middle). Now click near the middle of the right outer lateral. IRRICAD will draw in the submain and connect to each lateral it crosses. Continue the pipe for approximately **13ft** (**4m**) past the last lateral. *Right-click|Restart* to finish the pipe.

10. Select *Zone|Control Valve*. From the dropdown list select the **1" (25mm) Electric Valve**, leaving the "Depth" as **0**, and place this on the end of the submain on the right side of the screen. Accept the default zone name.

11. Now select *Mainline|Pipe*. Leave the pipe as **Computer Selected** at **0** "Depth". Click [OK]. Connect the mainline pipe to the control valve with a left-click and draw upward for approximately **33ft** (**10m**). Left-click to place the end then *Right-click|Restart*.

12. Select *Mainline|Water Supply* and place on the end of the mainline pipe with a left-click as in Figure 4-26. Leave the Water supply details as the default; simply click [OK].

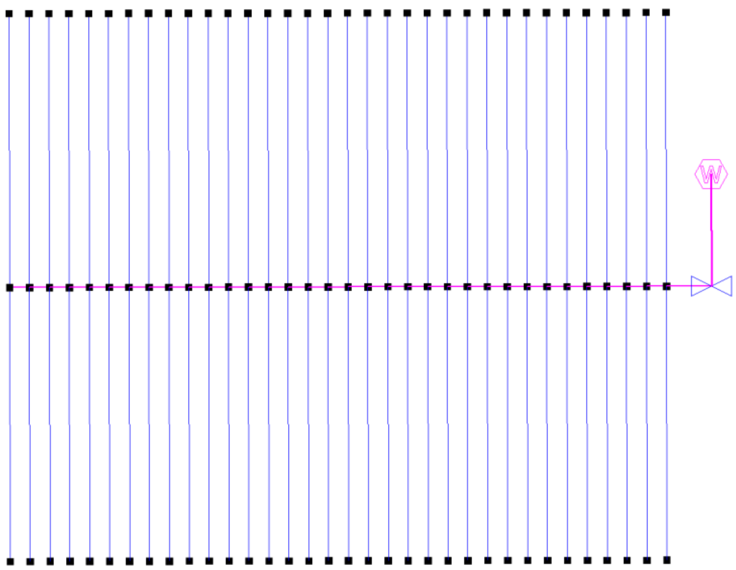


Figure 4-26

4.3.1.3 CHECKING CONNECTIONS

13. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks.*

14. If any outlets or control valves are marked as unconnected , check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

4.3.1.4 ZONE DESIGN

15. Select *Design|Design Parameters|Hydraulic Parameters* and enter the "Maximum Zone Pipe Velocity" as **5ft/s** (**1.5m/s**). Click [OK].

16. The first step in Zone Design is to size the submain pipes. Select *Design|Zone Design|LP Design*. It is always useful to view some reports before continuing. Look at the *Reports|Zone Design Reports|Zone Design Summary* this report gives a good indication of what is happening in the zone. It should look similar to Figure 4-27. The present maximum dripper pressure is 13.22psi (9.3m) and the minimum is 12psi (8.5m). The actual pressure variation in the zone is calculated from the difference between the actual maximum and minimum outlet pressures relative to the actual maximum outlet pressure and is 9.28%. This pressure variation includes the submain friction loss as well

as the loss in the tapes. Close the report window by clicking the [X].

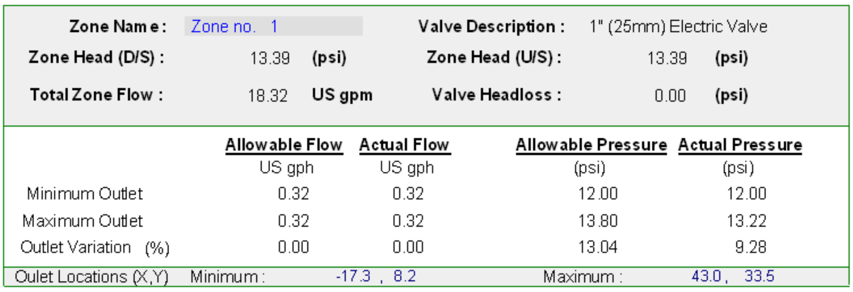


Figure 4-27

4.3.1.5 Entering Management Requirements

The primary purpose of management is to allow you to specify an operating sequence for the zone control valves. This operating sequence is then used to set up a series of flow conditions so that the mainline can be correctly sized and/or analyzed.

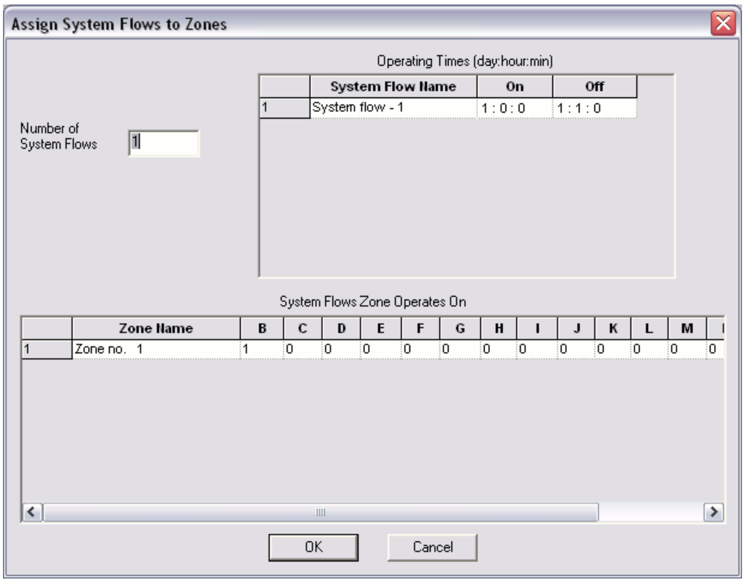


Figure 4-28

17. Now we wish to assign the zones to system flows. Select *Design|Assign All Zones to One System Flow* as we only have one Zone (control valve or block). You will notice that "Zone no. 1" will operate on **System Flow 1** as in Figure 4-28. Click [OK].

4.3.1.6 Mainline Design

18. Now we wish to size the mainline. Run *Design|Mainline Design|LP Design*.

19. Look at the *Reports|Mainline Design Reports|System Duty Report*s to see the water supply requirements for each system flow. Select *File|Save* to save the design. Type demo.des as the file name to save as.

4.3.2 Simple Drip Tape Design Using Block Entities

Tasks covered in this tutorial:

- Drawing an automatic block of tapes
- Setting a valve pressure
- Automatic Labeling
- Moving an item

This tutorial shows the steps required for drawing and designing a drip tape entity. Read the notes below and then proceed with the exercise.

4.3.2.1 Block Entities

Using 'Block Entities' i.e. *Tape Irrigation Block*, is an alternative method to using *Tape Block*. The advantages of this method are ease and quickness of drawing the block complete with submain, control valve and flushing manifolds if required. When the block is drawn as a 'block entity' it is easy to change the parameters, for example row spacing or lateral direction. Extra labels are available for block entities, such as Area, Actual Flow, and Number of Rows. The only disadvantage of using 'Block Entities' is that the laterals cannot be modified individually and in the case of windmills for example, in the middle of the block, laterals cannot be cut out. However, the block can be exploded once drawn if required.

4.3.2.2 Starting the Tutorial

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD Pro* to start IRRICAD. If IRRICAD is already running select *File|New* to start with a clean design.

2. In *Settings|Irrigation – Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open]. Change the "Zone Pipes Line Width" to **2** and the "Mainline Pipe Line Width" to **3**.

3. Go to the Units tab and click the [US] ([Metric]) button to restore the default units for this tutorial. Note Metric measurements are displayed in brackets. These settings can be retained for each design by clicking the [Save As Default] button.

4. Select the Misc tab and click the "Medium Design Size". Change the "Base Database Symbol Size" to **10ft** (**3m**). This determines the size of the symbols according to the size of the design. When you are finished click [OK].

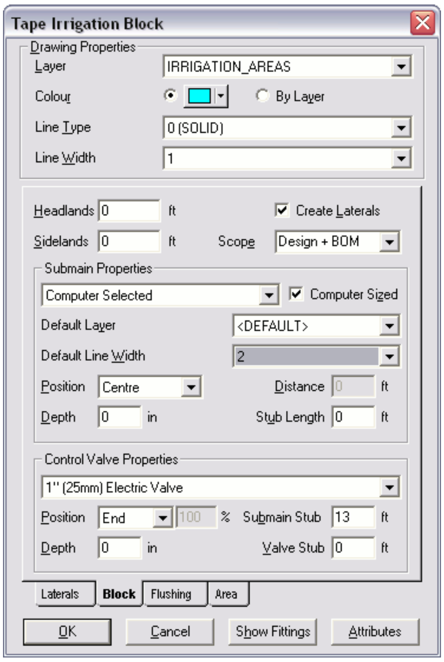


Figure 4-29

5. Select *Zone|Tape Irrigation Block* and select the **Drip tape** from the dropdown list of tapes. Leave the "Depth" as **0**, as the tapes will be at ground level. Leave the default "Inlet Pressure" as **12psi** (**8.5m**) and make sure "Regulated" is unchecked. This Regulated option would mean you have PRVs at the start of each tape, which we do not have in this case. Type in **6ft** (**2m**) for the "Lateral Spacing" and leave the "Number of Laterals" as **0**. Make sure the "Determine Automatically" option for the "Lateral Direction" is selected. Now click on the Block tab. Here we can choose to have our submain and valve drawn automatically if required.

6. In the "Submain" area of the dialog box set **Center** as the "Position" but leave as **Computer Selected**. In the "Valve" area of the dialog box set the "Position" to **End**, The "Submain Stub" as **13ft** (**4m**) and specify the valve as the **1" (25mm) Electric Valve** (Figure 4-29). Click [OK].

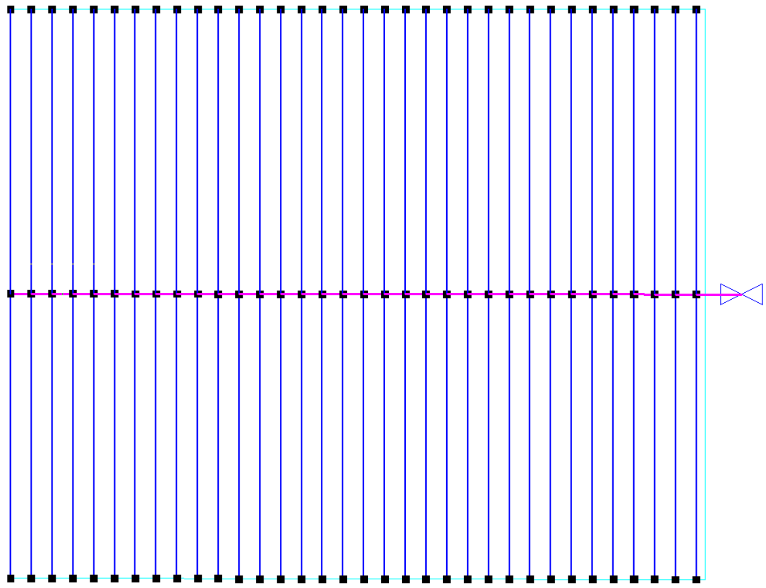


Figure 4-30

7. Now move the cursor to the bottom left of the screen and draw the outline of the block: left-click then draw a line upwards for **165ft** (**50m**) as seen on the status bar d=**165** (**50**) (approximately). Left-click the mouse to place a vertex at this

point and then continue drawing the block area by moving **200ft** (**60m**) to the right and then left-clicking. Now proceed downwards for **165ft** (**50m**) left-click then *Right-click|Close* after the third point has been placed. Because we selected "Determine Automatically" for the "Lateral Direction" we now have to select the boundary which defines the direction by clicking on the left-hand vertical boundary. Once this is completed the laterals are automatically drawn, with a submain through the center of the block and with a valve 13ft (4m) to the right as in Figure 4-30.

8. Now select *Mainline|Pipe*. Leave the pipe as **Computer Selected** and the "Depth" as **0**. Click [OK]. Connect the mainline pipe to the control valve with a left-click and draw upwards for approximately **33ft** (**10m**). Left-click to place and then *Right-click|Restart*. Select *Mainline|Water Supply* and place on the end of the mainline pipe with a left-click as in Figure 4-31. Leave the Water supply details as the defaults; simply click [OK]. Now select *View|Zoom All*.

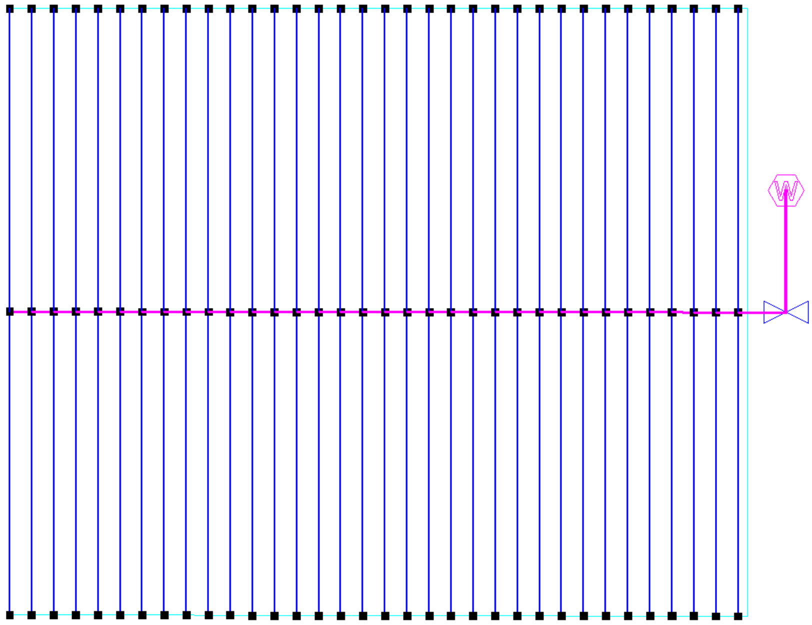


Figure 4-31

4.3.2.3 CHECKING CONNECTIONS

9. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks.*

10. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

4.3.2.4 ZONE DESIGN

11. Select *Design|Design Parameters|Hydraulic Parameters* and enter the "Maximum Zone Pipe Velocity" as **5ft/s** (**1.5m/s**). Click [OK].

12. The first step is to size the submain pipes. Select *Design|Zone Design|LP Design*. It is always useful to view some reports before continuing. Look at the *Reports|Zone Design Reports|Zone Design Summary*, this report gives a good indication of what is happening in the zones. It should look something similar to Figure 4-32. The present maximum dripper pressure is 12.43psi (8.74m) and the minimum is 10.79psi (7.59m). The actual pressure variation in the zone is calculated from the difference between the actual maximum and minimum outlet pressures relative to the actual maximum outlet pressure and is 13.08%. This pressure variation includes the submain

friction loss as well as the loss in the tapes. Close the report window by clicking the [X].

Zone Name :	Area no. 1		**Valve Description :**	1" (25mm) Electric Valve	
Zone Head (D/S) :	12.60	**(psi)**	**Zone Head (U/S) :**	12.60	**(psi)**
Total Zone Flow :	18.32	**US gpm**	**Valve Headloss :**	0.00	**(psi)**

	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure	
	US gph	US gph	(psi)	(psi)	
Minimum Outlet	0.32	0.32	10.80	10.79	***
Maximum Outlet	0.32	0.32	13.20	12.43	
Outlet Variation (%)	0.00	0.00	18.18	13.17	
Oulet Locations (X,Y)	Minimum :	-13.0 , 3.6	Maximum :	47.4 , 28.6	

Figure 4-32

13. When this block is installed the control valve is going to be pressure-reducing and the downstream pressure will be set to **13psi** (**9m**). To specify this go to *Design|Zone Design Configuration* and enter **13.00** (**9.00**) in the "D/S Valve Pressure" column for Area no. 1. Click [OK] and run *Design|Zone|Detailed Analysis*. Open the *Reports|Zone Design Reports|Zone Design Summary* and notice that the valve pressure has been set to **15** (**10.5**) and the resultant pressures throughout the zone have been recalculated from that. See Figure 4-33.

Zone Name :	Area no. 1		**Valve Description :**	1" (25mm) Electric Valve	
Zone Head (D/S) :	13.00	**(psi)**	**Zone Head (U/S) :**	13.00	**(psi)**
Total Zone Flow :	18.32	**US gpm**	**Valve Headloss :**	0.00	**(psi)**

	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure
	US gph	US gph	(psi)	(psi)
Minimum Outlet	0.32	0.32	10.80	11.20
Maximum Outlet	0.32	0.32	13.20	12.84
Outlet Variation (%)	0.00	0.00	18.18	12.76
Oulet Locations (X,Y)	Minimum :	-13.0 , 3.6	Maximum :	47.4 , 28.6

Figure 4-33

4.3.2.5 Entering Management Requirements

The primary purpose of management is to allow you to specify an operating sequence for the zone control valves. This operating sequence is then used to set up a series of flow conditions so that the mainline can be correctly sized and/or analyzed.

14. Now we wish to assign the zones to system flows. Select *Design|Assign All Zones to One System Flow* as we only have one Zone (control valve or block). You will notice that "Area no. 1" will operate on **System Flow 1** as indicated Figure 4-34. Click [OK].

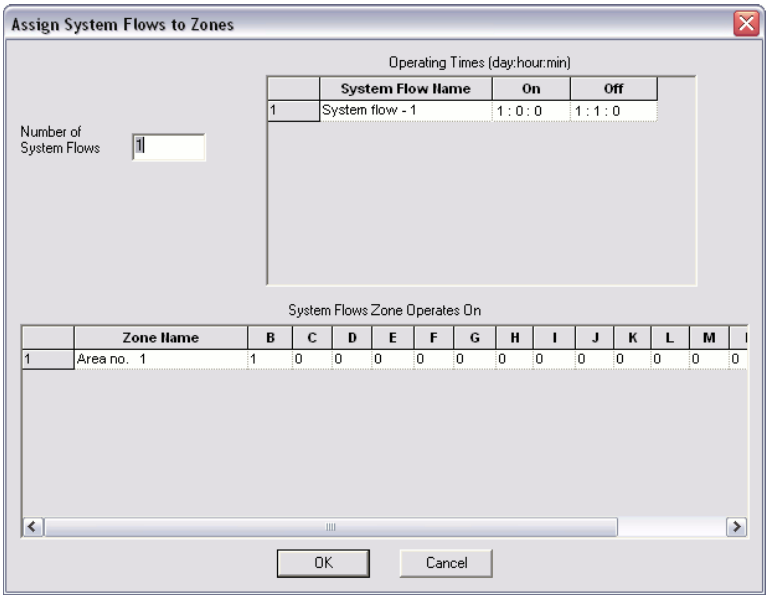


Figure 4-34

4.3.2.6 Mainline Design

15. Now we wish to size the mainline, select *Design|Mainline Design|LP Design*.

16. Look at the *Reports|Mainline Design Reports|System Duty Report*s to see the required demand on the water supply. This is the pressure and flow that is required downstream of the headworks to operate the system you have designed. Save the design as demo1.des by selecting *File|Save*.

4.3.2.7 Automatic Labeling

17. Now select *Settings|Labels*. In this dialog you specify which types of items you want labelled by checking the appropriate

check boxes. Check “Irri. Blocks” and then click the [Text] button. Key words, that will create automatic labels that contain the text required, can now be added. By default the text box is loaded with the area name key word. We want the labels to include the area size, the name of the tape, the number of rows and the flow with the correct units. To do this, we need to specify the following keywords:

#NAME#	The name of the Block/Area.
#AREA# #AREAUNIT#	The area of block including units.
#DESC#	The Tape description
#NUMROW# Rows	The number of rows (remember to add a space and then the word ‘Rows’ after the key word.
#ACTFLOW# #FLOWUNIT#	The actual flow, as calculated during the design process, including the units.

18. Click [OK] when you have finished entering the text, the dialog should look like Figure 4-35below.

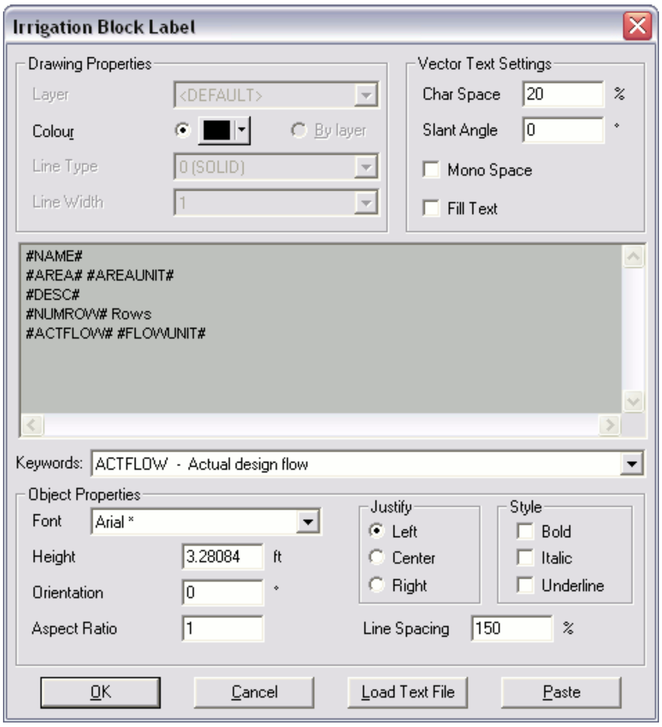


Figure 4-35

19. Now we can set the [Background] options. We can specify a background and a border of the label in a colour of our choice. Select a colour for the background and a colour and line thickness for the border. Click [OK]. Leave the "Layer" set to **[DEFAULT]** – this means that the labels will automatically be placed on the IRRICAD Layer. The next option determines the placement of the label. It can be BELOW the object (in this case below the Block), ABOVE, INLINE (centered within the block), to the LEFT or to the RIGHT. Select **INLINE**. Click [OK].

20. Now select *Modify|Select All* and then *Tools|Create Labels*. The keywords will be resolved to appropriate values and a label will be placed in the center of the Block.

21. If you wish to change the style of existing labels, go to *Settings|Labels* and make the changes required. For example, select the [Text] button for "Irri. Blocks" and change "Justify" to "Left" instead of "Center". Click [OK] on both dialogs and then select *Tools|Update Labels*. All existing labels on the design will be updated to reflect the changes made in the settings. Note: if the fill behind the label does not appear large enough for the label, zoom in and the select *Tools|Update Labels*.

22. Now select *Modify|Select Object* and click on the label. Select *Modify|Move* and move the label to below the valve. See Figure 4-36.

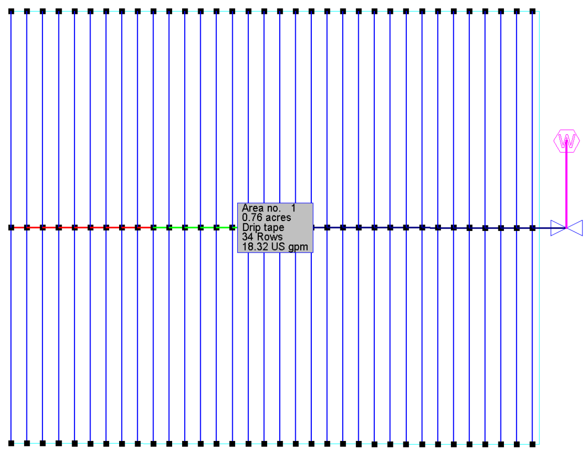


Figure 4-36

4.3.3 A Simple Orchard Design

Tasks covered in this tutorial:

- Drawing simple background information
- Creating sprayline outlets
- Drawing a block of connected spraylines (laterals)
- Specifying lateral and outlet spacing
- Connecting up multiple zone items
- Saving a design
- Specifying the maximum allowable velocity
- Limiting number of pipe sizes selected by computer sizing

4.3.3.1 Block Entities

Using 'Block Entities' i.e. *Spray Irrigation Block*, is an alternative method to using *Spray Block*. The advantages of this method are ease and quickness of drawing the block complete with submain, control valve and flushing manifolds if required. When the block is drawn as a 'block entity' it is easy to change the parameters, for example row spacing or lateral direction. Extra labels are available for block entities, such as Area, Actual Flow, and Number of Rows. The only disadvantage of using 'Block Entities' is that the laterals cannot be modified individually and in the case of windmills for example, in the middle of the block, laterals cannot be cut out. However, the block can be exploded once drawn if required.

4.3.3.2 Starting the Tutorial

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD Pro* to start IRRICAD. If IRRICAD is already running select *File|New* to start with a clean design.

2. In *Settings|Irrigation – Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open]. Change the "Zone Pipes Line Width" to **2** and the "Mainline Pipe Line Width" to **3**. Go to the Units tab and click the [US] ([Metric]) button to restore the default units for this tutorial.

3. Note Metric measurements are displayed in brackets. These settings can be retained for each design by clicking the [Save As Default] button.

4. Select the Misc tab and click the “Medium Design Size”. Change the “Base Database Symbol Size” to **10ft** (**3m**) as shown in Figure 4-37. This determines the size of the symbols according to the size of the design. When you are finished click [OK].

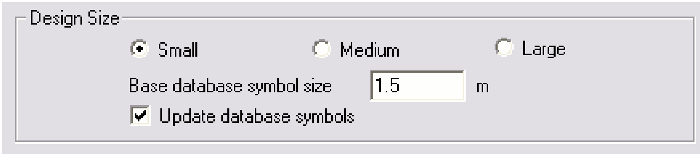


Figure 4-37

4.3.3.3 Enter Background Information

This is information required to position the irrigation system. Examples include boundaries, roads, buildings, text and symbols. For this tutorial we will put in a **390 x 150ft** (**120 x 45m**) rectangle for the block boundary.

5. Select *Draw|Rectangle|2 Point* and move the cursor to the bottom left of the screen and click the left mouse button to start the rectangle. You will notice that the status bar will ask you to enter the corner point of the rectangle prior to you clicking the mouse and for you to enter the opposite corner after you have placed the first. Draw the cursor away from the first point and left-click to place the second point. Now select *Modify|Change* and click on the border of the rectangle. Edit the “Width” to be **390** (**120**) and the “Height” to be **150** (**45**). Click [OK]. Select *View|Zoom All*. Your design should look like Figure 4-38.

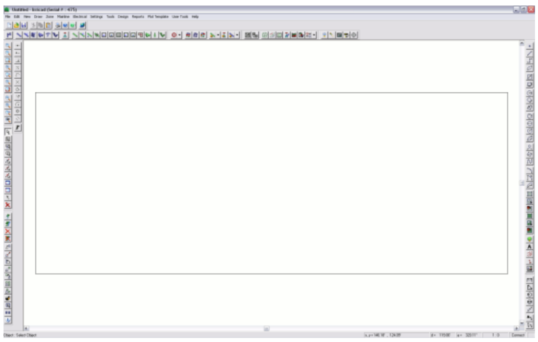


Figure 4-38

4.3.3.4 Placing the Block

6. Before placing any laterals select *Settings|Irrigation – Design Specific*. Check the “Create Wetted Radii” and “Create Sprayline Outlets” check boxes (under normal circumstances “Create Sprayline Outlets” should be unchecked as the number of outlets may be high and will consequently slow down redrawing of the design). Now go to the Layers tab and scroll down until you see “SPRAYLINE_OUTLETS”. Check the box to turn this layer on (this layer can also be turned on in *View|Sprayline Outlets*). Click [OK].

7. Drawing in each sprayline would be very tedious; we can however enter a block of connected spraylines (laterals) by selecting a polygon and ‘applying’ the required block properties to it. To do this use *Modify|Select Object* and click on the rectangle edge (it should change colour) and then select *Zone|Spray Irrigation Block*. Click [OK] on the message asking if you want to create block entities from the selected item. A dialog for setting the lateral and block properties will now be displayed. We want IRRICAD to size the laterals so leave the pipe as **Computer Selected**. The laterals are to be placed at ground level so the “Depth” field can remain at **0.0**.

8. In the same dialog, select the **Microsprinkler 360 degrees** and click on it to select it. Select the **WHITE 360** as the nozzle in the “Nozzle” field, highlighting the required nozzle and left-clicking the mouse. Enter a pressure of **18.5psi** (**14m**).

9. Selecting a riser (outlet connector) is optional but in this example we will use a Microsprinkler stake and tube 3/8” (10mm). In the same dialog, select the **Microsprinkler stake and tube 3/8” (10mm)** from the “Riser” dropdown list.

10. Enter the “Lateral Spacing” as **13ft** (**4m**). Enter the “Outlet Spacing” as **11.5ft** (**3.5m**).

11. Select the [Options] button and check “User Defined” for the “Lateral Direction”, make sure that the option checked for “Reference Outlet” is “Determine Automatically”. Click [OK].

12. Set the outlet spacing type to “Rectangular” with an “Offset” of **0%**. The dialog should look like Figure 4-39.

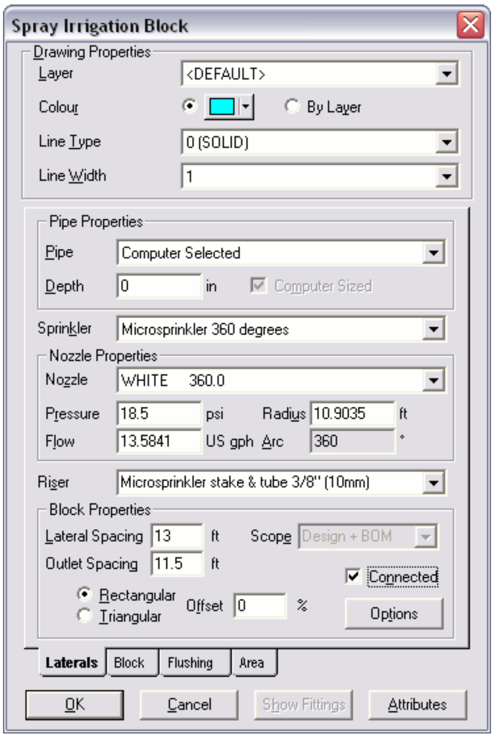


Figure 4-39

13. Now click the Block tab, this tab contains options for automatically placing submains and control valves.

14. Leave the "Submain" as **Computer Selected** and select **Start** from the "Position" dropdown box. Select **Center** as the Control Valve "Position" and then select the **3" (80mm) Electric Valve** from the "Control Valve" dropdown list. Enter a "Valve Stub" of **5ft** (**1.5m**). Click [OK].

15. Because we selected "User Defined" for the "Lateral Direction" we now have to enter two points that define the lateral direction (this will be indicated in the bottom left of the status bar). *Right-click|Snaps|Endpoint* and click on the left top corner of the rectangle. Now you will notice that the status bar is asking for the 2nd point in the block lateral. *Right-click|Snaps|Endpoint* and click on the bottom left corner. Once this is completed the laterals are automatically drawn, with a submain at the top of the

block and a central valve with a **5ft** (**1.5m**) stub, as in Figure 4-40.

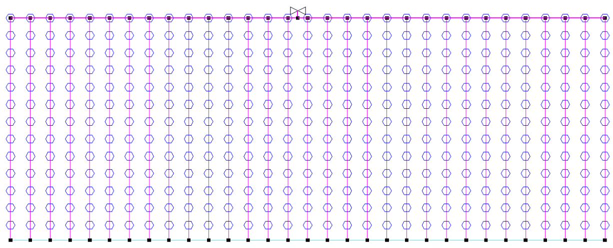


Figure 4-40

16. Now we are ready to enter the Mainline. Select *Mainline|Pipe*, set the pipe as **Computer Selected**, the "Depth" as **0** and the "Line Width" as **3**. Click [OK]. Connect the pipe to the control valve by clicking on it and then draw the mainline pipe out upwards for approximately **33ft** (**10m**). Note that the status bar indicates the distance travelled since the last left-click via the 'd=' field. Left-click to place the end of the pipe and then *Right-click|Restart*.

17. Select *Mainline|Water Supply*. Connect to the junction on the left end of the mainline pipe. Accept the default name of Supply No. 1. Do not enter any flow or pressure requirements (IRRICAD will assume that the water supply is unrestricted and will determine these requirements during design and analysis). Click [OK]. Select *File|Save* and save the design as demo2.des. This completes the entry of the hydraulic components of the design. Your design should look like Figure 4-41.

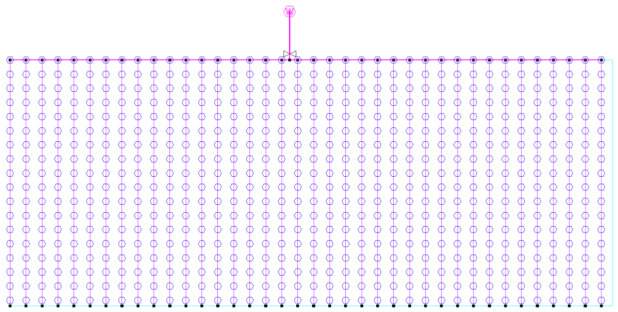


Figure 4-41

4.3.3.5 The Design Process

Checking Connections

18. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks.*

19. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

Zone Design

20. Select *Design|Design Parameters|Hydraulic Parameters* and set the "Maximum Zone Pipe Velocity" to **5ft/s** (**1.5m/s**). Click [OK].

21. Select *Design|Zone Design|LP Design*. This method of computer sizing takes into account the maximum allowable velocities (in *Design|Design Parameters|Hydraulic Parameters*) and the pressure requirements of the sprinklers. Select this option to have IRRICAD size the laterals and submain for the zone.

22. You will notice that 5 pipe sizes have been selected for the submain. In order to simplify installation we will limit the number of pipe sizes that can be selected for the submain. Select *Design|Zone Design Configuration* and enter **3** in the "Number

of Submain Sizes" column. Click [OK] and re-run *Design|Zone Design|LP Design*.

23. It is advisable to check the data in the reports after zone design (*Reports|Zone Design Reports*). At this stage the *Zone Design Summary* report gives a good indication of the overall hydraulic performance of the zone, showing the allowable range and actual minimum and maximum outlet flows and pressures. Click on the [X] to close the report window.

Entering Management Requirements

The primary purpose of management is to allow you to specify an operating sequence for the zone control valves. This operating sequence is then used to set up a series of flow conditions so that the mainline can be correctly sized and/or analyzed.

24. Select *Design|Assign All Zones to One System Flow*. IRRICAD assigns Area no. 1 to operate on System Flow 1 as in Figure 4-42. The on and off times (one hour operating time), for the system flow, are automatically listed. Click [OK]. We are now ready to proceed with the design process.

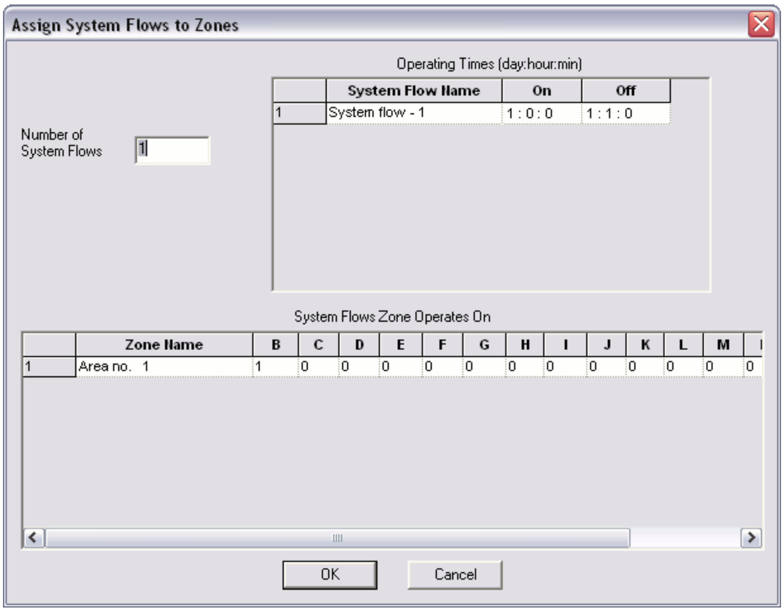


Figure 4-42

Mainline Design

25. You can now size the mainline, to do this select *Design|Mainline Design|LP Design*. IRRICAD will then size the mainline and calculate the water supply pressure necessary to ensure that the zone control valve receives the required upstream pressure. You should have results similar to Figure 4-43.

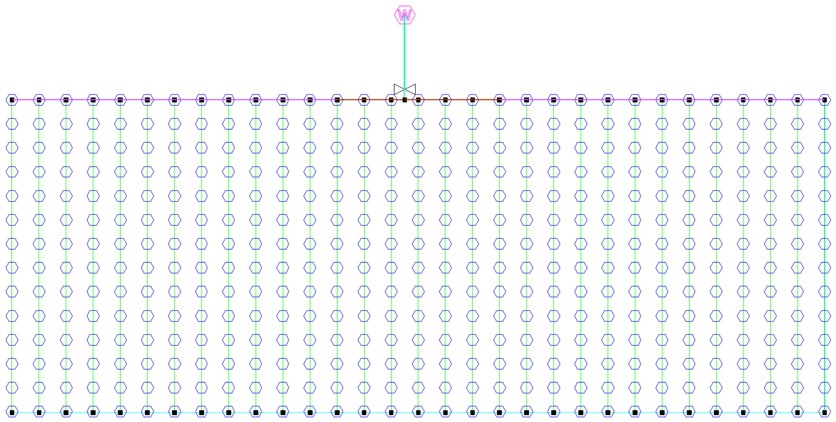
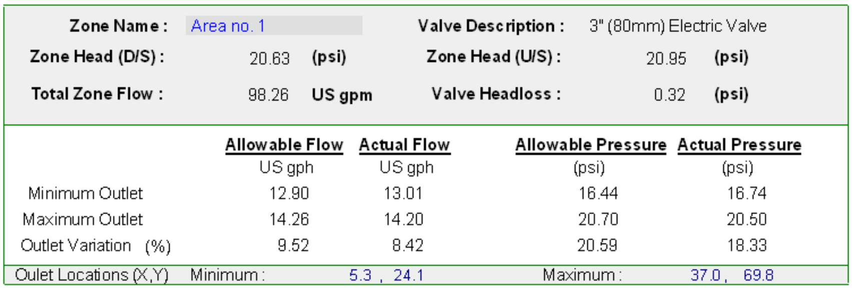


Figure 4-43

4.3.3.6 DISPLAY REPORTS

26. You may wish to view some of the design reports. As described previously the *Zone Design Summary* report (*Reports|Zone Design Reports*), detailed in Figure 4-44, shows a summary of the pressure variation in the block.



Zone Name :	Area no. 1		Valve Description :	3" (80mm) Electric Valve	
Zone Head (D/S) :	20.63	(psi)	Zone Head (U/S) :	20.95	(psi)
Total Zone Flow :	98.26	US gpm	Valve Headloss :	0.32	(psi)

	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure
	US gph	US gph	(psi)	(psi)
Minimum Outlet	12.90	13.01	16.44	16.74
Maximum Outlet	14.26	14.20	20.70	20.50
Outlet Variation (%)	9.52	8.42	20.59	18.33

Oulet Locations (X,Y) Minimum : 5.3 , 24.1 Maximum : 37.0 , 69.8

Figure 4-44

27. The *System Duty Report* (*Reports|Mainline Design Reports*) shows the duty required at the water supply. The *Mainline Summary Report* is a summary of actual and required pressures at the zone control valve.

Other tools that may be helpful, particularly in undulating blocks, are described below.

The hydraulic gradeline tool (*Reports|Hydraulic Gradeline*) allows you to click on a lateral or submain pipe and view a graphical display of the pressure along that section of pipe. For more information on this tool see the Help Topics (*Help|Help Topics*). Another useful tool, *Reports|Show Pressure Zone Limits,* visually shows the location of the emitters with the minimum and maximum pressure within a zone.

If you have had trouble completing this design, please check that the size of the original rectangle is correct.

Note this tutorial could be repeated using the *Zone|Tape Irrigation Block* tool for Drip tape blocks.

4.3.4 Working with Multi-Valve Designs

Tasks covered in this tutorial:

- Subdividing blocks
- Automatically Connecting Valves
- Running more than one valve
- Managing multi-valves in Design
- Limiting the number of pipes selected
- Multiple valves running together

4.3.4.1 Getting Started

1. Complete the above tutorial (A Simple Orchard Design) if you have not done so already.

2. We wish to split this block up into multiple zones because the flow of the entire block exceeds the capacity of the water supply. o automatically split the block into 4 even parts we can use the subdivide tool. Press <Alt> and click once on any part of the block entity (e.g., a lateral) when in *Select Object* mode and then select *Tools|Subdivide Block*.

3. In the “Slices” section, select “Number” and type in **4**. In the “Cuts” section, select “None”. See Figure 4-45.

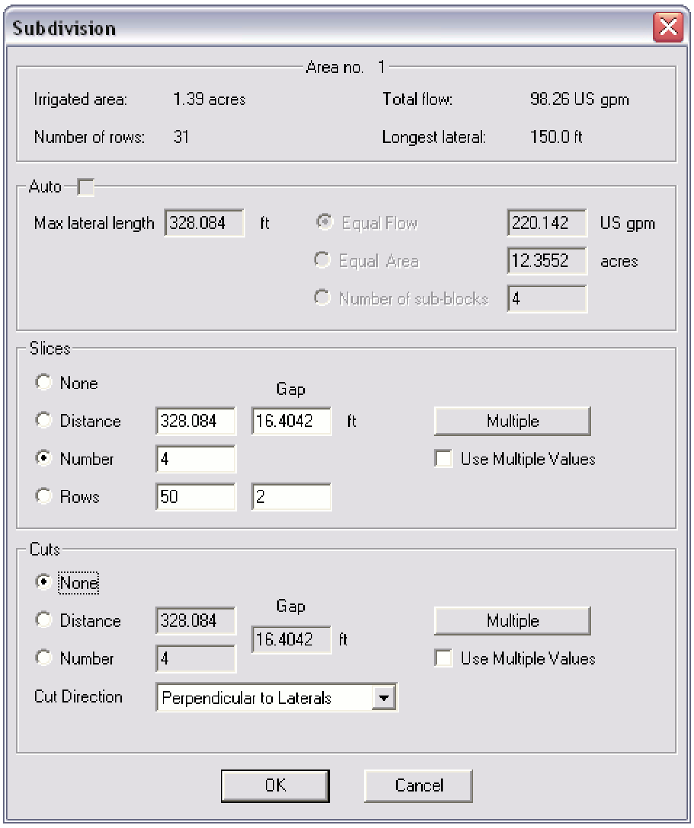


Figure 4-45

5. Click [OK]. A dialog will appear and a preview of the subdivision specified will be shown in the design view. Click the [Accept/View Changes] button to accept the subdivision. See Figure 4-46.

IRRICAD will automatically subdivide the block and connect submains and control valves for each new sub-block, thereby creating four new zones.

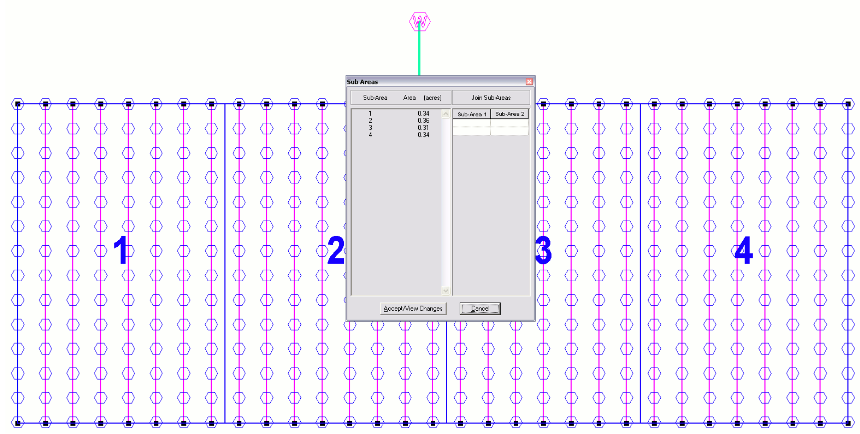


Figure 4-46

5. Run a mainline pipe from the existing mainline to the left and to the right above the new valves. Now select *Tools|Connect Valves* for IRRICAD to automatically connect mainline pipe to the new valves. See Figure 4-47. Select and delete the center mainline pipe below the intersection of the new mainline pipes.

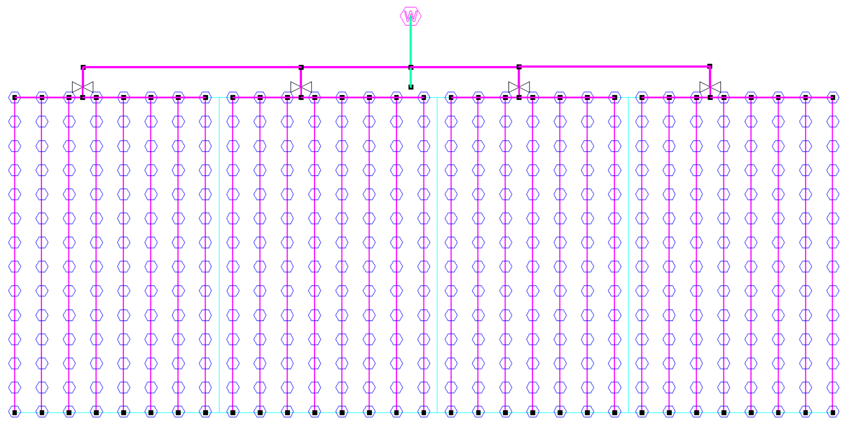


Figure 4-47

6. Now we will specify how the zones will be operated. As we want each zone to run by itself select *Design|Assign Each Zone to a Unique System Flow.* The dialog will automatically assign system flows to our zones. Note also that each zone has been

given a new name based on the original block area name. See Figure 4-48. Click [OK].

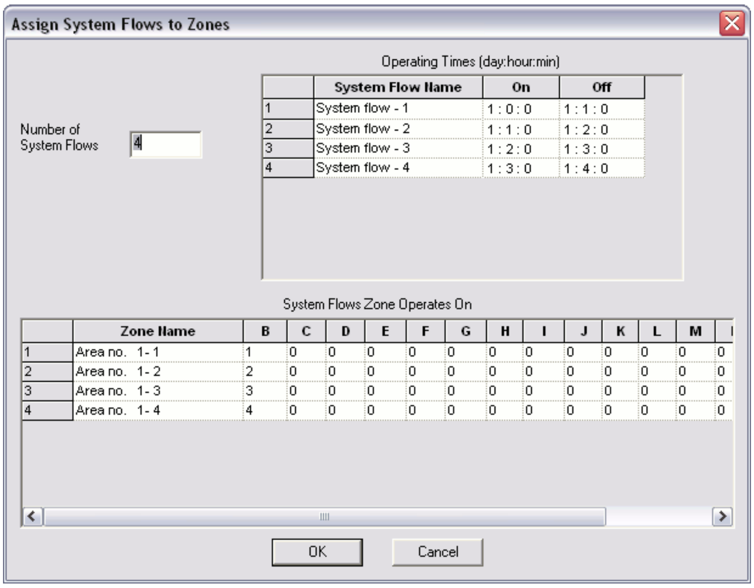


Figure 4-48

7. Select *Design|Zone Design|LP Design*. Once again you will notice that multiple submain sizes have been selected.

8. Go to *Design|Zone Design Configuration* and change the "Number of Submain Sizes" to **3** for all zones.

9. Rerun *Design|Zone Design|LP Design*. Click [OK] on each of the warning messages.

10. Run *Design|Mainline Design|LP Design*.

11. View the *System Duty Report* when complete (*Reports|Mainline Design Reports|System Duty*), your results should look similar to Figure 4-49.

Water Supply : Supply no. 1

Duty Number	On time	Off time	Pressure (psi)	Flow US gpm
1	1: 0: 0	1 : 1 : 0	21.47	25.36
2	1: 1: 0	1 : 2 : 0	21.41	25.36
3	1: 2: 0	1 : 3 : 0	21.35	22.19
4	1: 3: 0	1 : 4 : 0	21.46	25.36

Figure 4-49

4.3.4.2 VALVES OPERATING TOGETHER

Throughout the above the tutorials we have usually specified that all valves operate independently regardless of the number of valves in the system. We will now look at different scenarios where more than one valve is operating at the same time.

12. Select *Design|Assign Zones to System Flows*. Change the "Number of System Flows" to **2**. Click [OK] to refresh the screen.

13. Leave the "Operating Times" as the default (the actual running time is unimportant in this case), click [OK] again.

14. Now you can visually select which zones will operate on each system flow. Click on Area no. 1-1 and Area 1-2 (they will highlight when they are selected), then *Right-click|Assign to Sys Flow*. Click [OK].

15. Now click on Area no. 1-3 and Area 1-4, then *Right-click|Assign to Sys Flow*. Make sure the "System Flow Number" has changed to **2**. Click [OK]. See Figure 4-50.

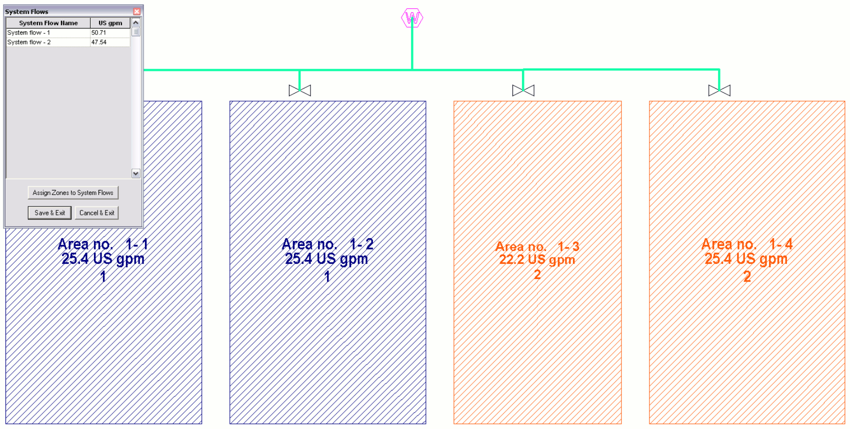


Figure 4-50

16. Re-run *Mainline Design*. Note that you do not need to re-run Zone design or analysis since nothing has changed in the zones. However, you will need to run *LP Design* for *Mainline Design* because the required pipe sizes may well change with the different flow regime.

17. Now open the *System Duty Report* (*Reports|Mainline Design Reports|System Duty*). Your results should look like Figure 4-51.

Water Supply : Supply no. 1

Duty Number	On time	Off time	Pressure (psi)	Flow US gpm
1	1: 0: 0	1 : 1 : 0	21.60	50.71
2	1: 1: 0	1 : 2 : 0	21.57	47.54

Figure 4-51

Note this tutorial could be repeated using the *Zone|Tape Irrigation Block* tool for Drip tape blocks.

4.3.5 MICRO IRRIGATION DESIGN

This tutorial will take you through the steps required to design a Micro Irrigation scheme. The tutorial is intended to introduce you to the procedure required to design systems containing blocks of laterals as would normally be found in an orchard for example. Although the tutorial is based on a micro-sprinkler system the procedure applies equally well to drip and solid set systems. Although this tutorial shows a regular shaped system, irregularly shaped systems can be designed just as easily. There are many methods of completing such a design; this tutorial outlines only one of the possible ways.

4.3.5.1 Starting the Tutorial

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD Pro* to run IRRICAD. If already running IRRICAD select *File|New* to start with a clean screen. In *Settings|Irrigation - Design Specific*, browse for the tutorial database **Tutorial.mdb**. This should be found in the Irricad\database folder.

2. If you prefer to work in Metric units, go to *Settings|Units* and click the [Metric] button (Metric unit users only). Note Metric measurements are displayed in brackets.

3. Go to the Misc. tab and select the Medium design size as in Figure 4-52. Change the “Base Database Symbol Size” to **23** (**7**). This determines the size of the symbols according to the size of the design. Enter your name in the “Designer” field. When you are finished click [OK].

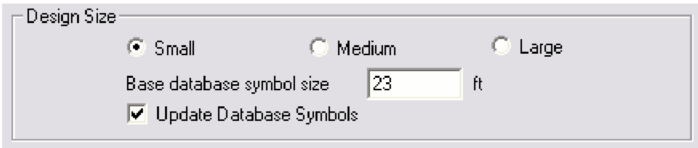


Figure 4-52

4.3.5.2 Entering Background Information

This is information that will help to position the elements of the irrigation system. Examples include boundaries, roads, buildings, text and symbols. In this tutorial we will put in an 1155ft x 825ft (350m x 250m) rectangle for the block boundaries. We will use a grid to help with positioning although this is optional.

4. Select *Settings|Grid / Origin* and enter the “X” and “Y” spacing as **15ft** (**5m**). Tab between the fields. Check the “Display Grid

Points" checkbox. Now select *Settings|Snap* and check the "Snap to Grid" option. Click [OK].

5. Select *Draw|Rectangle|2 Point* and click the left mouse button to start the rectangle. Draw the rectangle out to any size and then select it using Select Object and double-clicking on the boundary. Change the "Width" to **1155** (**350**) and the "Height" to **825** (**250**) and press <Enter>.

4.3.5.3 More Background Information

6. Select *View|Zoom All* to get the whole area in view on the screen. Inside this area are four blocks that we are going to design an irrigation system for. We need to place four more rectangles inside the current boundary rectangle and then move them into position. To do this select *Draw|Rectangle|3 Point* and place the first point inside the existing boundary **45ft** (**15m**) - 3 grid points - from the top and left boundaries. Notice that only every 2nd grid point along the X-axis is shown at this zoom. Draw the cursor out towards the middle along the top. Now type **495,<0** (**150,<0**) and press <Enter>. Move the cursor down at right angles and type in **330** (**100**) and press <Enter>.

7. Select *Modify|Copy|Array* and click on the inner rectangle to select it then enter 1 for the number of copies and 2 for the number of rows. Click on the bottom right corner of the inner rectangle then move the ghosted rectangle to three grid points from the right boundary, in-line with the original. Click to place. Move the ghosted rows to 3 grid points from the bottom and right boundaries. Click to place.

8. You need to enter site data if elevation changes over the plan are likely to affect the hydraulics of the system. If the design area is essentially flat you do not need to enter any elevation data and all objects will be given a default height of 0.

9. In this example there is a 5ft (1.5m) fall from the top to the bottom of the screen. To allow for this, select *Draw|Contour* and enter one contour line at the top of the screen. Move to the top left of the screen just above and to the left of the boundary rectangle. Click the left mouse button then drag the rubberband horizontally to the right until it is above and to the right of the boundary rectangle and click the left mouse button. Select

Right-click|Done. In the dialog, type **33** (**10**) as the contour height. Click [OK]. Now draw a contour similarly along the bottom of the screen below the boundary rectangle. Select *Right-click|Done* and type **28** (**8.5**) in the dialog as the contour height. Click [OK].

10. If you can still see the green rubberband color, select *View|Redraw*. Your design should look something like Figure 4-53.

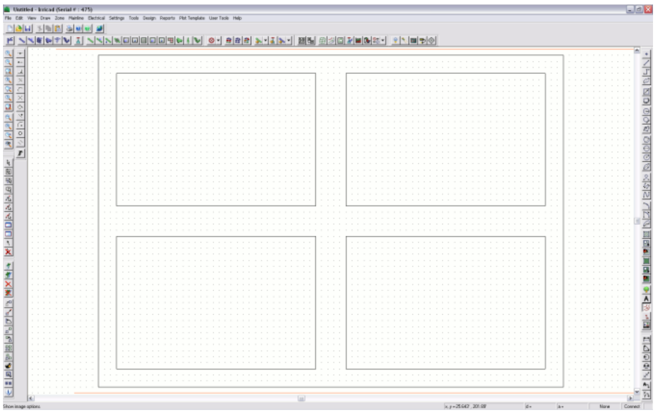


Figure 4-53

4.3.5.4 CREATING THE LATERALS

11. Before placing any laterals select *Settings|Irrigation - Design Specific* and uncheck the "Create Sprayline Outlets" checkbox. While you are in this dialog change the line widths of the pipes to "Laterals" **1**, "Mainline Pipes" **3**, "Zone Pipes" **2** and "Wires" **1**.

12. Now select the *Settings|Irrigation Items* tab, and uncheck the "Flow Check Enabled" box if it is checked. Click [OK].

13. Select the top left small rectangle by using *Modify|Select Object* or clicking on the white arrow icon on the left-hand tool bar. Once the rectangle is highlighted, select *Zone|Spray Irrigation Block*. Click [Yes] on the 'Create Block / Block Entities from Selected Items' message.

14. The Laterals tab dialog for setting block and sprayline properties will be displayed. As you are completing a new design and may not know what pipe size to use you will get IRRICAD to size the laterals the pipe as **Computer Selected**. The laterals will be placed at ground level so the "Depth" field can remain at **0.0**. In the same dialog, select a sprinkler by clicking the down arrow. Highlight the **Micro-sprinkler 360 degrees** and left mouse click to select it. Select the **WHITE 360** as the nozzle by clicking on the down arrow of the "Nozzle" field, highlighting the required nozzle and left clicking the mouse. Enter a pressure of **18.5psi** (**13m**). Selecting an outlet connector or riser is optional but for this example we will use a Micro-sprinkler stake and tube $^3/_8$" (10mm). If the micro-sprinkler is an assembly already containing a stake and tube you would not need to select another connector. In the same dialog, select the **Micro-sprinkler stake and tube $^3/_8$" (10mm)** from the dropdown list. Enter the "Lateral Spacing" as **13ft** (**4m**). Enter the "Outlet Spacing" as **11.5ft** (**3.5m**). Leave the "Outlet Spacing Properties" as **Rectangular** for a rectangular layout. Leave the "Offset" as **0%**, and make sure that the "Connected" checkbox is checked for connected spraylines. The dialog should look like Figure 4-54.

15. Click the [Options] button and in the dialog that appears leave the "Number of Laterals" as **0** so that IRRICAD fills the blocks completely with laterals. Leave the "Lateral Direction" as **Determine Automatically**. Leave the "Extra Outlets" box unchecked so that IRRICAD does not put additional sprinklers on the ends of the lateral lines when the distance from the last sprinkler to the end of the line is greater than half the outlet spacing. Leave the "Outlet Orientation" at **0º** and the "Reference Outlet" as **Determine Automatically**. Leave the "Layer" as **<DEFAULT>** so the spraylines will be entered into the Spraylines layer. Leave the "Lateral Line Width" as **2**.

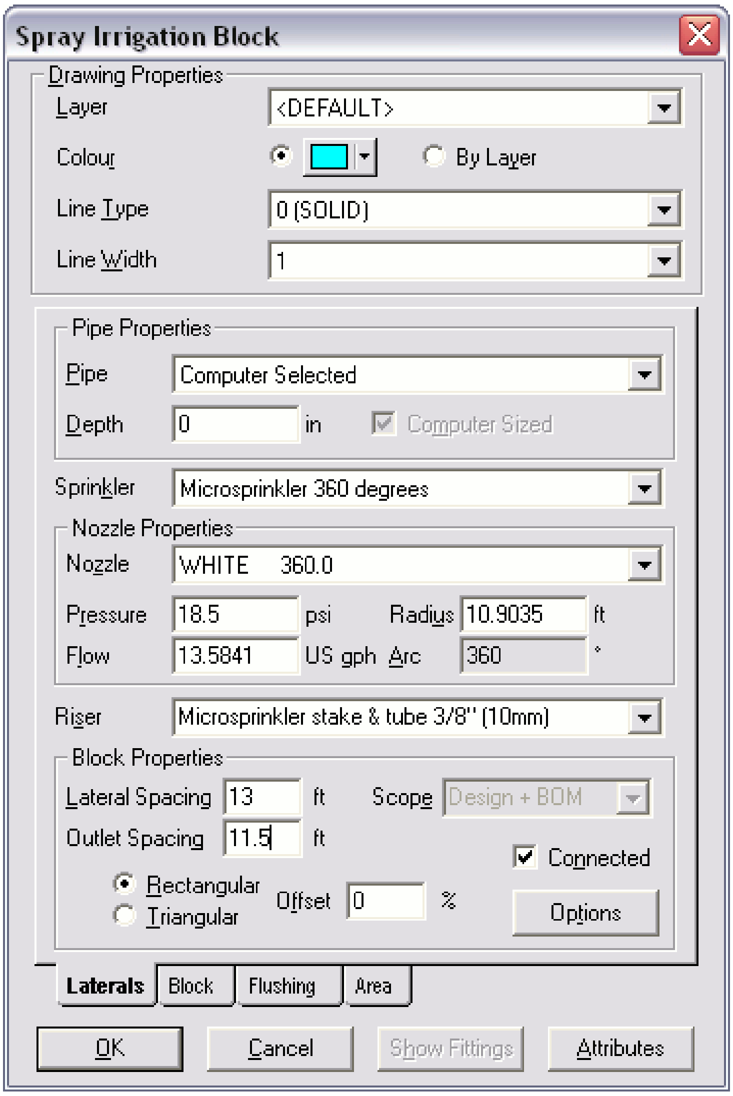


Figure 4-54

4.3.5.5 Creating the Automatic Submain and Valve

16. Click on the Block tab. The laterals are to run the full length of the smaller block rectangles but be about 15ft (5m) inside the

side boundaries. Set the Headlands and sidelands as **15ft** (**5m**) each.

17. Make sure the "Create Laterals" check box is checked. The "Scope" determines if an item will be just for design purposes only or for design and costing. Make sure **Design + BOM** is selected.

18. As we want the submain through the center of the block in "Submain Properties" section select **Center** as the "Position". This will now enable a pipe size to be selected, however, we require IRRICAD to size the pipe for us. Enter **20 inches** (**500mm**) as the "Depth" for the submain. Enter a "Stub Length" of **5ft** (**1.5m**) for the submain to extend beyond the last lateral.

19. In the "Control Valve Properties" section select **Start** as the "Position" and now you can select the 3" (80mm) Electric Valve from the dropdown list. Enter **15ft** (**5m**) as the "Submain Stub" from the valve to the first lateral. Enter the "Depth" as **-4 inches** (**-100mm**) as the height above ground. Leave the "Valve Stub" as **0** as there is no extra length after the submain stub.

20. Click [OK] and select the bottom boundary of the rectangle for IRRICAD to align the laterals with.

21. Repeat steps 12 to 19 on each of the remaining rectangles (IRRICAD will remember the selections from above) using the center boundary to align the laterals with so that all valves end up in the center. If the valve ends up on the wrong side of the area, do not worry, simply hold the <Alt> key down and double-click on any block entity and the dialog will appear (when in *Select Object* mode). Change the Valve "Position" to End and it will relocate the valve at the opposite end of the block.

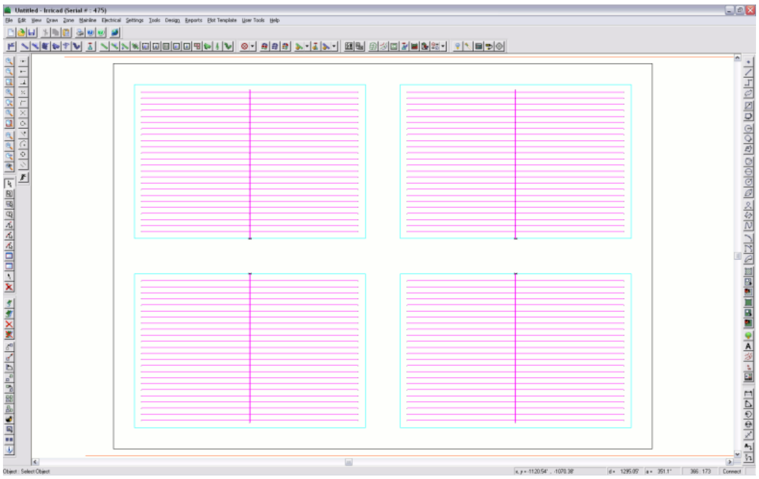


Figure 4-55

4.3.5.6 Connecting to the Mainline

22. Select *View|Zoom Window* and drag a window that will encompass all four control valves and by placing the top left corner and the bottom right corner of the zoom window by left clicking. Select *Mainline|Pipe*. Leave the pipe as **Computer Selected**. Enter the "Depth" as **20** (**500**), and leave the "Line Width" as **4**. Click [OK]. Connect the pipe to the top left block control valve by clicking on it then connect to the bottom left block control valve similarly. Select *Right-click|Restart*. Repeat to connect the two right block control valves.

23. Select *Settings|Snap* and click the [Running Snaps] button. Check the "Midpoint" option, the "RN Snaps On" and the "Show Preview" check box. Reselect *Mainline|Pipe* and move the cursor over the existing left-hand mainline until the preview of midpoint snaps appears (a diamond in the center of a line). Click on the mainline pipe at this position. Draw out the pipe to the right-hand existing mainline and once again move the cursor over the existing pipe until the midpoint is found. Left click to place then select *Right-click|Restart*. Now find the midpoint of the horizontal mainline pipe and click to attach a new pipe. Draw upwards approx. **10ft** (**3m**).

24. Select *Mainline|Water Supply*. Connect to the junction on the end of the short piece of pipe by left clicking on it. Leave the name as the default **Supply No. 1**. Do not enter any flow or pressure requirements, as IRRICAD will determine these during design and analysis and assumes that the water supply is unrestricted. Click [OK].

25. Select *Draw|Spot Height* and place a spot height on the water supply. Make the height **28.5** (**8.75**). This is to ensure that the position of the water supply will be allocated the correct elevation at that point. If spot heights are available for a client's property, these can be used in conjunction with contour lines. If you have the information it is a good idea to use it. Select *View|Zoom All*. Your design should look like Figure 4-56. This completes the entry of the hydraulic components of the design.

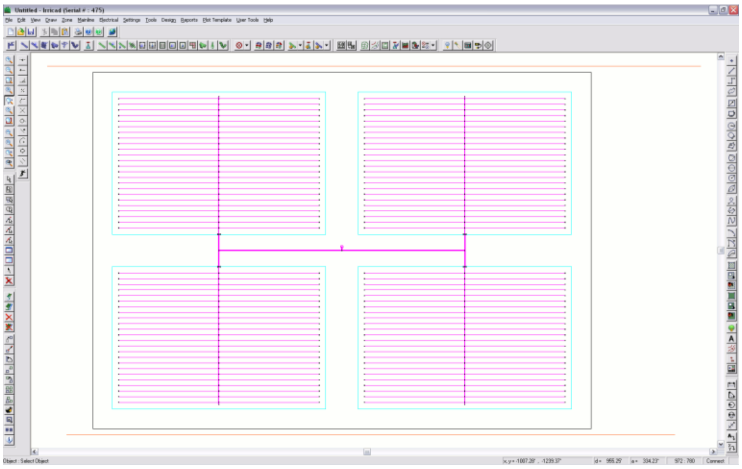


Figure 4-56

4.3.5.7 The Design Process

We are now ready for the design process.

Checking Connectivity

26. Select *Design|Check Outlet Connectivity* to make sure that all the outlets are connected to the zone control valve and that the valve is connected to the water supply. If IRRICAD does not

report any unconnected items you can continue. If items are reported as not connected, their location will be displayed.

Note: Outlets do not have to be connected. Zone Control Valves, however, must be connected to the water supply before designing the mainline.

Zone Design

27. Select *Design|Zone Design Configuration*. In the dialog you will see all four blocks listed down one side. For each block you can decide if you wish to design / analyze that zone. Leave this box checked for all blocks. The next column allows you to turn on or off the ability to allow for minor losses - leave this checked for all blocks. "Change Diameter at Outlet" only applies to zones with telescoping laterals. A check will ensure that a change in lateral diameter will take place at an outlet location. It is not normally used for dripper or micro-sprinkler systems, so leave this option unchecked for all blocks. "Number of Lateral Sizes" allows you to specify the maximum number of pipe sizes used in each lateral (maximum 3). The default is 1. Change this to **2** for this design. "Number of Submain Sizes" allows you to specify the maximum number of pipe sizes to be used in the submain. Enter this as **2** for all blocks (if this number is left at 0 IRRICAD is unlimited in the amount of submains it can use to solve the design). "Valve Pressure" is used when you wish to specify a valve pressure for a zone. A **0** entry means that IRRICAD is required to calculate a suitable pressure, so leave this as **0.0** as in Figure 4-57. Click [OK].

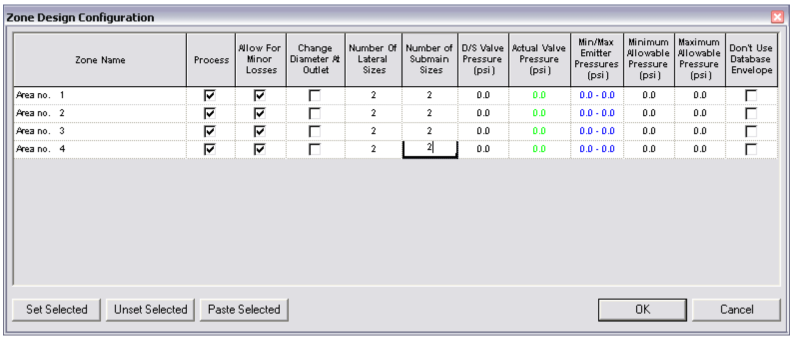


Figure 4-57

28. Select *Design|Design Parameters|Hydraulic Parameters* and enter the "Maximum Zone Pipe Velocity" as **5ft/s** (**1.5m/s**). Click [OK].

29. Select *Design|Zone Design|LP Design*. This method of computer sizing takes into account the maximum allowable velocities (in *Design|Design Parameters|Hydraulic Parameters*) and the pressure requirements of the sprinklers. Select this option to have IRRICAD size the laterals and submains for the zones. You will get some warning messages during LP Design indicating that some of the blocks have nozzle pressures outside the specified operating range. You should have results similar to Figure 4-58.

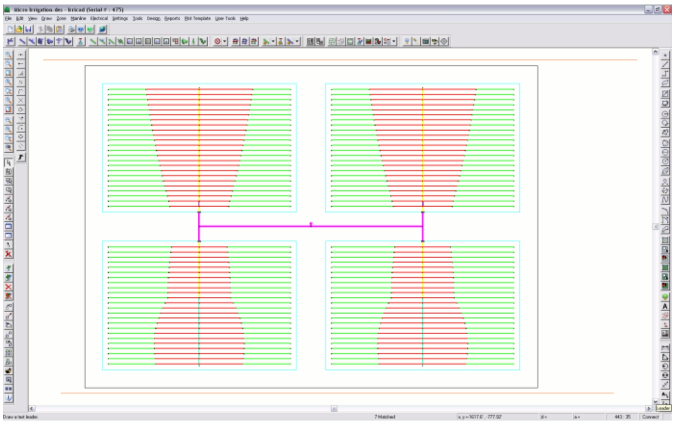


Figure 4-58

30. It is advisable to check the data in the zone reports after zone design (*Reports|Zone Design Reports*). At this stage the Zone Design Summary report gives a good indication of the overall design of the zones. As you will see, the minimum present outlet pressure is 0.2psi (0.2m) below the allowable minimum outlet pressure. We will not worry about this at this stage. Note down the present downstream pressure of the valve that IRRICAD has calculated for each zone as this will be used later for analysis. It should be between 17-21psi (12m and 15m). Click on the X to close the report window.

Entering Management Requirements

We now need to enter some management requirements. The primary purpose of management is to allow you to specify an operating sequence for the zone control valves, which set up a series of flow conditions in the mainline so that the mainline can be correctly sized and analyzed. You have the option of specifying a simple worst case scenario for valve operation or of specifying a full operational sequence for all valves.

31. Since we will be operating each zone separately, on different system flows, *select Design|Assign Each Zone to a Unique System Flow*. A system flow is a zone or group of zones operating at the same time. The resulting dialog will have automatically allocated the four system flows to different time slots and each zone to a different system flow. This table can be edited if required so check the data is correct. Note the number of system flows is 4. The sequential operating times (one hour) for each system flow are listed. If actual start and stop times are not important (and this is the case for this system) the default times should be accepted. System flow operating times cannot overlap. Now note that Block 1 will operate on system flow 1, Block 2 on system flow 2, and so on as in Figure 4-59. Click [OK].

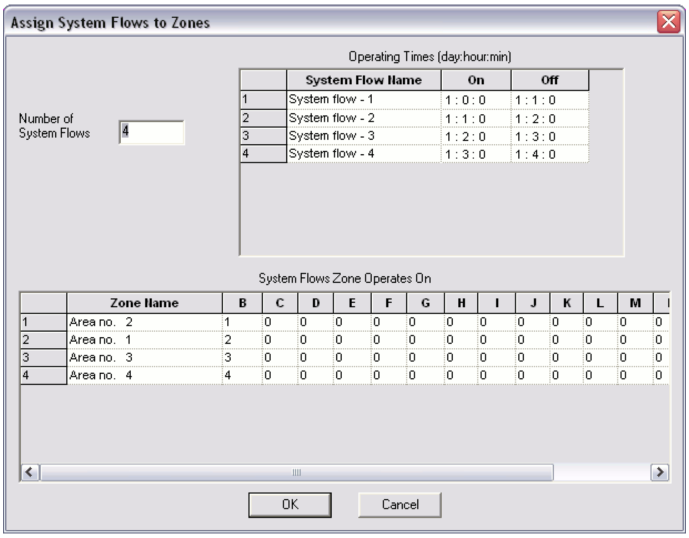


Figure 4-59

Mainline Design

32. Now have IRRICAD size the mainline for the design. Select *Design|Mainline Design|LP Design*; IRRICAD will then size the

mainline for the design and calculate the water supply pressure so that the zone control valves receive the required pressure.

4.3.5.8 MAKING CHANGES AFTER INITIAL DESIGNING

We now want to tidy up the design as the position where the laterals change size varies. In order to make the system easier to install it is desirable, in this example, though optional, to straighten up the size change positions. This will also fix the warning message about some nozzle pressures being outside the specified operating range.

33. Select *Modify|Move Sizes*. On the left side of the submain in the first block find the junction furthermost from the submain where the laterals change size. Draw a line vertically through the laterals such that it passes through this junction by left clicking above the block and then left clicking at the bottom of the block, so that the line passes fully through all the laterals (holding the <Ctrl> key down will help with a straight line – if "Ortho Mode" is set to 0º) or use grid points as a guide to help you with this. When you select *Right-click|Done* a dialog will give you the choice of whether you want the lateral size change to take place at a sprinkler or not and which size you want to move. Uncheck the "Nearest Outlet" checkbox so that the lateral will change size on the line. Select the "Close" option, so that the junction closest to the line will be moved. Click [OK] and IRRICAD will move the junctions to the line.

34. Repeat for both sides of the submain in all blocks. Your design should now look like Figure 4-60.

35. The system can now be analyzed to assess the effect of the modifications. Select *Design|Zone Design Configuration* and type in the valve pressures you noted previously as the "Valve Pressure" for the respective zone control valves. You can specify the same pressure at each valve - choose the highest pressure to enter for all. Click [OK].

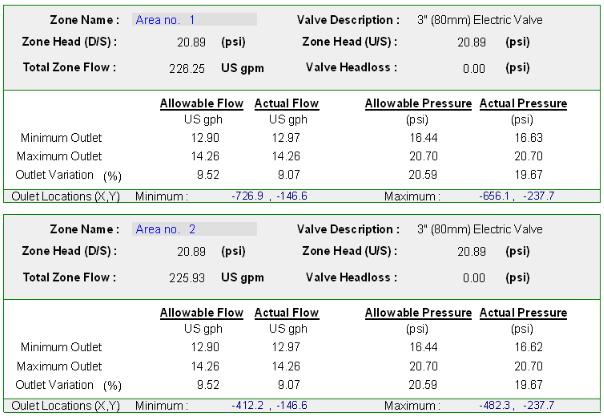
36. Now select *Design|Zone Design|Detailed Analysis*. This will analyze each block without making any changes to the pipe sizes already selected. *Detailed Analysis* also shows you exactly what is happening at the outlets. When *Detailed Analysis* is completed, re-run *Design|Mainline Design|Analyze*.

Figure 4-60

4.3.5.9 DISPLAY REPORTS

You may wish to select and view some of the design reports.

As seen previously, the *Zone Design Summary* report (*Reports|Zone Design Reports*) gives you a summary of the pressure variation in the block. The *Mainline Design Reports|System Duty Report* gives you the duty required at the water supply for each system flow. The *Mainline Summary Report* gives a summary of actual and required pressures at the zone control valve.



Zone Name :	Area no. 1		Valve Description :	3" (80mm) Electric Valve	
Zone Head (D/S) :	20.89	(psi)	Zone Head (U/S) :	20.89	(psi)
Total Zone Flow :	226.25	US gpm	Valve Headloss :	0.00	(psi)

	Allowable Flow US gph	Actual Flow US gph	Allowable Pressure (psi)	Actual Pressure (psi)
Minimum Outlet	12.90	12.97	16.44	16.63
Maximum Outlet	14.26	14.26	20.70	20.70
Outlet Variation (%)	9.52	9.07	20.59	19.67

Oulet Locations (X,Y) Minimum : -726.9 , -146.6 Maximum : -656.1 , -237.7

Zone Name :	Area no. 2		Valve Description :	3" (80mm) Electric Valve	
Zone Head (D/S) :	20.89	(psi)	Zone Head (U/S) :	20.89	(psi)
Total Zone Flow :	225.93	US gpm	Valve Headloss :	0.00	(psi)

	Allowable Flow US gph	Actual Flow US gph	Allowable Pressure (psi)	Actual Pressure (psi)
Minimum Outlet	12.90	12.97	16.44	16.62
Maximum Outlet	14.26	14.26	20.70	20.70
Outlet Variation (%)	9.52	9.07	20.59	19.67

Oulet Locations (X,Y) Minimum : -412.2 , -146.6 Maximum : -482.3 , -237.7

Figure 4-61

37. Check that the outlet pressure variations (as seen in Figure 4-61 in the *Zone Design Summary* report) are within requirements. Note the changes since you have moved the lateral pipe sizes and run *Detailed Analysis*.

If you wish to narrow the pressure variation, there are several things you can do:

Move the change of pipe sizes of the laterals as described previously using Move Sizes so that there are longer lengths of the larger pipes.

Manually change the submain pipe sizes using *Modify|Select Object* and *Modify|Change* or *Modify|Change Type*.

Change the nominal pressure required at the outlets to a value closer to the actual pressure calculated by using *Modify|Select|All* and *Modify|Change Type* and selecting a representative sprayline.

For details on how to use these tools see the Tool & Command Reference, Section 5.

To have IRRICAD automatically select the pipe fittings required for the design you need to select *Design|Computer Selection of Fittings*. IRRICAD will look at each pipe or component junction in the design and from the database select the fittings needed to join these pipes or components together. The internal junction numbers will be displayed on the status bar as it does this.

After running *Computer Selection of Fittings* it is a good idea to look at one of the Bill of Materials reports, e.g., *Reports|Costing BOM Reports|BOM* to find out if IRRICAD was able to select all the fittings required for the job. If fittings could not be found to solve particular junctions details of those junctions will be listed at the end of the report.

4.3.6 Solid Set Sprinkler Design

4.3.6.1 Introduction

This tutorial will take you through the steps of a setting up a solid set sprinkler design. To achieve the purpose of this tutorial we will proceed to set up a sprinkler system for frost protecting a stone fruit orchard. Although it is a regular shaped system irregular shapes can be just as easily. There are many ways of doing such a design, this tutorial outlining only one of the ways.

4.3.6.2 Overview

A solid set system is one that is non-movable, tends to be unconnected spraylines (though pipes and sprinklers are placed in one action, they remain separately pipes and sprinklers) and has a low number of sprinklers. Because we wish to place water on trees to protect from frost, we require a riser to place the sprinkler 16.5ft (5m) above the pipe in the ground.

4.3.6.3 Starting the Tutorial

1. Double-click on the IRRICAD Icon, or select *Start|All Programs|IRRICAD Pro*. If already running IRRICAD select *File|New* to start with a clean screen.

2. In *Settings|Irrigation – Design Specific* and browse [...] for the **Tutorial.mdb** database. Highlight and select [Open]. Change the "Zone Pipes Line Width" to **2** and the "Mainline Pipe Line Width" to **3**.

3. Note that at the top of the dialog is a series of tabs. Select the *Design Details* tab. Edit the design details for this design. For the site type **Stone Fruit Orchard** and for the notes type **Solid Set Sprinkler Tutorial**. If you prefer to work in Metric units, go to *Settings|Units* and click the [Metric] button (Metric unit users only). Note Metric measurements are displayed in brackets. Select the *Misc.* tab and select the "Design Size" as "Medium". Change the "Base Database Symbol Size" to **26** (**8**). This determines the size of the symbols according to the size of the design. When you are finished, click [OK]. Select *File|Save* and save the design.

4.3.6.4 Entering Background Information

First we will enter the background or base information which is required in order to position the irrigation system. Examples include property boundaries, roads, buildings, perhaps text and symbols. This client has an area of 37 acres (15ha) in nectarine trees. For the tutorial we will put in an orchard boundary 1640ft (500m) x 980ft (300m) to cover the blocks of trees, water supply, house and some sheds. The rest of the client's property does not concern us for this project.

4. We will use a grid to help position things, though this is optional. Select *Settings|Grid / Origin* and set up a grid **20**x**20**ft (**6**x**6**m). Check the "Display Grid Points" checkbox.

5. Select the *Snap* tab and select the "Snap to Grid" option. Click [OK]. Select *Draw|Rectangle|3 Point*. Place the cursor at the bottom left and left mouse click. Draw a horizontal line to the right, and then without clicking, type **1640<0** (**500,<0**) on the keyboard and press <Enter>. Move the mouse upwards and, without clicking the mouse, type **980** (**300**) on the keyboard and press <Enter>. Select *View|Zoom All*. You now have a rectangle 1640x980 (500x300) on the screen.

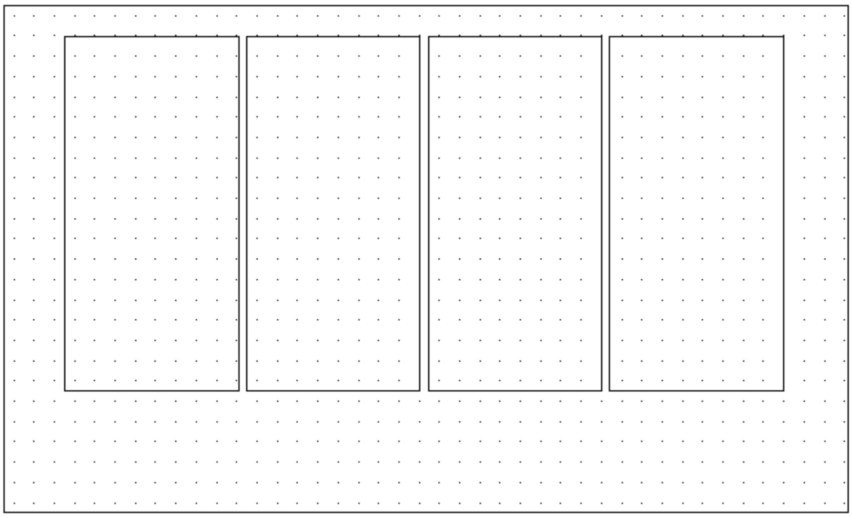


Figure 4-62

6. This small orchard is divided into blocks 330ft (100m) x 700ft (210m). Draw a *3-point Rectangle* in the same manner as above, so the smaller rectangle is inside the larger one. Start the top right corner of this rectangle 120ft (36m) (6 grid points) from the right boundary and 60ft (18m) (3 grid points) from the top boundary. Notice that only every 2nd grid point along the X-axis is shown at this zoom. Type **330,<180** (**100,<180**) for the width and **700** (**210**) for the length of the rectangle. Select the

rectangle, then select *Modify|Copy|Linear* and enter **3**. Click [OK]. Select the top right corner as the reference point then drag the 3 copies to the left until the left most copy is about 120ft (36m) (6 grid points) from the orchard left boundary, i.e. the 4 rectangles are evenly spaced across as in Figure 4-62, and left click. The block rectangles are only 20-40ft (6-12m) apart. This distance between blocks represents a shelterbelt; the grid represents tree spacing within the block.

7. Using *Draw|Rectangle|2 Point*, draw a house and farm building towards the bottom left of the orchard boundary. Make the house **40x60ft** (**12mx18m**) and the buildings **20x20ft** (**6mx6m**). Use grid points to size the rectangles.

8. Select *Settings|Snap* and select “Connect” to turn “Snap to Grid” off. Now place a road name at the top of the boundary by selecting *Draw|Text* and typing **Luke Road**. Change the “Height” to **32ft** (**10m**). If you wish, change the font to another true type font. Click [OK], and place the label above the top property boundary line by left clicking. Select *Draw|Text* again and type **Tyre Road**, and change the “Orientation” to **90º**. Click [OK] and place at the left boundary. Label the house and buildings in the same way, changing the “Orientation” of the text back to **0º**.

9. Turn off the grid in *Settings|Grid/Origin/GIS* by unchecking the “Display Grid” check box.

4.3.6.5 Laying Out Fixed Spaced Outlets

10. Select the left most smaller rectangle by using *Modify|Select Object* and clicking on the rectangle edge.

11. Now select *Zone|Spray Irrigation Block*. On the Laterals tab, leave the pipe as **Computer Selected**. Select the **Big Impact Drive Sprinkler** and the **4.4mm** “Nozzle”. Change the “Pressure” for the nozzle to **64psi** (**45m**). The “Radius” will change to 59.05ft (18m). Select the **¾“ x 16ft** (**20mm x 5m**) **Galvanized Pipe Riser** and change the “Lateral” and “Outlet Spacing” to 60ft (**18m**) each. Leave the “Outlet Spacing Properties” as “Rectangular” and **0%** “Offset”. Uncheck the “Connected” checkbox. Leave the “Scope” as **Design + BOM**. Click the [Options] button and check the “Extra Outlets on Ends” checkbox as in Figure 4-63. Click [OK] on both dialogs.

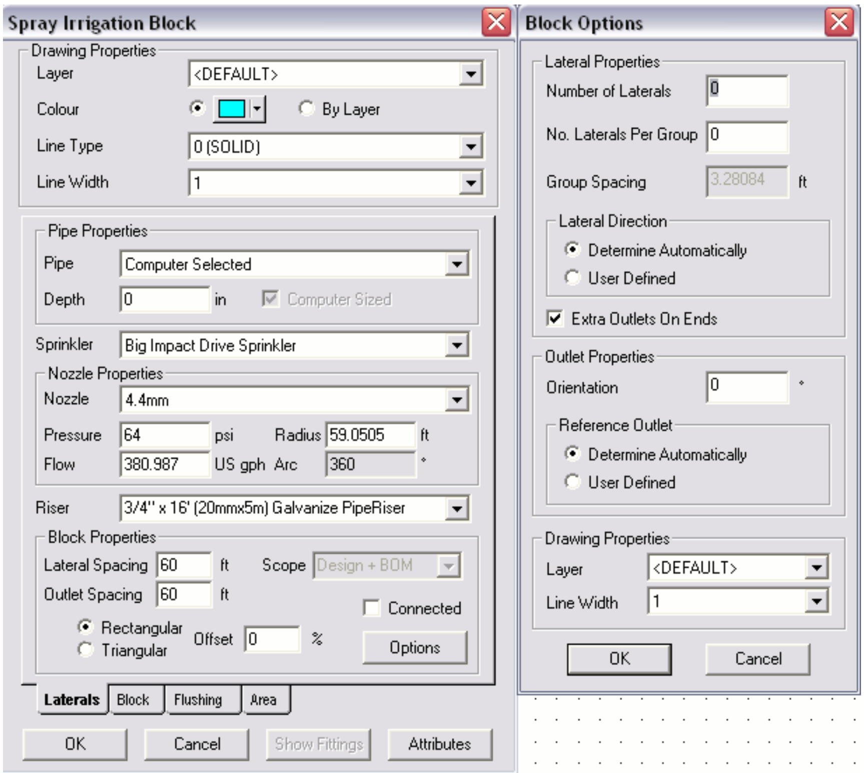


Figure 4-63

12. Click on the Block tab. The “Headlands” and “Sidelands” will be left at **0** and make sure the “Create Laterals” box is checked. The “Scope” should be **Design + BOM**. Leave the “Submain Properties” as **Computer Selected** and select the **Start** “Position” for the submain with a **5ft** (**1.5m**) “Stub Length” and a **20in** (**500mm**) “Depth”.

13. In the “Control Valve Properties” select the **4” (100mm) Gate Valve (Flanged)** with **15ft** (**5m**) “Submain Stub” and a **-4in** (**500mm**) “Depth”. Click [OK].

14. Select the bottom edge of the left most rectangle for the laterals to be aligned with. The rectangle will automatically fill with spraylines at the correct row and outlet spacing.

15. Repeat steps 10 to 14 for each of the small rectangles. The plan should look like Figure 4-64.

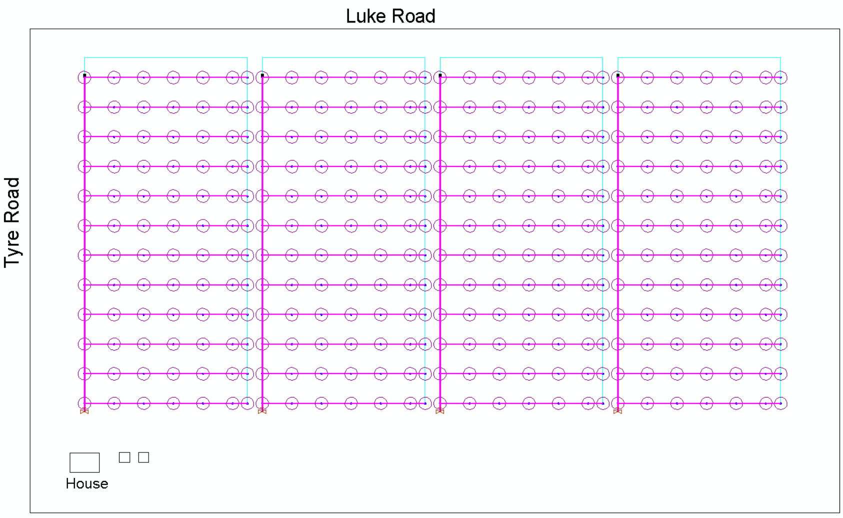


Figure 4-64

16. Select *Mainline|Pipe* and enter **20in** (**500mm**) as the "Depth" of the pipe. Click [OK] on the dialog.

17. Connect the four control valves by left clicking on each one then select *Right-click|Restart*. Because the water supply cannot be in-line on a mainline, tee-off a short piece of mainline on which to place the water supply by moving to the center of the pipe between the first 2 valves and left clicking, moving down about **65ft** (**20**m) and left click again. Move right about **16ft** (**5m**) and left click again then select *Right-click|Restart*.

18. The water supply can be positioned by selecting *Mainline|Water Supply*. Click on the end of the mainline pipe just created. Leave the *Water Supply* details at the default values. Click [OK].

We are assuming an unlimited water supply, so IRRICAD will work out the pressure and flow required from the water source. If the water supply is limited (e.g., resource restrictions), these would be entered here. See Figure 4-65.

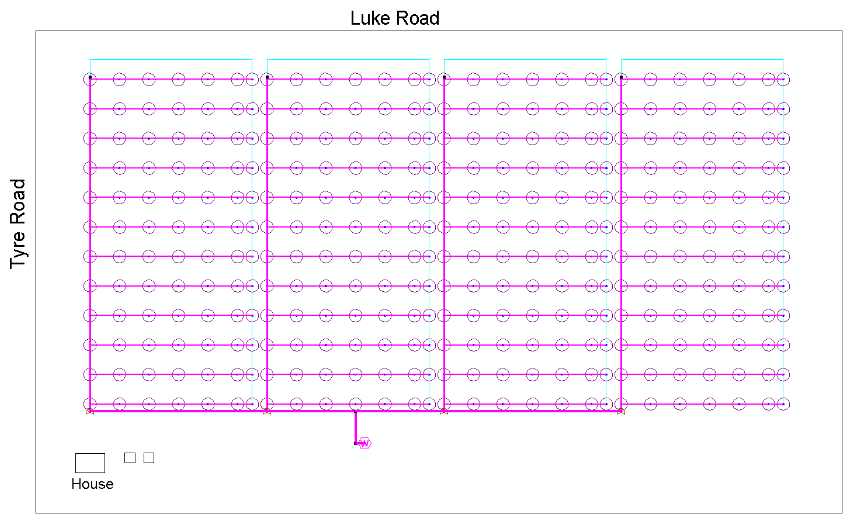


Figure 4-65

4.3.6.6 DESIGNING

Checking Connections

19. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks.*

20. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone

items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

Zone Design

21. Now select *Design|Design Parameters|Analysis Parameters*. At the bottom left of the dialog is a section headed Iterations. In the box titled "Max. for Velocity & LP" is a default of 200. Increase this value to **250** for this exercise. Under normal circumstances, if LP or Velocity Design is having problems solving the design, increase this value by 50 at a time. In *Hydraulic Parameters* check the "Max. Zone Pipe Velocity" is **6.5ft/s** (**2m/s**). Click [OK].

22. Before selecting the design process run the Database Editor by clicking on the *Start|All Programs|IRRICAD Pro|Databases*. If the Tutorial database is not your default database, it will not automatically be opened (check the file name at the top of the Database Editor window). If the opened database is not **Tutorial.mdb**, click [Save Changes] and use *File|Open* to open the Tutorial database from in the \Irricad\database folder.

23. The first component tab is the Pipe tab. Find the **4" (100mm) Class C PVC Pipe** and type **ZM** in the usage column (or highlight the pipe and select [Edit / View Pipe]. Select **ZM** from the dropdown list in the "Usage" field). [Save Changes] and close the Database Editor.

24. Select *Design|Zone Design|LP Design*. As LP is running, you will see the pipes being selected for the design.

Entering Management Requirements

25. Management data must now be entered. Select *Design|Other Management Options|Zone Operating Times*. Enter the "On Time" for each zone as 5am and the "Off Time" for each zone as 7am (e.g., **1:5:0 - 1:7:0**). Click [OK]. This type of management is more commonly used for small irrigation systems that have blocks starting and stopping at different times.

Mainline Design

26. Now run *Design|Mainline Design|LP Design*.

27. Use *Select Object* to click on a pipe. Select *Right-click|Object Info*. Check the "Hydraulic Object Info" checkbox. This info gives you the layer the pipe is on, the pipe size and the hydraulic information for the pipe since design has been run. This is a quick summary for the hydraulic object selected. More than one item can be selected at a time; however, there is a limit to how many items *Object Info* can display.

28. Go to *Design|Zone Design Configuration* and enter the "Valve Pressure" as **78psi** (**55m**) for all zones.

29. Run *Design|Zone Design|Detailed Analysis*.

This will analyze each block without making any changes to the pipe sizes already selected. *Detailed Analysis* uses an iterative process to exactly match the flow of an emitter, sprayline or control valve to the pressure at that point and therefore allows a designer to more accurately gauge how a system would perform in practice. This is especially so when the resulting pressures are substantially different from those specified. In the standard analysis mode IRRICAD uses the selected nominal flows for emitters and spraylines to calculate the flow and resulting pressures in a system. In most circumstances this method is slightly conservative. *Detailed Analysis* gives us a better picture of what is happening at the outlets. Detailed analysis can be used for zone drippers, sprinklers, and spraylines, tapes and also VIH sprinklers in mainline. There is obviously no advantage in running a detailed analysis for systems that only contain pressure compensated emitters. For using *Zone Design|Detailed Analysis*, valve pressures must be specified. For running *Mainline Design|Detailed Analysis*, a water supply pressure must be specified.

30. Re-run *Design|Mainline Design|Analyze*.

4.3.6.7 REPORTING

31. Look at the reports. Useful reports which tell you the basics of what is happening in the system at a glance are the *Reports|Zone Design Reports|Zone Design Summary* and *Reports|Mainline Design Reports|System Duty Report*.

Your Summary Report should look something like Figure 4-66, where each zone flow is approximately 459gpm (104m^3/h), the actual outlet pressure variation is 14% and the pressure loss through the valve is 0.

Zone Name :	Area no. 1		**Valve Description :**	4" (100mm) Gate Valve (Flanged)	
Zone Head (D/S) :	74.88	**(psi)**	**Zone Head (U/S) :**	74.88	**(psi)**
Total Zone Flow :	533.38	**US gpm**	**Valve Headloss :**	0.00	**(psi)**

	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure
	US gph	US gph	(psi)	(psi)
Minimum Outlet	361.94	362.57	57.03	57.26
Maximum Outlet	399.29	387.67	71.12	66.55
Outlet Variation (%)	9.35	6.47	19.80	13.97

Oulet Locations (X,Y) Minimum : 109.7 , -6.1 Maximum : 9.1 , -61.0

Zone Name :	Area no. 2		**Valve Description :**	4" (100mm) Gate Valve (Flanged)	
Zone Head (D/S) :	74.88	**(psi)**	**Zone Head (U/S) :**	74.88	**(psi)**
Total Zone Flow :	533.38	**US gpm**	**Valve Headloss :**	0.00	**(psi)**

	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure
	US gph	US gph	(psi)	(psi)
Minimum Outlet	361.94	362.57	57.03	57.26
Maximum Outlet	399.29	387.67	71.12	66.55
Outlet Variation (%)	9.35	6.47	19.80	13.97

Oulet Locations (X,Y) Minimum : 219.5 , -6.1 Maximum : 118.9 , -61.0

Figure 4-66

Look at some of the other reports for more results on the system.

To acquire a full costing report, we will want to price all the fittings as well as the design we have just laid out. Select *Design|Computer Selection of Fittings*. IRRICAD will automatically find fittings for the junctions. When this is complete, look at any of the *Costing / BOM Reports* in the *Reports* menu to find any fittings selection errors. Any junctions that could not be solved with the items currently in the database or flagged for usage will be listed at the end of the report.

See the **Correcting Fittings Errors**, Section **4.5.3** to find out how to fix these by updating the database.

4.3.7 Residential Design

This tutorial design involves siting sprinklers in a garden, and connecting them up to a zone control valve and water supply.

4.3.7.1 Starting the Tutorial

1. The first step is to start a new design. Run IRRICAD or select *File|New*.

2. Now select *Settings|Irrigation - Design Specific* and browse for the database **Tutorial.mdb**. You should find this database in the Irricad\database folder.

3. While in this dialog make sure that the "Create Wetted Radii" checkbox is checked and change the line widths to the following:
   - Laterals: 2
   - Mainline: 4
   - Zone: 3
   - Wire: 1

4. Select the Misc. tab and select the **Small** "Design Size". Enter the symbol size as **1.7ft** (**0.5m**). Click [OK].

4.3.7.2 BACKGROUND INFORMATION

We need to enter some details about the house and garden we are designing the irrigation system for. The L-shaped house is created with rectangles, and has a 5-sided conservatory on one end. We will use a grid to help us position things, though this is optional.

5. Select *Settings|Grid/Origin* and enter the "X" spacing as **16ft** (**5m**) and the "Y" spacing as **10ft** (**3m**). Check the "Display Grid Points" checkbox. In the *Snap* tab select the "Snap to Grid" option. Click [OK]. Select *View|Zoom In* twice.

6. Select *Draw|Polygon|Center* and enter **10** in the "Number of Sides" field. Select "Inscribe" and click [OK]. Click on a grid point in the top left quadrant of the screen and then move the cursor up a grid point and left click. The polygon boundary should cover 3 grid points vertically, one point at the center and one each at the top and bottom of the boundary. Select *Draw|Rectangle|2 Point*. Click on the bottom of the polygon then draw the rectangle up and to the right until it covers 4x3 grid points and is therefore **48x20ft** (**15x6m**). Left click.

7. Click on the 2nd to last box on the far right of the Status Bar which currently says "Grid". This will now change to "Connect" and turn off the Grid at the same time and is the same as changing the "Snap" option in *Settings|Snap* and turning off "Display Grid" in *Settings|Grid/Origin/GIS*.

8. Select *Draw|Rectangle|3 Point*. Select *Right-click|Snaps|Endpoint* then click on the bottom right corner of the rectangle. Now hold the <Ctrl> key down and move the mouse to the left. Let go of the mouse (be careful not to bump it so that the straight line is maintained) and type **23** (**7**) and press <Enter>. Move the cursor down and type **23** (**7**) and press <Enter>.

9. Because we wish the house and conservatory to be one object, we wish to delete the line where the two rectangles join and the polygon sides inside the rectangle. If we were to select this line or a polygon side, the whole rectangle or polygon would be selected. If we explode the objects we can delete a line at a time as required. Select *Modify|Select|All*. Both rectangles and the polygon should be green in color - meaning they are selected. Now select *Modify|Explode*.

10. Select *Modify|Select Object*. Select the five polygon sides inside the rectangle and the rectangle side inside the polygon by holding down the <Shift> key clicking on them and select *Modify|Delete*. Click [Yes] to confirm deletion of the selected objects.

11. Click on the rectangle line where the rectangles meet (make sure only the short side is selected) and select *Modify|Delete*. Click [Yes] to confirm deletion of the selected objects. One line will be deleted.

12. The second line is the complete side of the horizontal rectangle. Select *Modify|Break*. Click on the line. Select *Right-click|Snaps|Endpoint* and click where the line meets the right-hand side vertical line of the two rectangles. Select *Right-click|Snaps|Intersection* and place the cursor on the inner corner where the second rectangle starts and left click. The line between has been erased. The house should look like Figure 4-67.

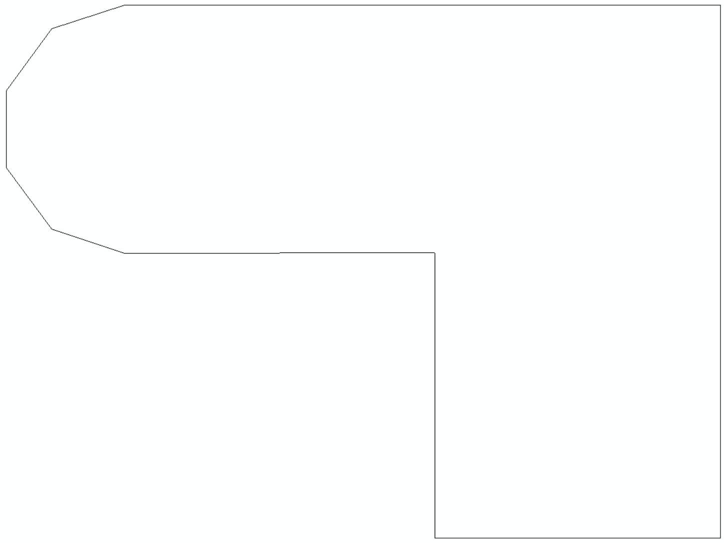


Figure 4-67

The bottom right hand side of the house is a garage. The driveway runs from here straight down to the road. A path continues from the drive up the side of the house to the front door. To draw these items in, we will use a double line for the driveway, and a single line to continue the path.

13. The width of the house at this point is approximately 23ft (7m). The path will be 3ft (1m) wide. Select *Draw|Line|Double*. The “Left Offset” will be **0**; the “Right Offset” will be **26ft** (**8m**). Click [OK].

14. Select *Right-click|Snaps|Endpoint*. Place the cursor at the bottom right hand corner of the house, left click and draw the double lines downward. Type **11.5,<270** (**3.5,<270**) and press <Enter>. Select *Right-click|Done*.

15. Select *Draw|Line|Single* then select *Right-click|Snaps|Endpoint*. Place the cursor on the top of the left-hand double line you have just drawn and left click. Type **23,<90** (**7,<90**) and press <Enter>.

16. A sidewalk runs along the road at the bottom of the drive. Using double lines again, draw a sidewalk 3ft (1m) wide. Select *Draw|Line|Double*, leave the “Left Offset” as **0**, but change the

"Right Offset" to **3ft** (**1m**), select *Right-click|Snaps|Endpoint*. Place the cursor at the bottom right-hand side of the drive left click and type **6,<0** (**2,<0**) and press <Enter>. Select *Right-click|Done*.

17. Now select *Draw|Line|Double* again, and reverse the left and right offsets, making the "Left Offset" **3ft** (**1m**) and the "Right Offset" **0**. Click [OK]. Select *Right-click|Snaps|Endpoint* and place the cursor at the bottom left-hand side of the drive, left click, type **66,<180** (**20,<180**) and press <Enter>. If you cannot move this far to the left without going off the edge of the screen use your mouse wheel to zoom out. Select *Right-click|Done*. Select *View|Zoom All*.

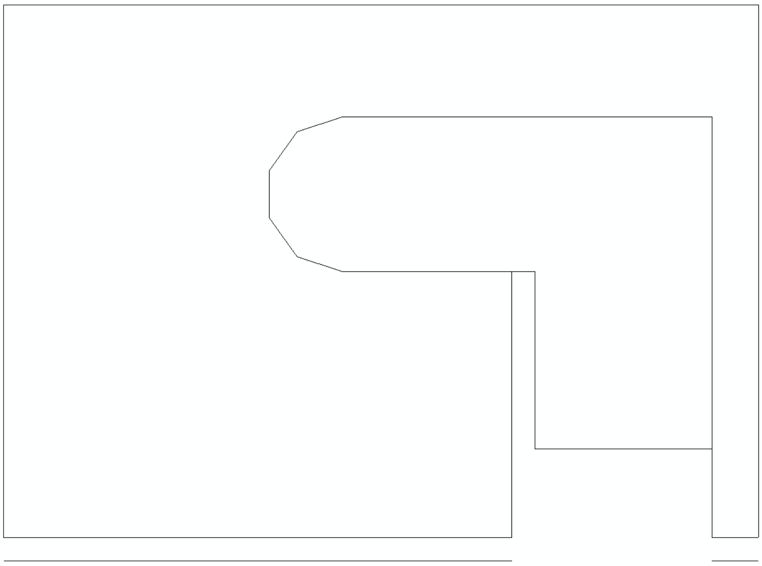


Figure 4-68

18. Using *Draw|Line|Continuous* specify the property boundary so that it looks like Figure 4-68. Select *Right-click|Snaps|Endpoint*. Place the cursor at the left top of the sidewalk left click and type **69,<90** (**21,<90**) and press <Enter>. Now type **98,<0** (**30,<0**) and press <Enter>. Select *Right-click|Snaps|Endpoint* then left click near the sidewalk to place the line the sidewalk on the right hand side of the house. Select *Right-click|Restart*. Select *File|Save* and save the design.

19. Along the right-hand side of the house and drive is a row of shrubs. Select *Draw|Symbol*. In the dialog you will see a [Load] button. Click this button and select **BROWN SHRUB** and **BROWN TREE** from the list of symbols (hold the <Ctrl> key down to enable multiple selections). Click [Open]. Make sure that **BROWN SHRUB** is selected. Leave the "Maintain Shape" checked but uncheck the "Dynamically Size" box and enter the "Width" as **5ft** (**1.5m**). Click [OK].

20. Move to the bottom right of the property and left click to place a shrub between the house and the boundary. Select *Modify|Copy|Linear* and click on the shrub symbol. Enter **7** as the number of copies and click [OK]. Click the center of the symbol and drag the copies vertically upwards to evenly space them along the boundary next to the house. (You can hold the <Ctrl> key down to achieve a straight line.) Left click to place.

21. Select *Draw|Symbol* and select **BROWN TREE** from the drop down list. Check the "Dynamically Size" box. Click [OK]. Place a tree in the top right corner of the property by clicking on the corner of the boundary, and dragging the symbol size out until it is a suitable size. Left click to place.

22. By using *Draw|Curve|Continuous Bezier* draw a garden area around the bottom and left sides of the property boundary. Make the garden approximately **10ft** (**3m**) wide. By clicking the cursor on the screen, you can place the curve as required. When finished, select *Right-click|Done*. In the same way, draw a garden area around the conservatory about **7ft** (**2m**) wide. You will probably find it useful to set the Circular Cursor (*Settings|Cursor* and check the "Display Circle" box) to **10ft** (**3m**) or **7ft** (**2m**) respectively as required.

23. Place some **BROWN SHRUB** symbols **3ft** (**1m**) in size (*Draw|Symbol*), as described above, along the garden boundary parallel with the sidewalk. See Figure 4-69.

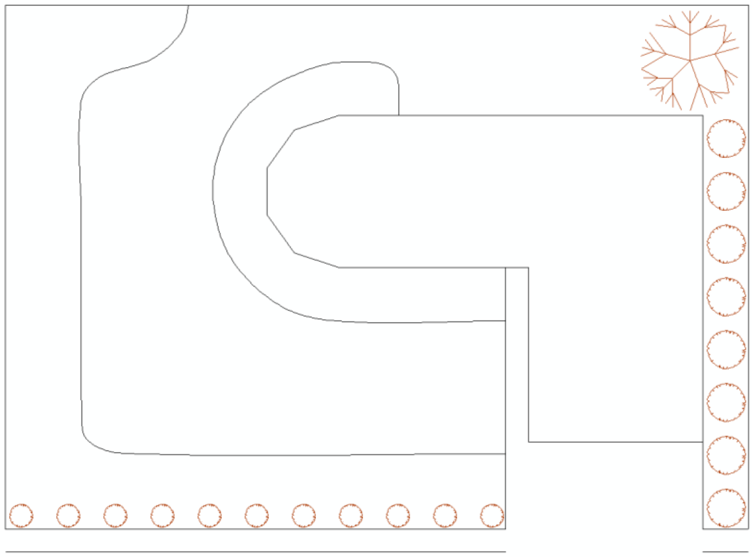


Figure 4-69

4.3.7.3 PLACING SPRINKLERS AND DIVIDING INTO ZONES WITHIN THE AVAILABLE WATER RANGE

The requirements for irrigating the garden involve irrigating the lawn and the garden.

24. To help orientate the sprinklers, select *Zone|Area* and draw two area boundaries, one around each piece of garden. To draw an area place the cursor at a boundary point, left click, then trace over the lines and curves, left clicking where required. Close the area by selecting *Right-click|Close*. Ignore the "Max. Intensity" and "Depth / Volume" values as we are using areas only for orientating arcs. Make sure the "Set Arc Orientation Using Area" checkbox is checked. Click [OK].

25. Select *Zone|Sprayline*. In the Sprinkler edit box, leave the pipe as **Computer Selected** and enter a "Depth" of **12in** (**300mm**). Leave the "Scope" and **Design + BOM**. Select the **Garden Spray Sprinkler** from the dropdown list. The default nozzle (**10 garden**) is the only "Nozzle" available with this outlet. Change the "Pressure" to **20psi** (**14m**). Note that the "Radius" **10.8ft**

(**3.3m**) will adequately water the garden. Change the "Arc" to **180º**. Do not select a "Riser" for the outlet, as this is optional and not required in this case. Enter the "Outlet Spacing" as **10ft** (**3m**). Uncheck the "Connected" box. Click the [Options] button and uncheck the "Fixed Spacing" box so IRRICAD will adjust the sprinklers to fit the required area. Click [OK] on both dialogs.

26. Move to the bottom right corner of garden area, just within the area boundary on the driveway side. Click to place the start of the sprayline. Move just inside the bottom left corner and click again. Go to the top left corner, click and then extend the sprayline along the top boundary about **10ft** (**4m**). Click to place, and then select *Right-click|Restart*. If the sprayline is snapping to the area boundary and the arc is not being orientated to inside the area, select *Right-click|Snaps|Place* before left clicking to place each point inside the area.

27. Place a sprayline around the conservatory garden starting next to the path along the garage, placing the sprayline next to the house, again, just inside the area. Several of the wetted radius arcs of the sprinklers in the conservatory garden do not touch the area. Although this is physically correct since the sprinklers cannot spray water around corners we will change the arcs to make the drawing look better. This is purely cosmetic. Using *Modify|Change* click on an arc that needs changing. Arcs are measured anti-clockwise from the horizontal (0º) so if the start of the arc needs adjusting edit the "Start Angle" field. If the end of the arc needs adjusting edit the "Included Angle" field. Click [OK]. You may need to do this several times to get the arc positioned correctly. Repeat for any other arcs that need adjusting. Your design should look something like Figure 4-70.

28. We are now ready to place the lawn sprinklers. Delete the Areas around the gardens. You can use *Modify|Selection Filter* to do this. Select **Area** as the "Type" and check the "Filter" checkbox. Select *Modify|Select|All* and press the <Delete> key. Go back to *Modify|Selection Filter* and uncheck the "Filter" checkbox.

<u>Note</u>: A shortcut to Modify|Selection Filter is to right-click on the last box of the Status Bar (far right). Here you can turn the filter On, Off or adjust the Filter Settings. You can turn the filter off simply by left-clicking on this box and the red fill will disappear – instantly showing you that the filter is no longer on.

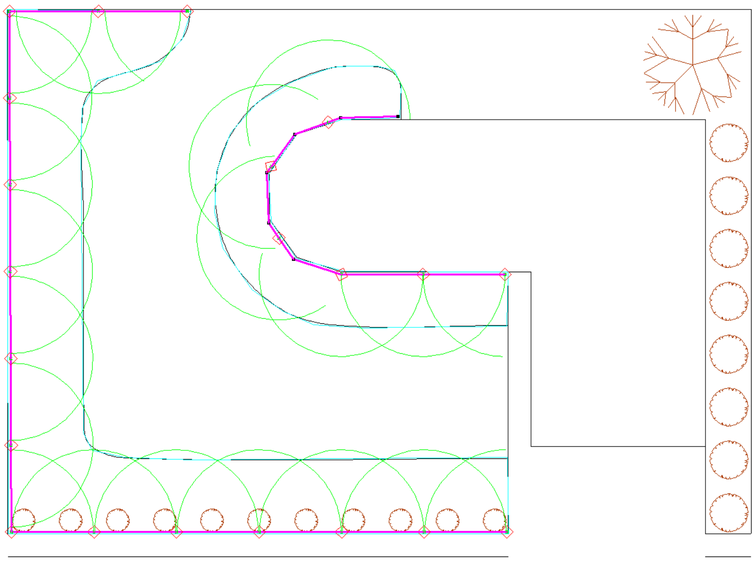


Figure 4-70

29. Select *Zone|Area* and draw an area that will encompass all the lawn area. Check the "Set Arc Orientation Using Area" checkbox. Click [OK].

30. Select *Zone|Sprayline*. Leave the pipe as **Computer Selected** and enter a "Depth" of **12in** (**300mm**). Leave the "Scope" and **Design + BOM**. Choose the **Lawn Pop-Up Sprinkler**. Select the **13** "Nozzle" from the dropdown list and change the "Pressure" to **35psi** (**25m**). Type in **180º** for the "Arc". Do not select a "Riser". Enter the "Outlet Spacing" as **13ft** (**4m**). Make sure the "Connected" checkbox is unchecked and also the "Fixed Spacing" box in the [Options] dialog. Click [OK].

31. Draw the spraylines just inside the lawn boundary. Start at the right of the end of the top conservatory garden. Follow the edge of the house, then the right boundary, top boundary and the garden edges (within the Area you have drawn), clicking at each change of direction to place the sprayline. Select *Right-click|Restart* at the top end of the conservatory garden. Delete the pipe back to the last sprinkler (do not do this elsewhere, only back to the last lawn sprinkler placed). Use *Zone|Outlet* to place

a full circle **Lawn Pop-Up Sprinkler** in the center of the larger lawn to ensure good coverage.

32. Adjust any arcs as required. Note, depending on the actual dimension of your design and the placement of the house etc, select outlets with the required radius as needed. If you have a larger area of lawn, select a different nozzle that gives you a larger radius of throw. Note that any outlet can be deleted, placed (select *Zone|Outlet*) or moved to achieve better coverage. See Figure 4-71.

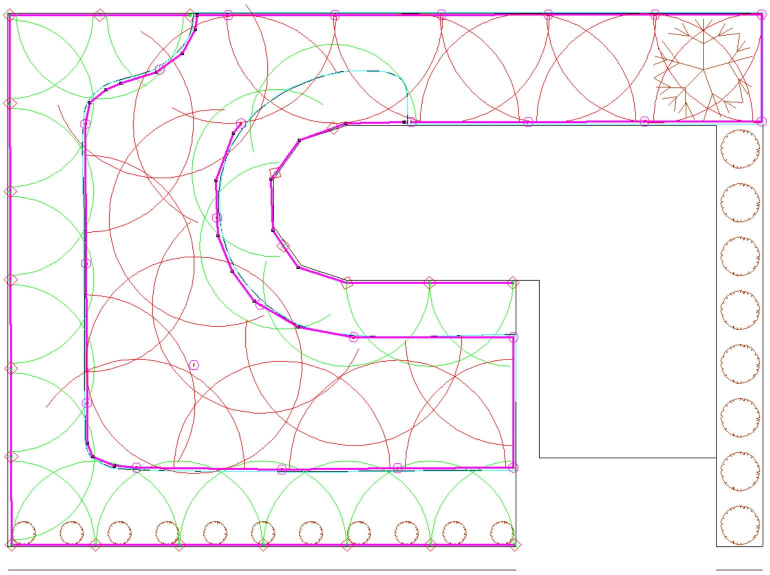


Figure 4-71

33. We wish to place a tape to water the shrubs at the side of the house. The first step is to set up the database to enable the drip tape to be used. Run the IRRICAD database editor either from your desktop or from the *Start|All Programs|IRRICAD|IRRICAD 9 Pro Databases*. When the database editor has finished loading the current default database, click the [Save Changes] button. In the screen that remains, select *File|Open*. Browse for the **Tutorial.mdb** database in the Irricad\database folder. Click the [Open] button.

34. Now select the Tapes tab at the top of the screen. Highlight the **Drip Tape 0.17/100' (1.65lph)** and select the [Edit / View]

button. Change the "Usage" to **L** and the spacing at the bottom of the dialog from 4.1ft (1.25m) to **1.6ft** (**0.5m**). Click the [Save] button on this dialog, and then the [Save Changes] button on the main dialog. Exit the database editor.

35. Select *Zone|Tape* and from the dropdown list select the **Drip Tape 0.17/100' (1.65lph)**. Set the inlet pressure to **14psi** (**10m**). Do not check the "Regulated" checkbox as this tape is not pressure regulated at the inlet. Click [OK] and draw a tape through the line of shrubs at the right-hand side of the house, from about the middle of the bottom shrub up to the middle of the top shrub. Select *Right-click|Restart*. See Figure 4-72.

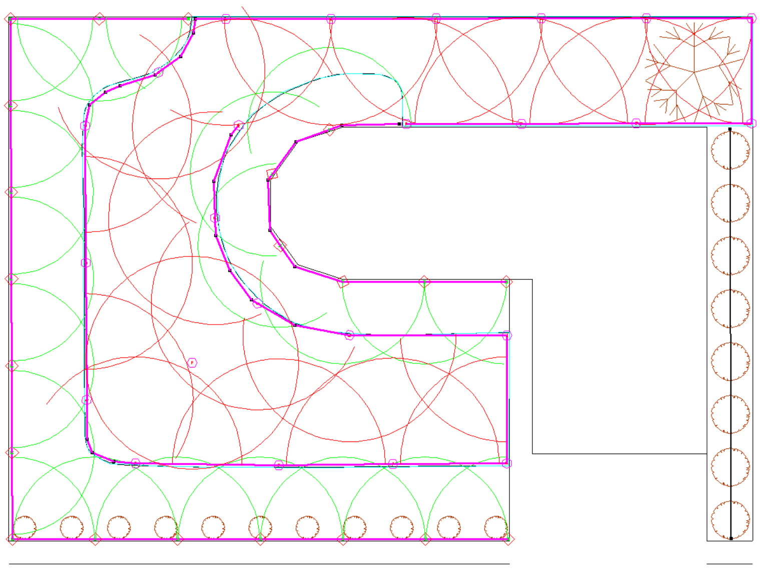


Figure 4-72

36. Select *Zone|Pipe*, and leaving the pipe as **Computer Selected**, enter a "Depth" of **12in** (**300mm**). Connect this pipe to the start of the tape and draw it upward to just below the sprayline. Do not connect to the sprayline. You may wish to use *Right-click|Snaps|Place* to avoid connecting to the sprayline.

Because we have a maximum flow rate of 6gpm (1.4m^3/h), this limits how many sprinklers we can have running at any one time. Because the garden and lawn sprinkler zones have a water requirement greater than the maximum available flow, we are required to create more zones.

To do this we will be cutting out sections of existing zone pipe, adding control valves and mainline pipes to join to the water source. When we have completed the changes, there will be six zones on this property: The lawn to the right of the water supply, the shrubs with drip tape, the conservatory garden, the front garden piece, the left side garden, and the main lawn piece.

37. First we will enter a water supply to signify the tap that will supply the sprinklers. Select *Mainline|Water Supply* and place the water supply on the house wall boundary close to the end of the conservatory garden (see Figure 4-73). In the *Water Supply* dialog enter the "Name" as **Mains Supply 1**, the "Design Head" of **50psi** (**35m**) and "Maximum Head" as **60psi** (**42m**), the "Design Flow" and "Maximum Flow" as **7gpm** (**1.6m3h**). Though the tap will be above ground level we have not worried about that in this example.

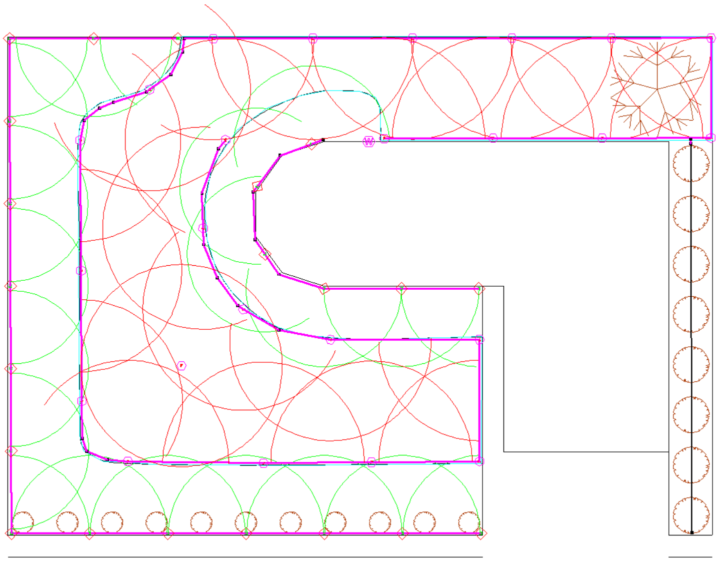


Figure 4-73

38. Select *Zone|Control Valve*. Select a **1" (25mm) Electric Valve** from the dropdown list and enter a "Depth" of **12in** (**300mm**) and click [OK]. Click on the zone pipe end after the top conservatory garden sprinkler to connect the valve.

39. Use *Modify|Select Object* and click on the pipe between the second and third garden sprinkler from the left on the bottom boundary. Press the <Delete> key. Select *Zone|Pipe* and connect a **Computer Selected** pipe at **12in** (**300mm**) "Depth" to the third sprinkler mentioned above. Extend this pipe approx. **3ft** (**1.0m**). Click to place then select *Right-click|Restart*. Select *Zone|Control Valve*. The **1" (25mm) Electric Valve** should still be selected. Place a valve on the end of the pipe you have just drawn.

40. Place another valve at the top of the design on the garden sprayline directly above the valve you have just placed.

41. Now connect two valves to the pipe above the water supply. Place them opposite the water supply, one a little to the left and one a little to the right. Select the piece of pipe between them and delete.

42. Lastly, connect a valve to the top of the pipe connecting to the tape. See Figure 4-74.

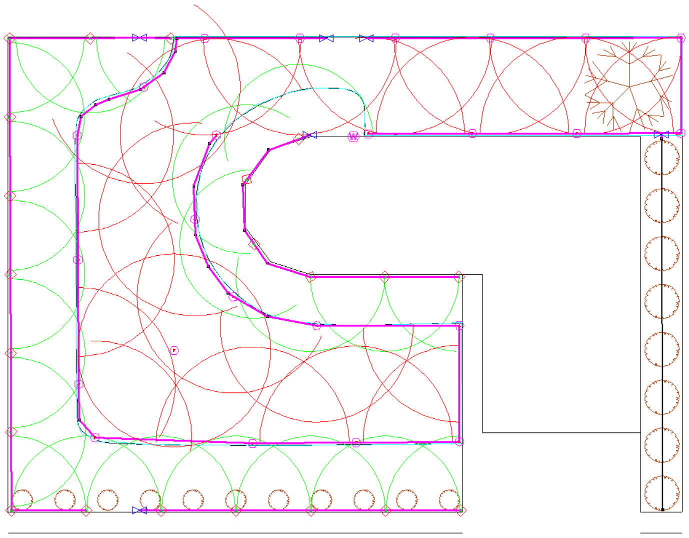


Figure 4-74

4.3.7.4 Connecting the System

43. We will now connect the valves with mainline pipes. Select *Mainline|Pipe* and select the **1" Class 125 PVC Pipe** and enter a "Depth" of **12in** (**300mm**). Because we know what pipe size we want to use, we have selected it. Click [OK].

44. We need to zoom in near the water supply. Select *View|Zoom Window* and draw a window around the valves near the water supply and the water supply itself. Connect a mainline pipe between the two valves at the top of the design above the water supply by left clicking on them then select *Right-click|Restart*.

45. Left click on the water supply and draw the pipe vertically up to connect to the pipe you have just drawn between the valves. Left click on the pipe then select *Right-click|Restart*. Left click on the valve in the conservatory garden near the water supply and draw the pipe horizontally to connect to the mainline pipe from the water supply. Make sure the pipe does not snap to the center of the water supply itself, as only one pipe can connect to the water supply. If this happens, select the pipe and delete it. Start again, but this time before connecting to the mainline pipe coming from the water supply use your mouse wheel to zoom in on the water supply. Now connect to the existing mainline pipe. Left click on this pipe then select *Right-click|Restart*. Select *View|Zoom All*.

46. Connect a pipe between the two garden valves at the top and bottom by left clicking on them then select *Right-click|Restart*.

47. Select *View|Zoom Window* and draw a window around the three valves along the top boundary. Tee off the left-hand side vertical mainline pipe by left clicking on it about **1.5ft** (**0.5m**) below the valve and draw the pipe horizontally to connect to the right-hand side vertical mainline pipe, left click then select *Right-click|Restart*. Select *View|Zoom All*.

48. Select *View|Zoom Window* and drag a window to encompass the water supply and the tape valve. Select *Mainline|Pipe* again and connect to the valve by left clicking on it. Left click again to connect the valve to the mainline pipe above the water supply.

49. There is still an unconnected sprinkler in the middle of the lawn. Due to the water limitation it cannot be attached to any of the other zones. Place a valve on the mainline pipe across from the sprinkler and draw a zone pipe from the valve to connect to the sprinkler. Your garden design should look like Figure 4-75.

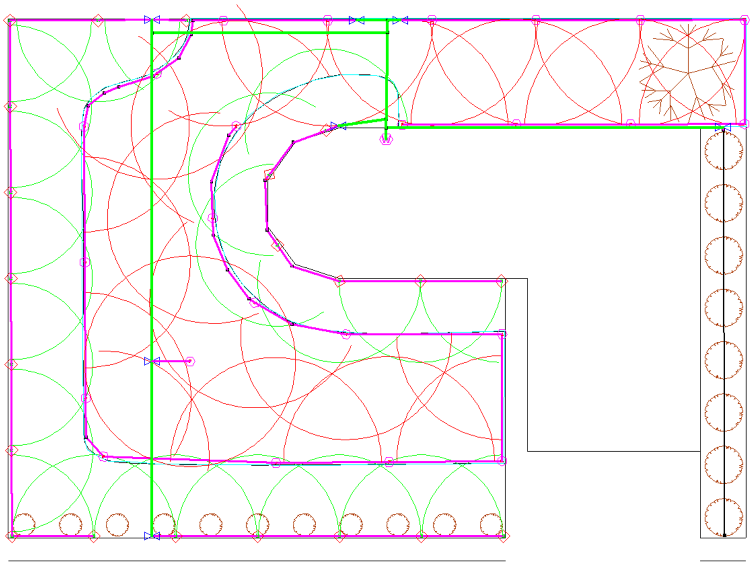


Figure 4-75

4.3.7.5 The Design Process

Checking Connections

50. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks.*

51. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to

the pipe. Select the valve, water supply or outlet (*Modify|Select Object* and click on the item) and move the item to the center of the junction (*Modify|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check that the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

Zone Design

52. We wish to size the zone pipes, so select *Design|Zone Design|LP Design*. Look at the *Reports|Zone Design Reports|Zone Design Summary* report to see what is happening in the zones. The results should be similar to Figure 4-76. You will notice that the zone flow for the tape zone is 0m^3/hr. This is due to the low flow and the rounding of the numbers in the report. Click the X to close the report window.

Zone Name :	Zone no. 1		**Valve Description :**	1" (25mm) Electric Valve	
Zone Head (D/S) :	20.19	**(psi)**	**Zone Head (U/S) :**	20.19	**(psi)**
Total Zone Flow :	4.20	**US gpm**	**Valve Headloss :**	0.00	**(psi)**

	Allowable Flow (US gph)	Actual Flow (US gph)		Allowable Pressure (psi)	Actual Pressure (psi)
Minimum Outlet	44.92	20.61	***	19.91	20.05
Maximum Outlet	47.33	50.72	***	21.28	20.30
Outlet Variation (%)	5.09	59.36	***	6.44	1.23
Oulet Locations (X,Y)	Minimum :	-12.9 , 91.3		Maximum :	-20.0 , 97.4

Zone Name :	Zone no. 2		**Valve Description :**	1" (25mm) Electric Valve	
Zone Head (D/S) :	20.03	**(psi)**	**Zone Head (U/S) :**	20.03	**(psi)**
Total Zone Flow :	3.12	**US gpm**	**Valve Headloss :**	0.00	**(psi)**

	Allowable Flow (US gph)	Actual Flow (US gph)		Allowable Pressure (psi)	Actual Pressure (psi)
Minimum Outlet	41.53	20.65	***	19.91	20.05
Maximum Outlet	43.75	41.90		21.28	20.14
Outlet Variation (%)	5.09	50.71	***	6.44	0.46
Oulet Locations (X,Y)	Minimum :	-12.9 , 81.0		Maximum :	-26.1 , 81.0

Figure 4-76

Entering Management Requirements

53. Now select *Design|Assign Each Zone to a Unique System Flow* and check that there are 7 system flows and each zone is operating on a separate system flow, like Figure 4-77 shows. Click [OK].

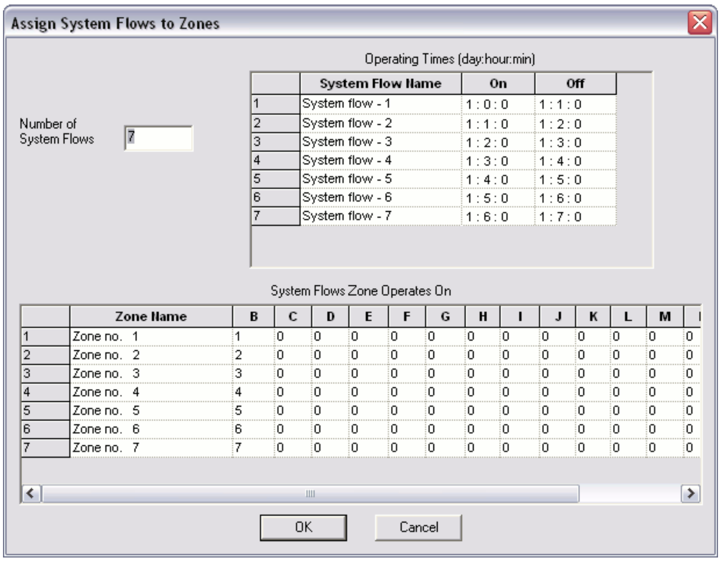


Figure 4-77

Mainline Design

54. Now select *Design|Mainline Design|Analyze* to analyze the mainline pipes.

55. To have IRRICAD select fittings for the design, select *Design|Computer Selection of Fittings*. Select a *Costing / BOM Report* to view any fitting selection errors. For information on how to fix fittings selection errors, see **Correcting Fittings Errors**.

4.3.8 WHEEL LINE DESIGN

This tutorial explains how to configure IRRICAD to design a Wheel Line irrigation system with a complete bill of materials.

The IRRICAD functions in this type of design include:

- Spraylines
- Database assemblies
- Demand points
- Assign system flows in management

An understanding of these functions is necessary for this exercise. If you are not familiar with these functions, please read the relevant sections of the on-line help (*Help|Help Topics*).

This example will go over the design of a typical quarter mile (400m) wheel line.

4.3.8.1 Overview

An example wheel line system is shown in Figure WL1. In IRRICAD the wheel line is entered in the Zone layer as a control valve and the idle hydrants are entered as demand points in the Mainline layer. Each hydrant becomes a zone. If a system has two wheel lines, they would both be entered as spraylines and there would be two active hydrants. See Figure 4-78.

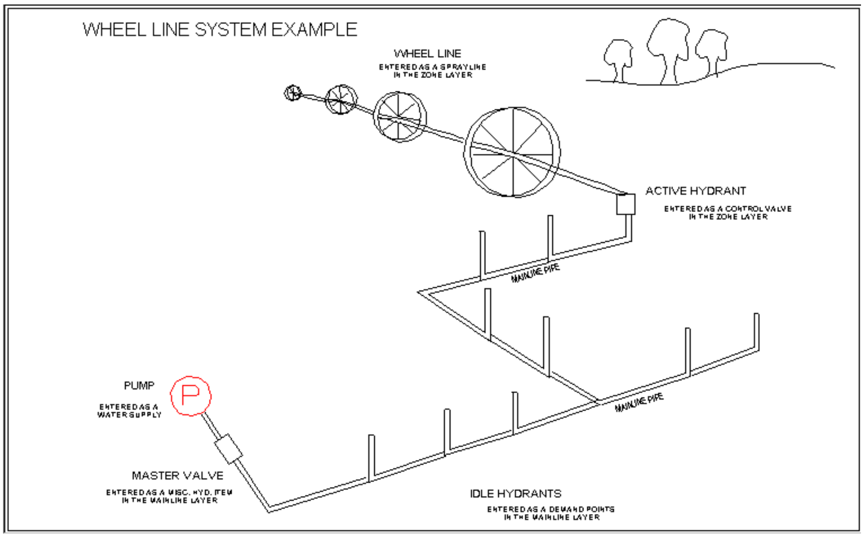


Figure 4-78

The *Assign Zones …* option in the *Design* menu is used to tell IRRICAD which zones will operate together. Any combination of hydrants can be analyzed.

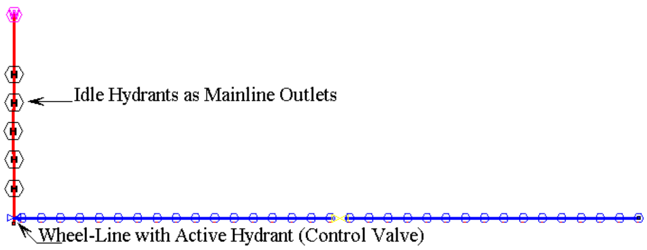


Figure 4-79

The layout of the typical quarter mile (400m) wheel line that will be used for this exercise is shown in Figure 4-80.

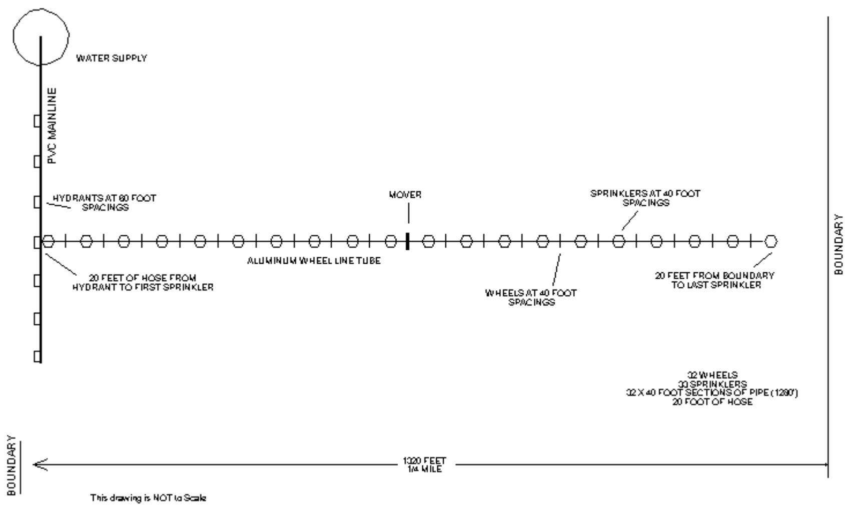


Figure 4-80

4.3.8.2 Starting the Tutorial

1. Run IRRICAD or start a new design by selecting *File|New*.

2. Select *Settings|Miscellaneous*. Select the **Medium** "Design Size", which will change the "Base Database Symbol Size" to **16.4ft** (**5m**). Click [OK].

3. Select *View|Zoom Out* twice to ensure that the sprayline can be entered in one action.

4.3.8.3 PLACING THE WHEEL LINE

4. Select *Settings|Irrigation Items - Design Specific*. Make sure the "Create Wetted Radii" and "Create Sprayline Outlets" check boxes are checked. Click [OK].

6. Select *Zone|Sprayline*. Select the **4" (100mm) Aluminum Wheel Line Tube** from the list of pipes by pressing the down arrow, moving the cursor down the list and clicking the left mouse button when the required item is highlighted. Uncheck the "Computer Sized" check box and leave the "Depth" at **0**.

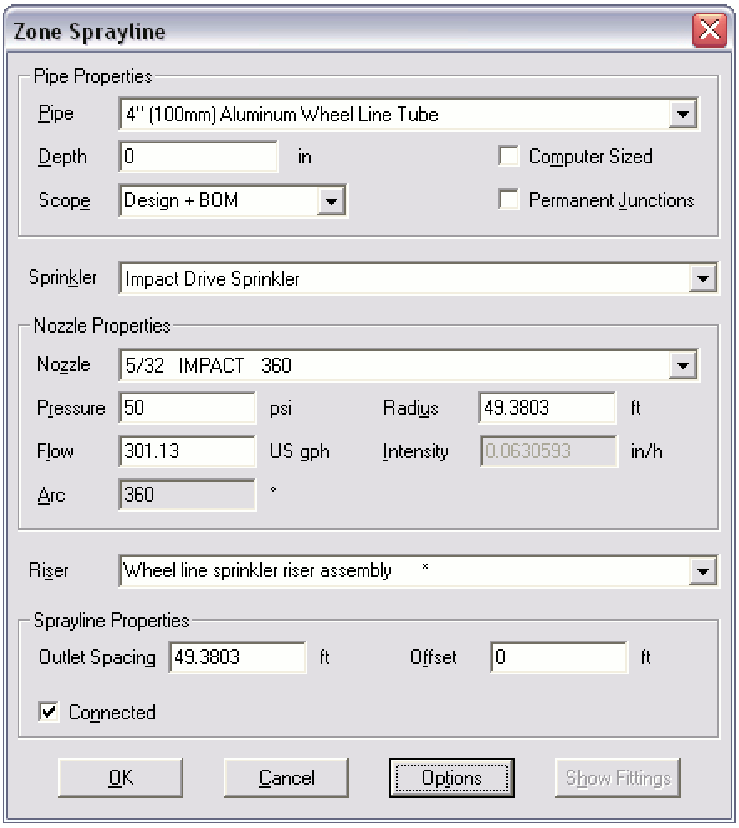


Figure 4-81

6. For the “Sprinkler”, select the **Impact Drive Sprinkler** from the dropdown list. Now select the **$^{5}/_{32}$ IMPACT 360** “Nozzle” from the nozzles that are associated with this sprinkler. Enter the “Pressure” as **50psi** (**35m**) as in Figure 4-81.

7. Select the **Wheel Line Sprinkler Riser Assembly** as the “Riser”. Now type in **40ft** (**12m**) for the “Outlet Spacing” and leave the “Offset” as **0**. Leave the “Connected” check box as checked.

8. Now click the [Options] button at the bottom of the dialog. In the next dialog, leave the “Layer” as <DEFAULT> and change the “Line Width” to **2**. Leave the “Orientation” as **0** and make sure that the “Fixed Spacing” check box is checked. Click [OK] on both dialogs.
9. Move your mouse to the far right of the screen about half way up. Place the start of the wheel line by clicking the left mouse button. Move the mouse horizontally across the screen and watch the distance at the bottom of the screen. When d= **1298ft** (**396m**) position the other end of the wheel line by clicking the left mouse button, and then selecting *Restart* from the *Right-click* menu.

The distance of 1298ft (396m) is significant. It can be anywhere between 1290ft (393m) and 1300ft (397m) but must not be greater than 1300ft (397m) or less than 1280ft (390m). The reason for this is that aluminum pipe is in 40ft (12m) lengths and there will be 1280ft (390m) in this design. There is normally 20ft (7m) of hose from the hydrant to the wheel line so the total length is about 1300ft (397m). This hose is not drawn on the plan, but is included in an assembly. If you draw the wheel line in at 1298ft (396m), the plan will show pipe from the sprinkler to the hydrant. IRRICAD will round this distance up to 1300ft (397m) in the bill of materials and we will use [Show Fittings] to add in -20ft (-7m) to trim it back to the required 1280ft (390m). This makes the plan look right and the bill of materials right.

10. The wheel line with sprinklers is now drawn on the screen. Use *Reports|Show Flow* to confirm the flow rate. Select *Reports|Show Flow* then draw a lasso around the wheel line by left clicking near one end then moving near the other end and left clicking again then moving down / up and left clicking then to near the first point and left clicking then selecting *Right-*

click|Close. There should be 33 outlets and a flow of about 165gpm (37.5m^3/h). Click the [Close] button to close the dialog.

4.3.8.4 Placing the Hydrants

11. To place the hydrant on the end of the wheel line select *Zone|Control Valve* and select the **Wheel line 4" (100mm) active hydrant assembly**. Leave the "Orientation" and "Depth" as **0**. Click [OK]. Place the control valve on the left hand end of the wheel line by left clicking the mouse and give the zone a "Name" such as **Active Hydrant 1**.

12. The other idle hydrants will be spaced 60ft (18m) apart on a mainline. These hydrants are entered in the mainline layer as demand flows. To make it easier to place them 60ft (18m) apart a grid can be set up. We need to align the grid with the hydrant valve. Place the cursor exactly on the valve and note down the coordinates (x,y =) displayed on the status bar. Select *Settings|Grid / Origin* and enter the "X" and "Y" spacings as **60ft** (**18m**). Check the "Display Grid Points" check box. Enter the "X" and "Y" "User Origin" as the coordinates of the hydrant valve. In the *Snap* tab select the "Snap to Grid" option. Click [OK].

13. Select *Mainline|Outlet* and find the **Demand Flow** "Sprinkler" in the drop down list. Select it and change the "Pressure" to **58psi** (**40.8m**) and the "Flow" to **165gpm** (**37.5m^3/h**). Select a **Capital H** for the hydrant "Symbol". These are the pressures and flows that you want available in the mainline at the hydrants. The pressure is an upstream pressure not a downstream pressure. A pressure of 58psi (40.8m) will allow for any losses through the hydrant and still give adequate pressure at the start of the wheel line. The pressure that you set here is really up to you, but on flat ground it should be higher than the sprinkler pressure that you have set in the sprayline.

14. Select the **Wheel line 4" (100mm) idle hydrant riser assembly** in the "Riser" field. Leave the "Orientation" as **0**, and click [OK].

15. Now position your mouse on one grid point above the wheel line hydrant by left clicking. Because mainline outlets are valve-in-head sprinklers, you will be asked to enter a zone name. Enter a

zone name such as Idle Hydrant 1. Move one grid point above that one and place another hydrant (Idle Hydrant 2).

4.3.8.5 Placing the Mainline and Water Supply

16. Select *Mainline|Water Supply* place on the screen two grid points above your top hydrant with a left click. Leave the water supply data as the default. Click [OK].

17. Select *Settings|Snap* and turn off the "Snap to Grid" option by selecting "Connect". Click [OK].

18. Select *View|Zoom Window* and draw a window around the water supply and the hydrants. Select *Mainline|Pipe*. Leave the selected pipe as **Computer Selected** and the "Depth" as **0**. Click [OK] and go to the water supply on the screen.

19. Connect the pipe to the water supply and to all the hydrants by left clicking the mouse each time the pipe passes over a hydrant, and draw a straight line through all the hydrants ending with the active hydrant. Connect about 10ft (3m) of mainline pipe past the last hydrant. This will allow IRRICAD to tee the mainline into the last hydrant rather than elbow into it. Select *Right-click|Restart*. See Figure 4-82.

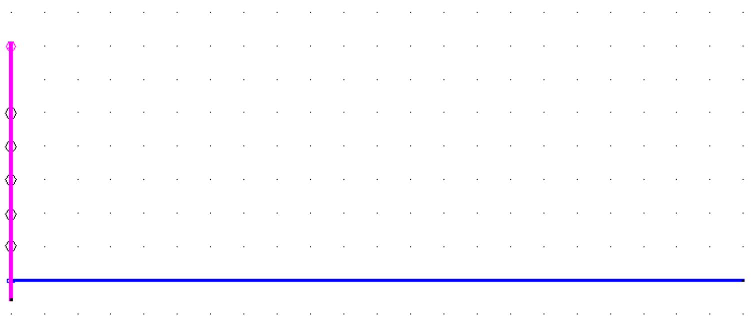


Figure 4-82

4.3.8.6 The Design Process

20. Select *Design|Check Outlet Connectivity*. IRRICAD checks to make sure that outlets are connected to a water supply.

21. Now select *Design|Zone Design Configuration*. In the far column set all the "Valve Pressures" to **58psi** (**40.8m**). This means you are fixing the valve pressures rather than letting them find their own levels. Click [OK].

22. Select *Design|Zone Design|Analyze*. You set the sprayline to **4" (100mm) Aluminum pipe** so you just have analyzed it rather than computer size the pipe.

23. Select *Design|Assign Each Zone to a Unique System Flow*. You have placed 6 hydrants in total so there will be 6 system flows. Each hydrant will operate on its own. IRRICAD automatically gives each system flow one hour and assigns each hydrant to its own system flow as in Figure 4-83. Leave the times at one hour. Click [OK].

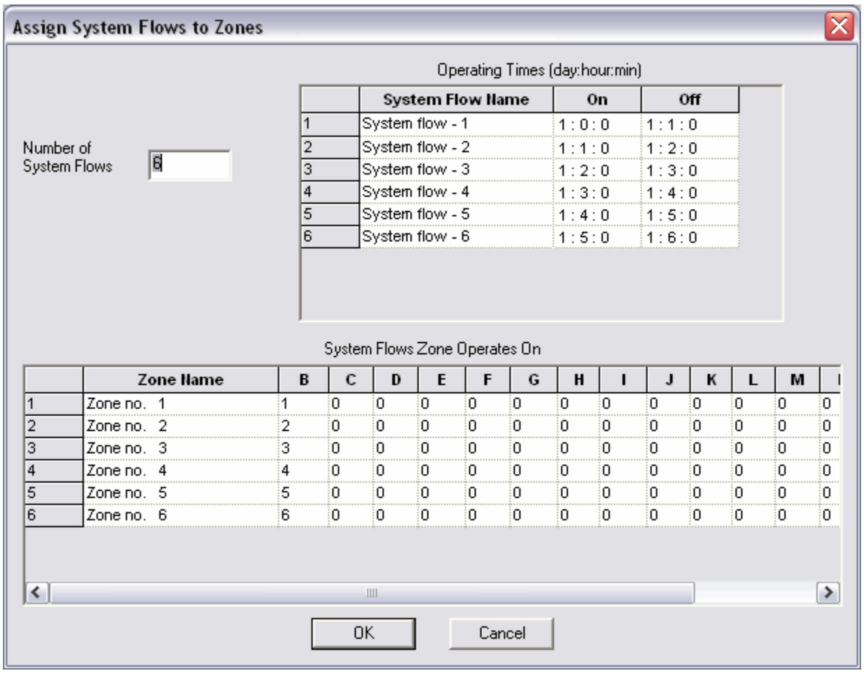


Figure 4-83

24. Lastly select *Design|Mainline Design|LP Design*. The pipes are now sized and analyzed.

25. Zoom into the end of the mainline by selecting *View|Zoom Window* and dragging a window around the area including the end of the mainline. Notice that the piece of pipe past the last hydrant has not been sized. IRRICAD will not size pipes with zero flow. Select *Modify|Select Object*. Now click on the piece of pipe that has not been sized. Select *Modify|Change* and change the pipe to the same as the sized mainline (**4" Class 125 PVC Pipe**). Click [OK].

26. Select *View|Zoom All*. Now select *Zone|Misc. Hydraulic* and find the **Wheel Line Mover assembly** in the dropdown list. Click [OK]. Select *View|Sprayline Outlets*. Place the misc. hydraulic item on the wheel line between two sprinklers half way along the sprayline.

27. Since some changes have been made, the hydraulics need to be recalculated. Select *Design|Zone Design|Analyze*. Now run *Mainline Design|Analyze*.

28. To look at the pressures and flows in the system, look at the Design reports. Select *Reports|Mainline Design Reports|System Duty*, which will show you the pressure and flow required from the water supply to met each system flows needs. The *Reports|Zone Design Reports|Zone Summary* report will show you the minimum and maximum pressures in the wheel line and also the pressure loss through the hydrant. Close the reports by clicking on the X.

29. The *Reports|Zone Design Reports|Zone Design Full* report gives a more detailed list of pressures and flows in the wheel line. Scroll down in this report until you find the section titled Spraylines and Tapes. Notice on the far right the O/Loss is listed. This is the pressure that is caused by the factors set up in the Wheel line sprinkler riser. Remember the sprinkler is 3½ft (1m) off the ground and the riser loss was equivalent to 5ft (1.5m) of ½" (12mm) pipe. Close this report and look into as many other reports as you like.

4.3.8.7 Computer Selection of Fittings

30. Select *Design|Computer Selection of Fittings*. When that is complete, select *Modify|Change* and by clicking on junctions and clicking on the [Show Fittings] button check to see what

fittings are used. Close dialogs by clicking on [Hide Fittings] and [Cancel]. To correct the length of aluminum tube listed click on one of the two spraylines, click [Show Fittings] and [Add]. Select the **4" (100mm) Aluminum Wheel Line Tube** from the list of pipes by clicking on the left most (number) column or by clicking on the description column then clicking [Select]. Click [Close]. The fitting will be added to the list of fittings for the sprayline with a quantity of 3.28ft (1m). Click on the “Quantity” and change it to **–20ft** (**-7m**) and click [Hide Fittings]. You will get a warning message that the quantity is less than the recommended minimum because quantities are usually greater than 0. Click [Yes] to continue and [OK] to close the junction dialog. See the notes under Placing the Wheel Line, Section 4.3.8.3 for an explanation. Look at a BOM report.

4.3.8.8 Database Items

Database assemblies play a key role in this type of design. There are five assemblies in this example. They are listed below.

Wheel line sprinkler riser assembly

Outlet Connector component database:

Item	Database	Part Number	Qty
Sprinkler leveler	Miscellaneous	L-75	1
Leveler elbow	Miscellaneous	SLE 1-12S	1
4" (100mm) Band-lock set	Couplers	58-4FWTD	1
76" (1930mm) wheel 4" hub	Miscellaneous	27-4-76	1

Inlet connection details	NONE, 1.00" (25mm)
Outlet Connection details	F T, 0.75" (18.75mm)
Height Above Ground	3.5' (1.05m)
Equivalent length diameter	0.50" (12.5mm)
HL equivalent length	5.00' (1.5m)
Leave the plotting symbol blank	
Usage Code	Y

The sprinklers on a wheel line are approximately 3.5ft (1.05m) above the ground. IRRICAD will take this into account when it determines pressures. To allow for the friction loss in the leveler and leveler elbow, an equivalent length and equivalent pipe diameter are used. If a 5gpm (19lph) nozzle is used, the friction loss that IRRICAD will calculate using the equivalent of 5ft (1.5m) of ½” (12mm) pipe is approximately 2psi (1.4m).

Wheel line 4” idle hydrant assembly

Outlet Connector component database:

Item	Database	Part Number	Qty
4" (100mm) Al hydrant valve	Valves	7-4 PT	1
4" (100mm) Class 160 PVC pipe	Pipe	4 160 SW	0.91m
4" (100mm) PVC male adapter	Coupler	436-040	2

Note: *Though can enter a length of pipe in an assembly in feet if you have selected US units, the assembly itself will display the length in meters, e.g., if you had entered 3’ of PVC pipe, 0.9144m will be displayed as present in the assembly.*

Inlet connection details	NPT M T, 4.0” (100mm)
Outlet Connection details	NONE, 4.0” (100mm)
Height Above Ground	0.00
Equivalent length diameter	0.00
HL equivalent length	0.00
Leave the plotting symbol blank	
Usage Code	Y

Wheel line 4” active hydrant assembly

Valves component database:

Item	Database	Part Number	Qty
4" (100mm) Al hydrant valve	Valves	7-4 PT	1
4" (100mm) Al valve opener	Valves	3-6-4 EH	1
4" (100mm) Class 160 PVC pipe	Pipe	4 160 SW	0.91m
4" (100mm) PVC male adapter	Coupler	436-040	2
4"x20' (100mm x 6.1m) hose	Miscellaneous	49-20-4 CD	1
4" (100mm) female end adapter	Coupler	58-5-4 PRF	1

Inlet connection details	NPT M T, 4.0" (100mm)
Outlet connection details	ALUM F S, 4.0" (100mm)
Headloss constant	0.002579
Headloss index	1.17682

The headloss constant and index were calculated using IRRICAD's curve fitting utility. The flows and pressure losses used are listed below. The pressure losses include the losses in the hydrant, valve and hose.

PSI Loss	Flow gpm
2.2	164
4.0	230
6.4	300

Wheel line Mover assembly

Other Hydraulics component database:

Item	Database	Part Number	Qty
Mover 70-76	Miscellaneous	70-76	1
Plastic engine cover	Miscellaneous	70-404	1
4" (100mm) hub adapter set	Coupler	70-11-4	1
1" ZAMAC plug	Coupler	11503	1
76" (1930mm) wheel 4" hub	Miscellaneous	27-4-76	3

Inlet connection details	ALU F S, 4.0" (100mm)
Outlet connection details	ALU F S, 4.0" (100mm)

Wheel line 4" plug assembly

Couplers component database:

Item	Database	Part Number	Qty
4" (100mm) end plug	Coupler	59-5PRM	1
Wheel line Band-lock	Miscellaneous	58-2-2S	1

The reason for the assemblies are as follows:

The wheel line is set up using *Zone|Sprayline*. A sprinkler is selected from the Outlet component database, e.g., the **Impact Drive Sprinkler**.

The **Wheel line sprinkler riser assembly** is then selected from the Outlet Connections component database. This means that for every sprinkler, a leveler, elbow, band-lock coupler and wheel are included.

The idle hydrants are laid out in the mainline layer by selecting a demand flow from the Outlets component database. The riser to that demand flow is then selected from the Outlet Connections component database. Selecting the **Wheel line 4" idle hydrant assembly** will ensure that for every idle hydrant a 4" (100mm) hydrant valve, 3ft (0.91m) of 4" (100mm) PVC pipe and 2 PVC male adapters are included.

At the upstream end of the wheel line a zone valve is positioned. The **Wheel line 4" (100mm) active hydrant assembly** should be selected for this valve. This ensures the valve opener, hose and fittings listed above are included.

The **Wheel line Mover assembly** is selected and positioned mid way along the wheel line. Note the assembly has only three wheels when the mover actually requires four wheels. This is because the mover displaces one wheel on the wheel line so the total in the bill of materials will be four.

IRRICAD will look for an end cap for the aluminum pipe during Computer Selection of Fittings. The **Wheel line 4" (100mm) plug assembly** will be selected and it will include the 4" (100mm) end plug and the band-lock.

4.4 MAINLINE DESIGNS

A mainline design can be any pipe delivery system from a rural water supply, stock water reticulation, etc. The difference between a mainline design and the design we have looked at previously is that a mainline design has the valve and outlet in one. Normally a system is laid out with a water supply, some mainline pipe, control valves, some zone pipe and then zone outlets, where the control valves are the connection between zone and mainline items and the on / off control for each zone. In a mainline design we have a water supply, mainline pipe and mainline outlets. Each mainline outlet is seen by IRRICAD as a valve-in-head outlet – i.e. has its own on / off control. Therefore each mainline outlet is the zone and control valve all in one. The principals behind IRRICAD design have not changed; it is simply that the zone items and control valve are condensed into one object.

In terms of the designs and analysis of a mainline design, zone design is still required before running mainline design options.

These tutorials assume you have completed at least the Basic Start chapters and the Simple Design Tutorials. These tutorials assume you know how to select items, connect items, and select the working database and the units of preference.

4.4.1 USING DEMAND POINTS

Demand points are used most often in mainline designs. The common use of demand points may be in large golf designs where it is known how much pressure and flow is required at certain points, or large agricultural designs where a hydrant is required to have a specific pressure and flow.

Demand points are only useful if you know the pressure and flow required at a particular point. Remember a hydraulic analysis is only as correct as the information you put in. Demand points can be used to make a quick mainline analysis.

4.4.2 A Rural Water Supply

1. Double click on the Irricad icon or select *Start|All Programs|IRRICAD Pro* to start IRRICAD. If already running IRRICAD select *File|New* to start with a clean screen. In *Settings|Irrigation – Design Specific* browse for the tutorial database **Tutorial.mdb**. This should be found in the \Irricad\database folder. If you prefer to work in US units, go to the *Units* tab and click the [US] button. If you prefer to work in Metric units, click the [Metric] button to restore the default units for this tutorial. Note Metric measurements are displayed in brackets. For this tutorial select lph as the flow and m as the pressure.

4.4.2.1 Drawing the Layout of the System

2. Select *Mainline|Water Supply* and place the water supply on the screen, near the left-hand side. Leave the entries as **0**, so that IRRICAD will calculate the system duty for the system you draw. Click [OK] to accept and close the dialog.

3. Select *Mainline|Pipe*. Leave the pipe as **Computer Selected** so that IRRICAD will select the pipe size for you. Click [OK] and click in the center of the water supply to place the start point of the pipe (left click on the screen). The pipe will rubberband with the cursor until you place the end point or next point of a pipe (if the pipe is bent). The pipe tool is like a continuous line tool and will rubberband between points until you end the pipe by selecting *Right-click|Restart*.

4. Select *Mainline|Outlet* and select **Demand Flow**. This type of outlet is called a Demand Point. It does not have a pressure / flow relationship but simply allows us to specify the flow and pressure required a particular point. Click [OK].

5. Left click on the mainline pipe where you wish to place a demand point or node. The outlet will automatically connect to the pipe. You will need to assign each outlet a zone name. Accept the default names for each node placed.

4.4.2.2 DESIGN

6. First, select *Design|Check Outlet Connectivity* to make sure that all outlets are connected to the water supply via mainline pipes. If you receive no messages, continue with design. If you do receive messages, check you cannot see a black pipe junction where the water supply or outlets connect to pipes. Pipes require pipe junctions, but where point objects connect, the junction should disappear. If an outlet is not connected, highlight the outlet by selecting *Modify|Select Object* and clicking on the outlet. Then select *Modify|Move* and move the outlet until the center of the outlet is central to the black junction and left-click. The black junction will disappear when the outlet is connected. If you are still having problems, make sure the default snap mode in *Settings|Snap* is set to **Connect**.

7. Even though we only have mainline items present in the design, we will still need to analyze the zones i.e. the outlets. Select *Design|Zone Design|Analyze*. This should be quite quick.

8. Once all outlets are placed we must tell IRRICAD how the system is to run. We call this Management. If all nodes are to run at one time (as is assumed the usual or the worst case scenario for rural water supply systems) select *Design|Assign All Zones to One System Flow*. IRRICAD will automatically fill out the table with 1 system flow running for a default time of 1 hour (the running time is not important, we just want to know what happens when it is running) and all zones assigned to run on system flow 1. Click [OK].

9. Now select *Design|Mainline Design|LP Design*. LP design a computer design option that will select pipes based on the pressure required at the outlet.

10. Now view the reports. Because this is a mainline design, the last 4 design reports will be most useful. Select *Reports|Mainline Design Reports|System Duty*. IRRICAD reports the pressure and flow required at the water supply to run the system you have designed. A pump can be sized from this data. The *Mainline Design Full* report is useful if you wish to know the velocity in the pipes, length of pipes and head difference. The *Mainline Summary Report* gives a summary of actual and required pressures at the zone control valve. The *Mainline*

Design Pipe Report lists the pressures in the pipes, and also lists the elevations of start and end point so the pipes.

4.4.2.3 VARIATIONS

11. Draw some contours or spot heights on the design. Elevation information can also be imported using *File|Import Contours*. Keep in mind that the elevation information needs to span all hydraulic input. Now redesign the system and view the reports.

12. Size the pipes using *Design|Mainline Design|Velocity Design*. You can set the maximum mainline velocity in *Design|Design Parameters|Hydraulic Parameters*. Keep in mind that *Velocity Design* does not know about the pressure that you are trying to achieve at the outlet. It is simply choosing a pipe size which will achieve a velocity as close as possible to the maximum allowable velocity set.

13. Run *Design|Computer Selection of Fittings*. IRRICAD will find fitting for each junction.

<u>Note</u>: *You do not have to layout a design in a specific order. You can place the nodes first, then pipe, then water supply if you wish. IRRICAD is very flexible until the Design section where management is required, then Zone Design then Mainline Design in that order. Remember the items available in the tutorial database are only a small set of items available in full IRRICAD databases. Databases are also easily changed or added to in the complete retail version.*

4.5 Database and Fitting Selection

Fitting Selection is a great tool to save time and produce a complete Bill of Materials without tearing your hair out! IRRICAD uses rules to solve junctions with fittings so if it can't find the fittings it needs it will list the unsolved junctions at the end of any Bill of Materials report or Costings report.

4.5.1 Customizing Your Database

Using the Irricad database editor, new items can be added to the database, deleted from the database, turned on or off for selection or edited. The on-line help or the hard copy manual explain the fields in database item dialogs so you can easily enter your own items or customize the existing items.

Probably the most future time saving task will be to create separate databases for the different types of designs you do. This is particularly true if you do quite different design work which all use different materials. One database may be Residential.mdb, another Vineyard.mdb, and another Stockwater.mdb. Now instead of turning items on and off in the database depending on the type of design you are doing today, you will only have the items you use for that particular system. This means your databases are smaller and you have more of them, and that you do not have multitudes of extraneous items you will never use present.

After you have either split up your databases to be design specific, or have deleted all the extraneous items out of them, you will either have the exact fittings you use or a range of fittings for IRRICAD to choose from. If you only use saddles instead of tees (both available in the Tees component group) then you will only have saddles available. If you decide to use saddles in a particular design, instead of tees, you can turn the tees off in the database (select **N**) before running *Computer Selection of Fittings*.

4.5.1.1 ENTERING NEW PIPES IN TO THE DATABASE

1. Running the database editor (*Start|All Programs|IRRICAD|IRRICAD Pro Database Editor*). Note the database the editor opens with is your default database – set in IRRICAD in *Settings|Irrigation – Design Specific* and clicking the [Save As Default] button.

2. Enter a new pipe by selecting *Component|Add Item*. IRRICAD will copy the pipe the cursor is currently on so if there is an existing pipe similar to the pipe you are adding to the database, click on this before selecting *Component|Add Item*.

3. A usage code is required for all items in the database if you want to be able to select this item in IRRICAD, either manually or during design or fitting selection. Most items have a Yes, No usage code, but pipes are designated to be used for either Laterals, Zone pipes, Flushing pipes or Mainline pipes. Laterals are connected spraylines, zone pipes are any pipes (other than laterals) used downstream from a control valve, flushing pipes will be eligible for manual selection and mainline pipes are all pipes used upstream from a control valve. Pipes can have more than one usage code; any combination of L, Z, F or M you wish. If the usage code is blank then this item cannot be used or selected.

4. Enter a name for your pipe, describing its basic qualities e.g., 2" (50mm) PVC Class 6.

5. Now enter a unique warehouse code for the pipe. This can be your ordering code or an inventory code.

6. Enter a supplier code (you can make your own in IRRICAD – *Reports|Supplier Code Multipliers*).

7. Enter a pipe type for your pipe, e.g., PVC, LDP etc. You can make your own in IRRICAD – *Design|Pipe Fitting Matching Table* but be warned IRRICAD uses this pipe type to select fittings.

8. The nominal diameter is the size the pipe is usually referred to by, e.g., 2" (50mm).

9. The actual diameter is very important to be entered precisely as this is the diameter IRRICAD uses in its pipe friction loss calculations.

10. The pipe roughness is the Hazen-Williams C factor, which can be found in Appendix B for all smooth pipes.

11. Enter the maximum allowable pressure as per manufacturers' specifications for that pipe.

12. Enter a wholesale cost and retail price and select a plotting colour and line type for this pipe. Click the [Save] button .

You now have a new pipe to use in a design.

The other item dialogs do not differ too much from this format. However, you can find information on this in the IRRICAD Database Editor section of the manual.

4.5.1.2 ENTERING A NEW OUTLET INTO THE DATABASE

All water outputting devices exist in IRRICAD as an Outlet body and a nozzle or collection of nozzles, regardless whether the device physically has nozzles or not.

To enter a new outlet into the database:

1. Enter the nozzle data first. To do this you require the manufacturer's sheet for the nozzle.

2. Open the Database Editor and if the database that automatically opens is not the database you wish to add the new product to, then select *Exit* (save changes if required) and then *File|Open* and browse the working database you wish to edit.

3. Use the arrows at the top of the right-hand-side of the open database to scroll along until you see the **Nozzles** tab.

4. Select *Component|Add Item*. IRRICAD will copy the nozzle the cursor is currently on so if there is an existing nozzle similar to the nozzle you are adding to the database, click on this before selecting *Component|Add Item* and start entering the relevant information into each field.

5. When you get to the "Radius Equation Constant (K)" and "Radius Equation Index (n)" fields, we will use the manufacturer's data in the *Curve Fit* to calculate the Constant (K) and Index (n). If the *Curve Fit* is not currently displayed on the right-hand side of the window, select *View|Curve Fit* and select **Outlet wetted radii from pressure** from the dropdown list.

6. The table you see requires at least three sets of data. Firstly make sure that the units above each column are set to match the units you are reading off the manufacturer's data. Enter the Pressure and the resultant Radius from the data sheet into the table.

7. Click the [Fit Curve] button. The Constant and Index will be calculated for you. Make sure that R^2 is above 90% or re-check your data. Copy the Constant in to the "Radius Equation Constant (K)" field and the Index into the "Radius Equation Index(n)" field by clicking the green arrow button.

8. When you get down to the "Flow Equation Constant (K)" and "Flow Equation Index (n)" fields below, you need to select **Outlet flow from pressure** from the dropdown list. Once again read the data off the manufacturer's sheet for this nozzle. Firstly make sure that the units above each column are set to match the units you are reading off the manufacturer's data. Enter the Pressure and the resultant Flow from the data sheet into the table.

9. Click the [Fit Curve] button. The Constant and Index will be calculated for you. Make sure that R^2 is above 90% or re-check your data. Copy the Constant in to the "Flow Equation Constant (K)" field and the Index into the "Flow Equation Index (n)" field by clicking the green arrow button.

10. Finish by selected a plotting symbol, size and colour. Click the [Save] button.

11. Repeat this process for as many nozzles as you which to add into the nozzle component group.

12. Now use the arrows at the top of the right-hand-side of the open database to scroll along until you see the **Outlets** tab.

13. Select *Component|Add Item*. IRRICAD will copy the outlet the cursor is currently on so if there is an existing outlet similar to the outlet you are adding to the database, click on this before selecting *Component|Add Item* and start entering the relevant information into each field.

14. For Outlets the inlet connect type (how the outlet connects to a riser or on to the pipe) can be NONE but still requires a gender and connect type e.g., NONE F S (or T for threaded, or B for barbed)

15. Leave the "Default Nozzle" field at this stage. The inlet diameter is the size of the outlet body e.g., 20mm for a popup body or 4mm for a dripper.

16. The "Arc Type" determines how the outlet operates – is it a **Fixed** outlet e.g., the arc cannot be adjusted? Is it a **Variable** outlet – the arc can be adjusted? Is it a **Matched** outlet – as the arc is adjusted the amount of flow is also adjusted accordingly

17. "Flow Tolerance" is usually 5% above and 5% below as a rule of thumb.

18. Finish filling in the fields and [Save] the new outlet.

19. Now with your new outlet highlighted, select *Component|Edit Nozzles*. This will take you to the **Nozzles** component group. In the bottom field you will see any nozzles which were copied for the existing outlet when you create the new one. Select the grey box to the left of the nozzle name. If there are more than one nozzle here (and if they do not belong with your new outlet), you can drag the cursor down to highlight all of the nozzles. Now select *Component|Remove Nozzles*.

20. Now click on the little grey box to the left of the required nozzle name to automatically be added to your outlet. Select all of the new nozzles you have just created for this outlet. You can see the added nozzles in the list below the main grid. Once you have added all the required nozzles, select *Component|Edit Nozzles*.

Select *File|Exit* and then the [Yes] button to save the additions to your database and to close the database.

4.5.2 HOW IRRICAD SELECTS FITTINGS AND UNDERSTANDING THE FITTING SELECTION RULES

Read Appendix G: Fitting Selection Details in the online Help Topics (*Help|Help Topics*). This chapter covers the rules that IRRICAD uses to solve the different types of junctions.

4.5.2.1 QUICK NOTES ON MAKING IRRICAD SELECT THE FITTINGS YOU WANT

IRRICAD will select the items you want if you keep in mind the rules that are used during Fitting selection.

In summary IRRICAD will always search the Lateral Take-Off component group first, then move search the cross, tee, bend and coupler groups as needed. IRRICAD always looks for the single cheapest item which has the correct connection codes required. An assembly is seen as a single item. Hence an assembly containing all the fittings required will be chosen if it is the only item that has the correct inlet and outlet connections. If a single item can not be selected, IRRICAD will choose the cheapest option of multiple components to solve the junction.

If there are many options for IRRICAD to choose from but you wish a particular item or set of items to be selected change the connection codes to be unique to those items so there is no other choice for the selection. Instead of BSP F T try BSPS F T making sure the item it is connecting to also has been given the unique connection code for this design. You can also make the item cheaper than its competitors.

4.5.2.2 USING RISER RULES

IRRICAD uses internal riser selection rules, but you can override these with creating your own.

The internal rules are: select the riser pipe that is the same size as the top item and the same type as the bottom item. This means that if the submain (100mm PVC MS) is buried at 500mm and the valve (80mm

BSP FT) is at –300mm (above ground) the riser pipe selected will be an 80mm PVC MS pipe.

You can override the internal rule by either specifying your own rule or selecting the pipe you want used in a particular situation. Select *Design|Riser Selection Rules*. Enter the depths to which this rule applies. The first depth entered must be the higher depth. Now select either **Rule** or **User**. If you select **Rule**, you have the options of specifying how the size and type of the riser is determined. If you select **User**, select the pipe you wish to be used from the drop down list on the far right.

Select *Design|Riser Selection Rules*. The rules you set can only be applied to a particular change in depth. Therefore you can set a riser rule for the riser selection between a submain and the laterals. This will not effect the riser selection between the mainline and valve providing the valve is at a different depth than the laterals or the mainline is at a different depth than the submain.

When creating a “Rule”, remember that “Depth 1” needs to be smaller than “Depth 2”. Remember that 0 is at ground level and a negative number is above ground. If you select **User**, you can select the pipe you wish to be used as the riser in that particular case. If you select **Rule**, you can select the “Size” and “Type” of pipe to be used based on the existing items in the design. For example if the valve is 80mm BSP valve and the mainline is 100mm PVC, do you wish the riser to be 80mm PVC, 100mm BSP, 80mm BSP or 100mm PVC? Select **Top** and **Bottom** appropriately for “Size” and “Type”.

1. Using the Tutorial.mdb draw a block of tapes using *Zone|Tape Irrigation Block* any size you wish. Select a Center submain through the middle of the block, setting the “Depth” to **20in** (**500mm**). Select a valve (at **0** “Depth”) and then draw in a mainline pipe (at **20in** (**500mm**) “Depth”) to connect to the water supply. Select your own pipe sizes as you place the pipes or use *Design* to size them for you.

2. Now run *Design|Computer Selection of Fittings*. Using *Select Object* or *Select Window*, select one junction where the submain connects to a lateral. Select *Modify|Change*, and then click the [Show Fittings] button. See what IRRICAD selected as the riser. IRRICAD has selected tape as the riser but it cannot find the correct tee to complete the junction.

3. Go in to *Design|Riser Selection Rules* and set the depths as required (**0** for "Depth 1" and **20"** (**500mm**) for "Depth 2") and set the rule to be **Top** for "Size" and **Bottom** for "Type" and re-run *Design|Computer Selection of Fittings.*

4. Using *Select Object* or *Select Window*, select one junction where the submain connects to a lateral. Select *Modify|Change*, and then click the [Show Fittings] button. Because IRRICAD is now looking for a ½" (16mm) PVC pipe and there is none available or turned on in the database, it cannot solve the junction.

5. Now change the "Rule" to **User** in *Design|Riser Selection Rules*. Select the pipe you wish to use for the riser, such as the **¾" (20mm) Polyethylene hose**. Now re-run *Design|Computer Selection of Fittings* and using *Select Object* or *Select Window*, select one junction where the submain connects to a lateral. Select *Modify|Change*, and then click the [Show Fittings] button to view the changes.

Note: *If there are more than 40 fitting for IRRICAD to choose from, when solving a particular junction, a warning message will be issued just to let you know.*

4.5.2.3 Using Pipe Fitting Matching Settings

The *Pipe Fitting Matching Table* in the *Design* menu allows you to insert new pipe types and designate their connection codes and to what fitting types they can connect.

More than one type of pipe can connect to a fitting type, but each pipe type can only connect to one fitting type, e.g., PVC, PV1, PV2 and PV3 pipe types can all connect to PVC fitting type, but PV1 pipe type can only connect to PVC fitting type.

The Bill of Materials will round up the lengths of pipes, whereas the costing reports will display the exact length. The rounded lengths in the *BOM Reports* can be altered by the extra allowance, the rounding, and the rolls / lengths.

Remember that for an item to connect to another item it must have the same nominal diameter, the same connection type and be the opposite gender.

4.5.2.4 Explaining Supplier Codes and Multipliers

Supplier codes can be used to view or print a bill of materials for the different sources of product for a job.

Supplier codes can also be used to increase across the board prices for a particular manufacturer.

Open the *Reports|Supplier Code Multipliers* table. Each supplier code can have a multiplier that can be used to calculate the final prices displayed in the costing reports. These multipliers will increase or decrease the final job cost using a base price, either the retail price or wholesale cost as entered into the database for that item. If the multiplier is a number other than 1 and the above check boxes for B, C, and / or D have been checked, and if the default pricing type in *Design|Design Parameters|Economic Parameters* is set to **Multiplier**, the costing of the job will be calculated accordingly.

If **Retail** or **Wholesale** is the default pricing type in *Design|Design Parameters|Economic Parameters,* then the costing reports will show the relevant prices or costs.

Remember the Bill of Materials will round up the lengths of pipes, whereas the Costing Reports will display the exact length. The rounded lengths in the BOM reports can be altered by the extra allowance, the rounding, and the rolls / lengths in the *Pipe Fitting Matching Table*.

4.5.3 Correcting Fittings Errors

After rerunning *Design|Computer Selection of Fittings*, there may be a few junctions that IRRICAD can't solve. This is due to that fact that the items it looks for are not in the database.

The first error may be similar to:

US Units:

Problem selecting suitable Tee

X: 102.20 Y: 263.82

PVC M S 2.00 PVC M S .00 1.50

Metric Units:

Problem selecting suitable Tee

X: 102.20 Y: 263.82

PVC M S 50.00 PVC M S .00 40.00

1. Use *View|Zoom Window* and zoom in on a piece of your design. Select *View|Go To Coords* and type in the X and Y co-ordinates displayed on your report, using the tab key to tab between the two fields. Let go of the mouse and use the <Enter> key as [OK]. The cursor will now be at the co-ordinate you entered, and this co-ordinate will be at the center of the page. Select *Modify|Change* and click on the item at this co-ordinate. Click the [Show Fittings] button. Here will you see all the fittings selected to solve this junction.

IRRICAD reports the connection types of the existing items in the design in the fittings errors, not the items it requires. In some instances it is straightforward where we could enter an item in to the database based on the information above, just reversing the gender so the items connect. In more complicated situations, it a good idea to go and look at the junction to see which junction IRRICAD is trying to solve. Reading up on the Fitting Selection Rules (in Appendix G) will help you understand the items IRRICAD needs to solve the junction.

2. Run IRRICAD Databases by clicking on the *Start|All Programs|IRRICAD|IRRICAD Pro Databases* or double-click on the icon if one is present on your desktop. (Note the database the editor opens with is your default database – set in IRRICAD in *Settings|Irrigation – Design Specific* and clicking the [Save As Default] button). Select *File|Open* and browse for the required database in the \Irricad\database folder if your working database has not opened. Open this database and select the required component tab, entering the item or items required to solve the junction.

3. Return to IRRICAD and rerun *Design|Computer Selection of Fittings*. If any other fitting errors are still present in the *Reports|BOM / Costing Reports|BOM* report, solve the next junction in the list using the above method to help you.

4. Use the tape irrigation block you drew above. Solve the missing End Cap.

5. Try an example of your own.

4.5.4 CREATING AND MODIFYING ASSEMBLIES

To create an assembly, it is important to note the following rules:

- If creating an assembly based on a particular valve, for example a 2" (50mm) Electric Valve Assembly, you still need to add a 2" (50mm) Electric Valve to the assembly.
- It is not necessary to have all items in the assembly with the correct connections for fitting together as the only connection types used are those entered for the Assembly as the one item. However, for practical reasons, it is beneficial to have the connections required between the assembly items.
- Outlet assemblies must contain an outlet.

4.5.4.1 USING ASSEMBLIES

You may wish IRRICAD to select different fittings than it has chosen.

You can create an assembly of the items you require, as long as those items are in the database.

1. For example, if you wish to make an assembly in the Tees group, go to the Tees component group and select the Tee you would like to use in your assembly (this is only so that most of the description is available for you to make changes to). Now select *Component|New Assembly*. Change the “Usage” code to **X**. Change the “Description” so you know this item is an assembly, and possibly what use it has e.g., **2½” (63mm) tee with expanding coupler to 3½” (90mm)**. Change the “Warehouse Code”. Change the “Major Connection Code” and “Minor Connection Code” to reflect the ends you wish to connect to e.g., **2½” (63mm) MDP FS** and **3½” (90mm) MDP FS**. Now click the [Continue] button.

2. Most importantly select the tee required in this assembly by clicking on the grey box to the left of the description of the tee e.g., **2½” (63mm) Female Tee** and enter the **1** as the required number of this item. Now select **1** of the **Reducing Coupling**

3½" x 2½" (90 x 63mm). When you have completed adding items into your assembly, select the *Component|Finish Assembly*. It is your job to make sure the items you are selecting will connect together. Save your database upon closing.

3. Now run *Design|Computer Selection of Fittings* for your assembly to be selected. View the *BOM / Costing Reports*. You will notice that an X usage code will list the assembly name in the main part of the list, and then afterwards list all the items that make up that assembly.

4.5.4.2 Creating an Assembly

We wish to create a swing joint assembly for use in small turf irrigation.

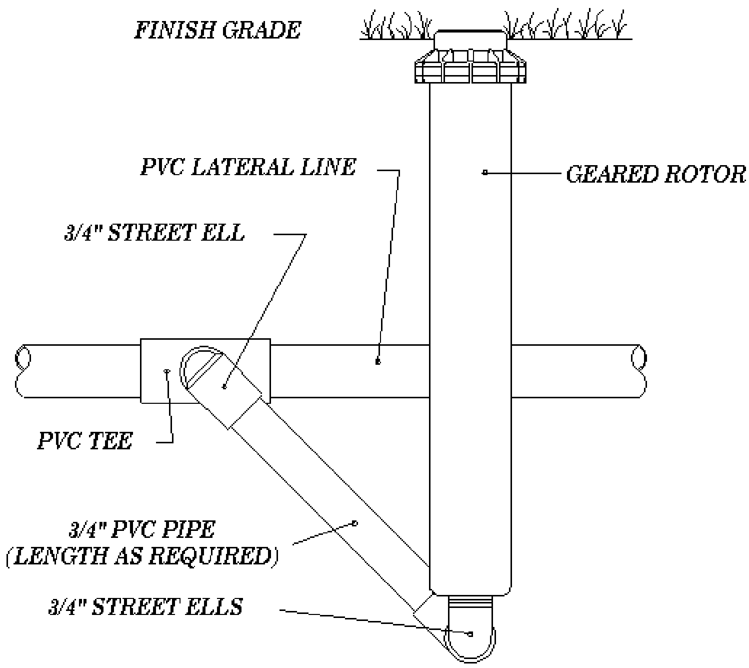


Figure 4-84

This assembly will contain:

- Three 90º street elbows
- ¾" PVC pipe

1. Run the IRRICAD Database Editor (*Start|All Programs|IRRICAD|IRRICAD Pro Database Editor*). The database editor opens your default database automatically. If the Tutorial database is not the default database (the name of the database is displayed on the title bar), use *File|Open* browse for the **Tutorial.mdb**. This should be in the Irricad\database folder.

2. Click on the Outlet Connections tab (you may need to scroll along the top to see this tab). Find the **Microsprinkler Stake and Tube $^{3}/_{8}$" (10mm)**. Click on the gray box to the left of the description to select the item. Select *Component|New Assembly*. Note that the characteristics for the existing riser have been copied. Edit the name for the outlet assembly to be: **Pop-Up Swing Joint Assembly**. Change the "Warehouse Code" to **SwingJAssembly** and select a "Supplier Code".

3. The "Inlet Connection" and "Outlet Connection" should correspond with the actual items that will be at either end. In this case a ¾" PVC elbow will be at the inlet end with a connection type of BSP MT to connect into the PVC faucet tee IRRICAD selects. The item that will be at the outlet end of the assembly will be a reducing street elbow, found in the Elbows / Bends tab, with a connection type of PVC MT with a minor diameter of ½" (15mm) to connect directly to the lawn pop-up sprinkler. Check that the "Inlet Connection" and "Outlet Connection" types for the assembly are **BSP MT** and change this if required. The "Inlet Diameter" is **¾"** (**20mm**) and the "Outlet Diameter" is **½"** (**15mm**).

4. The "Height Above Ground" is **0** (zero) because it is below ground. The "Equivalent Length Diameter" is **¾"** (**20mm**); this is the diameter to be used in the headloss calculations and represents the average diameter.

5. The "Headloss Equivalent Length" is equal to the complete length water will traverse through. We will use **6.6ft** (**2m**) in this case to represent the length of pipe and elbows: 0.66ft (0.2m) of PVC pipe, 2ft (0.6m) x 3 for equivalent lengths of ¾" elbows. The costs will equal those of the included items added together. Click the [Continue] button.

6. Using the tabs at the top of the screen, click on the Elbows / Bends tab and click on the grey box to the left of the **¾" (20mm) Female PVC 90 Street Elbow**. Type in **2** for the number to be selected. Click [OK]. Select **¾" x ½" Male Street Elbow** and type in **1** for the number required. Click [OK].

7. Go to the Pipe tab and select the **¾" (20mm) Class 125 PVC Pipe**. Type **0.66ft** (**0.2m**) for the length required.

8. As the Assembly is now complete, select *Component|Finish Assembly*.

4.5.4.3 Modifying an Assembly

We wish to add to an existing assembly - go to the Outlet Connections component group and select the **Lawn Pop-Up Assembly**.

1. Select *Component|Add to Assembly*.

Because the tee branch connecting to the street elbow is PVC FS, and the elbow end of the 3/4" (20mm) female PVC 90 Street Elbow is PVC FS, these items will require a coupler in order to be joined together in the field. A 3/4" (20mm) PVC male coupler that has an inlet and outlet connection type PVC MS is required.

2. Return to the Coupler tab and click on the f=grey box to left of the **3/4" PVC Male Coupler** to add to the assembly. Type in **1** for the number to be selected. Click [OK]. Select *Component|Finish Assembly*. Exit the database and click the [Yes] button to save changes.

4.6 CREATING AND MODIFYING SYMBOLS

This exercise will cover the process of making a new symbol, modifying an existing symbol and setting up a block of trees.

4.6.1 CREATING NEW SYMBOLS

Firstly we will create a simple pine tree symbol. The process is to use the drawing options to draw the symbol on screen, then to use *Create Symbol* to save it for later use. The symbol will consist of a small horizontal line with four curved branches protruding from it.

1. Select *Settings|Grid / Origin / GIS* and enter "X" and "Y" spacing of **20** (**6**) and check the "Display Grid Points" checkbox.

2. Now select the *Snap* tab and select the "Snap to Grid" option. Click [OK].

3. Select *Draw|Line|Single* and draw a vertical line of **160ft** (**48m**) for the trunk. Left click to place the start and drag the line vertically until the status bar d=160 (48) and the line cover 8 grid points then click to place the end.

4. Select *Draw|Arc|Center Start End*. Move to the top of the trunk and one grid point to the left and click. Click on the top of the trunk then move to the grid point vertically below the first (center) arc point and click. Move one grid point to the left of the last end point and click then two grid points to the right (onto the trunk) and click then two grid points vertically below the first (center) arc point and click. Move one grid point to the left of the last end point and click then three grid points to the right (onto the trunk) and click three points vertically below the first (center) arc point and click.

5. Repeat for the three branches on the right hand side of the tree in mirror image. Your symbol should look like Figure 4-85.

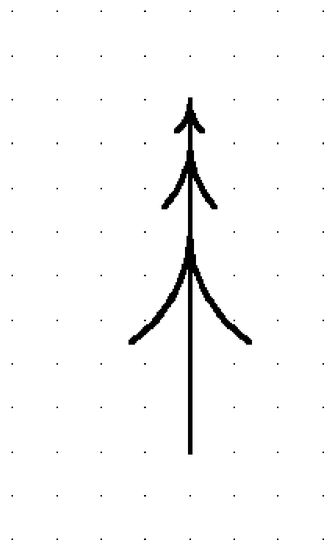


Figure 4-85

6. If you wish this symbol to be a green tree, select by using *Modify|Select|All* or *Modify|Select|Window*. Now select *Modify|Change*. In the dialog, select the color you wish to change it to (e.g., dark green) by clicking on the color field and selecting the color you require.

7. Click [OK] on the color dialog and click [OK] on the Drawing Properties dialog. Because there is more than one type of object selected (e.g., line and arc), the Change / Match dialog appears with the color in the "Change" column checked. Click [OK].

8. Now select the object by using *Modify|Select|Window* and invoke the *Tools|Create Symbol* command. Type in **Pine Tree** for the name and click [OK].

9. Select *Draw|Symbol*. You will notice that the newly created symbol is automatically loaded for use in your current design. The initial width and height in the dialog are the extents of the symbol definition. The "Maintain Shape" checkbox controls whether an instance of the symbol maintains the ratio of the width and height at which it was created (box checked) or whether it can be stretched or squashed in one dimension /

direction (box unchecked). The “Dynamically Size” checkbox controls whether an instance of the symbol can be sized interactively on the screen by rubberbanding an enclosing rectangle (box checked) or placed at the (fixed) size entered in the dialog (box unchecked).

10. Experiment with placing grass symbols with and without the boxes checked to see the effects of these options.

4.6.2 MODIFYING AN EXISTING SYMBOL

In this part of the exercise, you will modify the existing CLOTHESLINE symbol.

1. Select *File|New* to start with a clean screen. Select *Settings|Grid / Origin / GIS*. Set the grid size as **33x33ft** (**10x10m**) and check the “Display Grid Points” checkbox. Now select *Settings|Snap*. Select the “Snap to Grid” option. We will use the grid to help us align the clothesline wires correctly. Click [OK]. Select *Draw|Symbol*. You will notice that CLOTHESLINE is not available from the drop down list of symbols. Click the [Load] button and select CLOTHESLINE from the master list of symbols. Click [Open].

2. Uncheck the “Dynamically Size” checkbox. Type in 198ft (**60m**) for the width. Click [OK]. Place the symbol on the screen with a left click. Note that the symbol can only be placed on the grid points.

3. Before adding to the symbol, you need to explode it into its individual components. Select *Modify|Explode* and click on the symbol. Alternatively, select the symbol prior to invoking the *Explode* tool.

4. Now select *Draw|Polyline*. Move to the grid point on the top left diagonal nearest the center of the clothesline. Left click and move horizontally to the equivalent grid point on the top right diagonal and left click again. Repeat for the bottom right then bottom left diagonal then back to the starting point, or select *Right-click|Close*.

5. Repeat the whole process for a second polyline one-grid point further out from the center.

6. Select *Settings|Snap* and turn off "Snap to Grid" by selecting "Connect".

7. Finally select *Draw|Circle|Center Radius*. Select *Right-click|Snaps|Midpoint* then place the cursor in the center left click the mouse button and move the cursor slightly away from the center. Notice the circle follows the cursor. The radius of the circle is given on the status bar (d). Make d about 3ft (1m). Left click to place. The symbol should look like Figure 4-86.

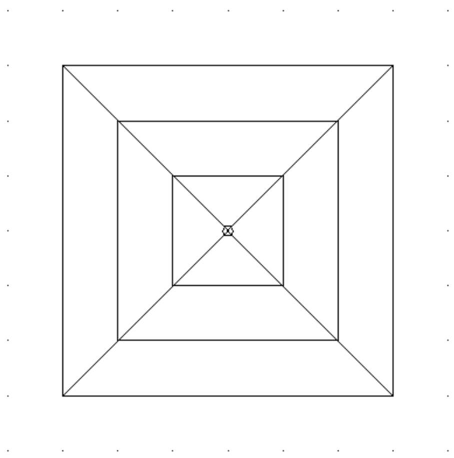


Figure 4-86

8. All that remains now is to save the symbol for later use. As before, select the symbol with *Modify|Select Window* and draw the window around the symbol. Save the symbol with *Tools|Create Symbol* and enter a new name e.g., CLOTHESLINE2. Click [OK].

9. If you want to replace the old symbol definition with the new so that you have only one CLOTHESLINE symbol you must first unload the old definition before saving the new. Select *Draw|Symbol*, click the [Unload] button, select CLOTHESLINE and click [OK] on the [Unload] dialog then click [Cancel] on the Symbol dialog. Now you can use the *Create Symbol* tool to create the new CLOTHESLINE symbol. These symbols can now be used in subsequent designs.

Note: Symbols are only loaded if they have previously been used in the design. If a new design is started, all required symbols will need to be loaded.

4.6.3 Setting Up a Block of Symbols

This exercise will cover the process of using the symbol created in Section 4.6.1 to set out a block of trees. Note setting out a block of trees can also be achieved using the *Draw|Tree Block* tool

1. Select *Draw|Symbol* and [Load] the newly created **Pine Tree** symbol. Uncheck the "Dynamically Size" checkbox. Enter the "Width" as **12ft** (**3.5m**). Click [OK].

2. Place a symbol on a grid point at the top left of the screen. Select *Modify|Copy|Array* and, moving the cursor over the symbol just placed, click the mouse. In the dialog enter **14** as the "Number of Copies" and **14** as the "Number of Rows" and click [OK]. Click on the grid point where the tree is placed as the reference point. Drag the ghosted symbols to the right of the original symbol and left click. Then drag the cursor down at right angles to the previous ghosted row of trees and left click. You now have a block of trees 14 x 15. See Figure 4-87.

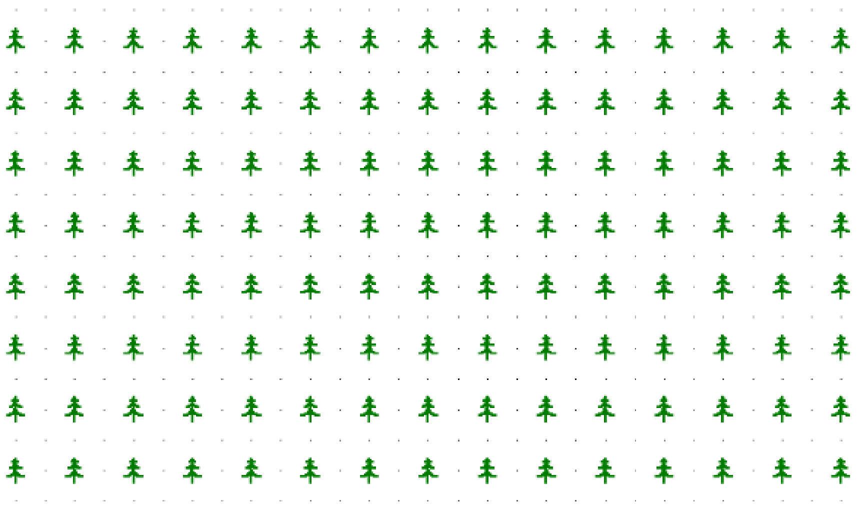


Figure 4-87

4.7 PRINTING USING PLOT LAYOUTS

This is a simple tutorial to explain how to make your design ready for printing.

For this example we will use the Micro Irrigation Design, Section 4.3.5

1. Complete the tutorial if you have not done so already. Open the completed tutorial by using *File|Open* and browsing for a design file.

2. Select *Settings|Design Details*. Enter the appropriate details in the edit boxes e.g., your Company Name, Site, Date, Designer Name, and Client Name, etc., going to the Client, Company tabs as required. Click [OK].

3. Select *Draw Plot Layout*. The printer and paper size is set to the defaults. Click the [Printer] button on the bottom left of the dialog and select the printer you wish to print to from the dropdown list. Click [OK].

4. Select B (A3) as the paper size from the dropdown list if your printer will allow. Otherwise select A (A4) or C (A2) size paper. Select the paper source, e.g., Upper Tray. Select **Landscape** as the required "Orientation".

5. The default margins indicate the smallest margin physically possible for the printer to print on to. Leave the margins as the defaults.

6. Enter a print scale or click the [Calculate] button (scale is calculated on the current zoom).

7. Select a "Drawing Template" from the dropdown list. Selected the B A3 Key Bottom for the B (A3) paper size. For A (A4) size paper select the A A4 Key Bottom and for C (A2) size paper select the C A2 Key Bottom. In general, you should always select a template to match the selected paper size. Your dialog should look like Figure 4-88.

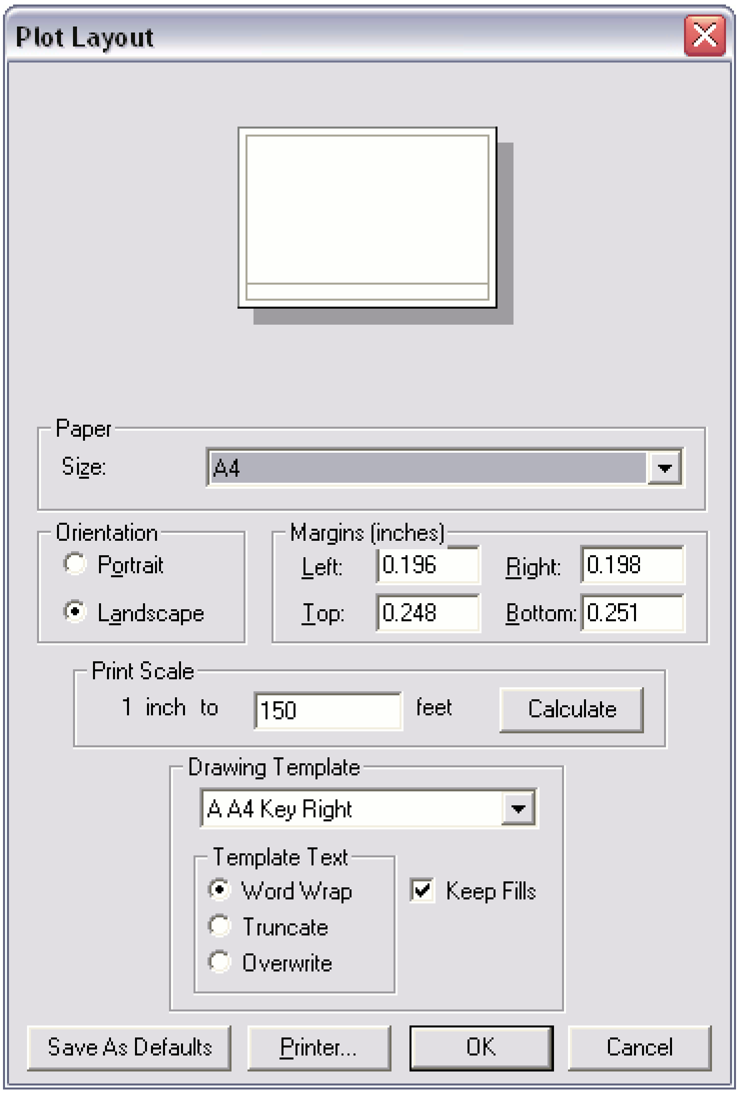


Figure 4-88

8. Click the [OK] button. The plot layout will be created at the specified scale.

9. Look at the plan with the layout. You will notice that details such as Company Name, Site, Client Name, Designer Name, Date,

Scale and Design No (or Name) are present in the title block of the plot layout.

10. If you wish to center the layout on the design, select the border of the layout using *Modify|Select Object* and then select *Modify|Move* and position the layout correctly.

11. You are now ready to print. Select *File|Print*. The *Print* dialog will remember the settings from the *Plot Layout* dialog so you should not have to edit anything.

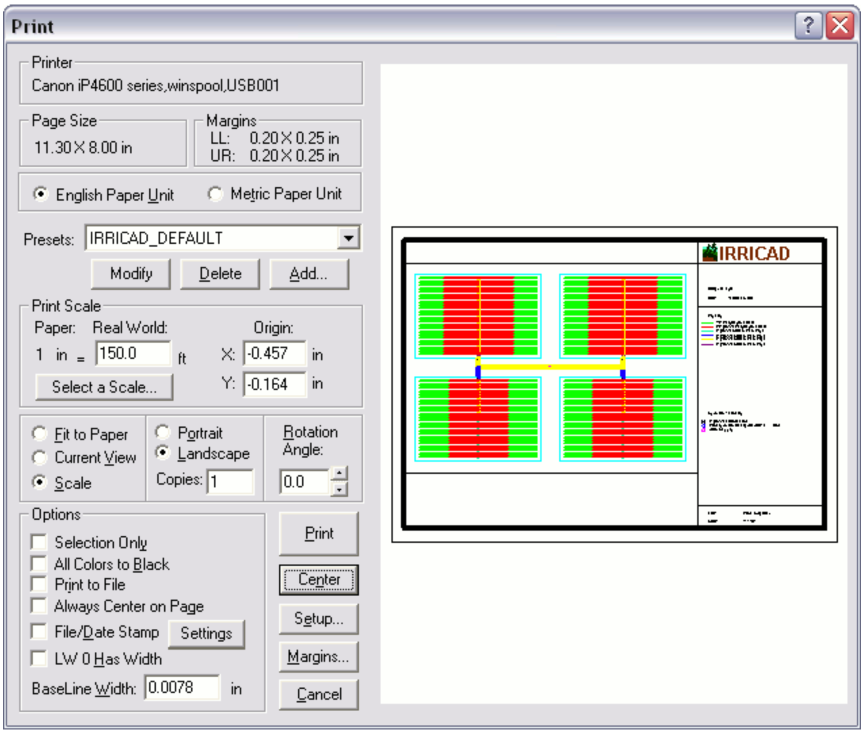
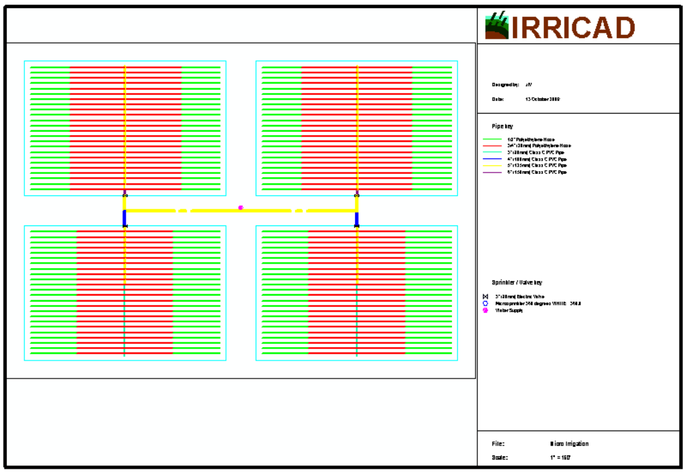


Figure 4-89

12. You may need to center the layout on the printable page. You can click the [Center] button or drag the print preview until positioned properly. Click the [Print] button.

The legend will itemize and display every unique item:



Sprinkler / Valve key

3" (80mm) Electric Valve
Microsprinkler 360 degrees WHITE 360.0
Water Supply

Pipe key

1/2" Polyethylene Hose
3/4" (20mm) Polyethylene Hose
3" (80mm) Class C PVC Pipe
4" (100mm) Class C PVC Pipe
5" (125mm) Class C PVC Pipe
6" (150mm) Class C PVC Pipe

Figure 4-90

4.8 DIGITIZING PLANS

A digitizer tablet can be used in conjunction with IRRICAD to enter scale plans on the IRRICAD screen.

There are two ways to do this: entering a scale or entering known reference points on the drawing from which a scale is calculated.

First we need to create a scaled plan from which to digitize – see Figure 4-91 (metric units) or Figure 4-92 (US units).

1. Draw a rectangle measuring 8” x 6” (200mm x 140mm) on an A (A4) size piece of paper. This represents a property boundary of 120’ x 90’ (40m x 28m) at a scale of 1”:15’ (1:200). Draw another rectangle 4” x 2.5” (100mm x 60mm) for the house. The bottom left corner of the house should be 2” x 2” (45mm x 50mm) from the bottom left corner of the property. Draw a third rectangle 1.5” x 1.5” (40mm x 40mm) for the garage to the right of the house touching the right property boundary. Draw a curved drive along the left and top of the property. The drive should be 1” (20mm) wide and positioned 0.5” (10mm) from the left and top boundaries. Label the bottom left corner of the property A (0,0), the bottom left corner of the house B (30’,30’) or (9m,10m), the top right corner of the house C (90’,67.5’) or (29m,22m) and the top right corner of the property D (120’,90’) or (40m,28m). Your drawing should look like Figure 4-91 (metric units) or Figure 4-92 (US units) without the measurements.

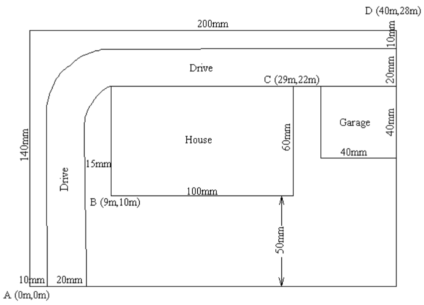


Figure 4-91

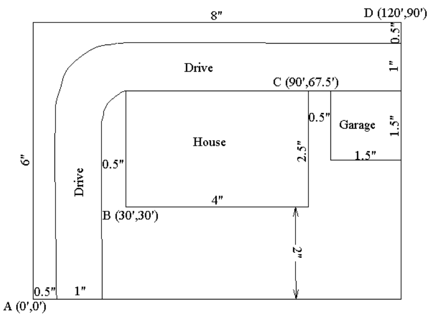


Figure 4-92

2. Attach this scaled plan securely to the tablet so it cannot move during the digitizing process. While digitizing IRRICAD must be in tablet or absolute mode. This mode is turned on automatically

when you enter a scale or reference points. You can tell if tablet mode is on or off by looking for a check mark in selecting *Settings|Digitizer|Tablet Mode*. At any time during digitizing you can turn off tablet mode and resume later. You will not need to re-enter a scale or reference points, just turn tablet mode on again. Tablet mode is switched on or off by selecting *Settings|Digitizer|Tablet Mode*. When tablet mode is on, the distance the digitizer puck is moved is relative to the scale. When tablet mode is off, the digitizer puck can be used like a mouse.

When tablet mode is on, the puck cannot be used to select menu items or tools - use the mouse or the keyboard. To use the keyboard, hold down the <Alt> key and click the underlined key (usually a letter) in the menu description (e.g., <Alt>+D for the Draw menu), then use the arrow and enter keys or the underlined key to select a particular menu item.

The digitizer puck buttons are set up to emulate the mouse buttons. Typically, button 1 is the left mouse button, button 2 the right mouse button, button 3 the middle mouse button (for 3 button mice) and button 4 is Esc. These defaults can be changed in the Windows Control Panel.

Tablet mode may also be toggled using the puck button assigned to the middle mouse button.

4.8.1 USING THE SCALE METHOD

This method can only be used for one-sheet digitizing. The complete area that will be digitized must fit within the tablet's active area. If the drawing is larger than the tablet, and therefore has to be moved around the tablet for the whole plan to be digitized, the reference method must be used.

1. Select *Settings|Digitizer|Scale*. In the dialog box enter the plan scale **15** (**200**). Click the [OK] button. *Tablet Mode* is automatically turned on.

2. Select *Draw|Rectangle|2 Point* or <Alt>+D,R,2. Place the puck on point A and left click. Move to point D and left click again. This will create the property boundary. Move to point B and left click then to point C and left click again. This will create the house. Select *Right-click|Snaps|Object*. Place the puck on the

top right corner of the garage and left click. Move to the bottom left corner of the garage and left click again.

3. Select *Draw|Curve|Spline* or press <Alt> + <D> then <V> then <S> on the keyboard. Select *Right-click|Snaps|Object* then place the puck on the bottom left of the drive and left click. Move up to where the drive starts to curve around the corner and left click again. Move around the curve left clicking about 6-8 times to create small segments, then move to the top right of the drive. Select *Right-click|Snaps|Object* then left click on the boundary. Select *Right-click|Done* or press <Esc> to finish the curve. Repeat the process for the right hand side of the drive snapping to the bottom boundary, the top left corner of the house and the right boundary.

4. Turn Tablet Mode off by selecting *Settings|Digitizer|Tablet Mode* (or clicking the middle button). Check the size of the property is 120 x 90ft (40m x 28m). To do this you can select *Draw|Line|Single* and place the first point on the bottom left boundary corner and draw out the rubberband line until the puck is or crosshairs are over the top left property corner. Do not place the second point of the line; note the distance as shown on the status bar (d = ?), Now move the puck to the bottom right boundary corner. Once again, do not place the second point of the line; note the distance as shown on the status bar (d = ?). Select *Right-click|Restart* or press the Esc key.

4.8.2 THE REFERENCE METHOD

This method is used if at least two points on the plan are known in world co-ordinates. It is also used when the plan to be digitized is larger than the tablet or when the plan will not be completely digitized in one session.

To digitize a large plan it must be divided into sections small enough to fit on the tablet. Sections should have overlapping reference points e.g., if the first section has points A and B then the second section should have points B and C and so on. The first section should be referenced then digitized. When completed, the plan should be placed so that the next section is on the tablet with two other points available for referencing. The plan can be sideways or upside down if necessary. The referencing procedure is now repeated and the new section digitized. This is repeated until the whole plan has been digitized.

Reference points can be measured on the plan prior to starting. The co-ordinates of these points must be calculated in world units. For example, point B is measured as (2",2") or (45mm,50mm) which, when multiplied by the scale 1":15ft (200), gives world co-ordinates of (30ft,30ft) or (9m,10m).

1. Select *Settings|Digitizer|Reference*. IRRICAD will prompt you to enter the first reference point. Place the puck crosshairs over point A and left click. For the second reference point move to D and left click. Note that we could also use B or C in this example. In the dialog enter **0** for X1, **0** for Y1, **120** (**40**) for X2, **90** (**28**) for Y2 and **15** (**200**) for the scale and click [OK].

2. IRRICAD will calculate a scale from the reference points and compare it to the value entered. If the two scales differ by more than 5% a warning message with the calculated scale is displayed. If you click [Yes] to continue IRRICAD will use the entered scale. If you click No to terminate the process, re-select *Settings|Digitizer|Reference* and repeat the process, entering the correct scale. Note that if you do not know the scale of a plan you can use this method to get IRRICAD to calculate the scale for you. Normally round the calculated scale to a sensible value e.g., if the calculated scale is 1:198.86 then enter 1:200.

3. *Tablet Mode* is automatically turned on at the end of referencing. Digitize the plan and check the size as for the scale method. Also check that the co-ordinates of points A, B, C and D are as shown on the scaled plan.

4.9 Plot Templates

4.9.1 Edit an Existing Plot Template

Often it is easier to customize an existing template rather than to create a completely new template. The steps involved are:

1. Change the background color. In order to see the white fills and black lines, it is best to change the background color so it is neither black nor white. To do this go *Settings|Drawing Items* and in the lower middle section of the dialog box you will see "Background Color". Click on the color to bring up the selection palate and select a light shade of a color you prefer. Avoid green as this is the default highlight color. Click [OK].

2. Select *Plot Template|Edit Template*. By default, IRRICAD lists templates found in the folder specified in the path \IRRICAD\symbols\template. If necessary, change the path and drive to locate the template to open.

3. Select a template by double-clicking the file name or by selecting the file name and clicking [Open]. Make sure the template is for the paper size that you want to use. The template will be drawn on the screen.

4. Go to *Settings|Drawing Items* and uncheck the "Fills" check box under "Display". This will turn the fills off to make editing easier.

5. Edit the template by using any drawing tools such as lines, arcs, rectangles, text and symbols or other IRRICAD tools such as *Change*, *Move* and *Delete* to add and change objects as required.

6. To select objects for editing, use *Modify|Select|Window*, or use the selection filters (*Modify|Selection Filter* setting the type to e.g., text and checking the "Filter" check box). If *Select Object* is used fills will often be selected when text or lines are targeted.

7. To edit a legend object it must first be exploded (*Modify|Select Object* then *Modify|Explode*). Legends must be (re-)created

using *Plot Template|Make Legend* before the template is saved. See the section on Creating Legends (Section 4.9.2.1) for a complete explanation.

8. Keywords created as text objects may form part of the template. When IRRICAD generates the plot layout in *Draw|Plot Layout* it recognizes these keywords and replaces them with the required information. Keywords start and end with #.

9. Go to *Settings|Drawing Items* and check the “Fills” check box under “Display” to turn the fills back on.

10. Use *Modify|Select|Window* to select the whole image on the screen. Go to *Plot Template|Save Template* and specify the name for this particular template.

4.9.2 CREATING A NEW PLOT TEMPLATE

The steps involved in creating a new plot template are:

1. Change the background color. In order to see the white fills and black lines, it is best to change the background color so it is neither black nor white. To do this go to *Settings|Drawing Items* and in the lower middle section of the dialog box you will see “Background Color”. Click on the color to bring up the selection palate and select a light shade of a color you prefer. Avoid green as this is the default highlight color. Click [OK].

2. Change the distance units to feet (meters) by selecting *Settings|Units* and clicking the down arrow on the distance edit field.

3. Decide the paper size that you wish to create a plot template for. e.g., Size B (A3) paper. Determine the maximum printable area on the paper and multiply by 1000 e.g., a printable area of 17 x 11" becomes 1416.67 x 916.67ft (420mm x 297mm becomes 420 x 297m). B (A3) size paper with an assumed margin perimeter around the paper of 0.3” (8mm) then becomes 25ft (8m). If the lower left corner of the paper is assumed have coordinates of 0, 0 then the printable area is from 25, 25 to 1391.67, 891.67 (8, 8 to 412, 289). To see a table of paper sizes and their dimensions see Paper Sizes, Section 2.9.8.7.

4. Start with a new design. The following process will define the extent of the active area, create two rectangles (one inside the other) and create a white fill in the area between the two rectangles. To work through the example using metric A3 paper, use the numbers in brackets.

5. Change the units to **ft** (**m**) in *Settings|Units*. Select *Draw|Line|Single*. Type **25,25** (**8,8**) and click <Enter>. As you type the coordinates they will appear on the status bar at the lower left of the screen. Make sure that the coordinates are typed correctly. The comma between the two numbers is necessary. Type **1391.67,891.67** (**412,289**) and click <Enter>.

6. Select *View|Zoom All* to display the diagonal line representing the extents of the printable area. This will be used later and then deleted.

7. Select *Draw|Rectangle|2 Point*. Type **–41.67,-41.76** (**-12,-12**) and click <Enter>. Type **1458.33,958.33** (**432,309**) and click <Enter>.

8. Select *View|Zoom All* to display the rectangle representing the outer boundary of the fill. This is intentionally outside the paper size.

9. Select *Draw|Rectangle|2 Point*. Type **33.33,33.33** (**10,10**) and click <Enter>.

10. Type **1383.33,883.33** (**410,287**) and click <Enter>. Select *View|Redraw*) to refresh the image. The smaller rectangle represents the inner boundary of the fill and it will be the border line for the template. See Figure 4-93.

11. Go to *Settings|Drawing Items* – "Current Color". Click on the color box to bring up the color palate and select white. Click [OK], [OK] to return to the main screen.

12. Select *Draw|Fill|Seed* and click on a space between the two rectangles. The space between the two rectangles will turn white. See Fills, Section 2.9.8.4.

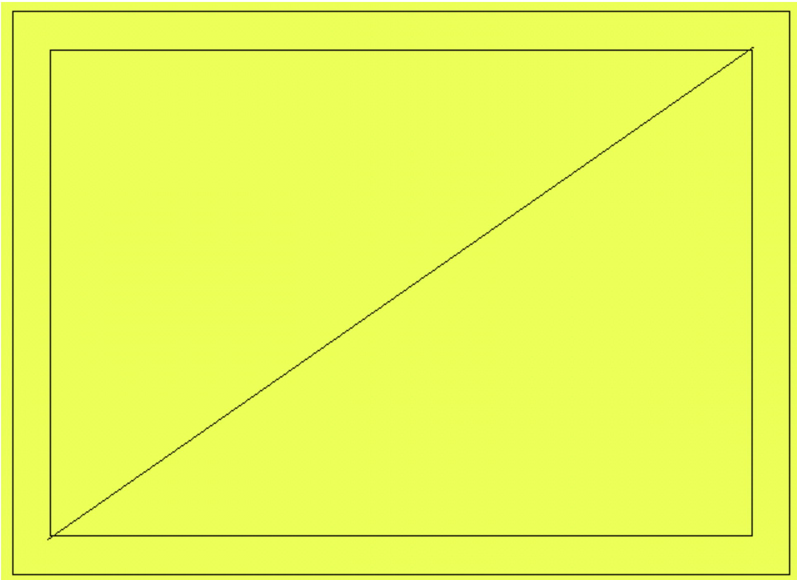


Figure 4-93

13. Go to *Settings|Drawing Items* - "Current Color". Click on the color box to bring up the color palate and select black. Click [OK], then [OK] to return to the main screen.

14. Select *Modify|Select Object*. Place the cursor just at the top of the outer rectangle and click on the edge. Only the outer rectangle should be highlighted. Click the <Delete> key to delete the rectangle.

15. While still in *Select Object* mode, place the cursor just at the inside edge of the inner rectangle and click on the edge. Only the inner rectangle should be highlighted. Select *Modify|Change* and change the "Line Width" to **4**. While still in *Select Object* mode, click on the diagonal line.

16. Go to *Plot Template* and click on *Make Active Area*. Select *View|Redraw* and a faint dashed rectangle will appear just outside of the border rectangle.

17. Select *Modify|Clear Selection* and then *Modify|Select Object*, click on the diagonal line and click the <Delete> key. See Figure 4-94.

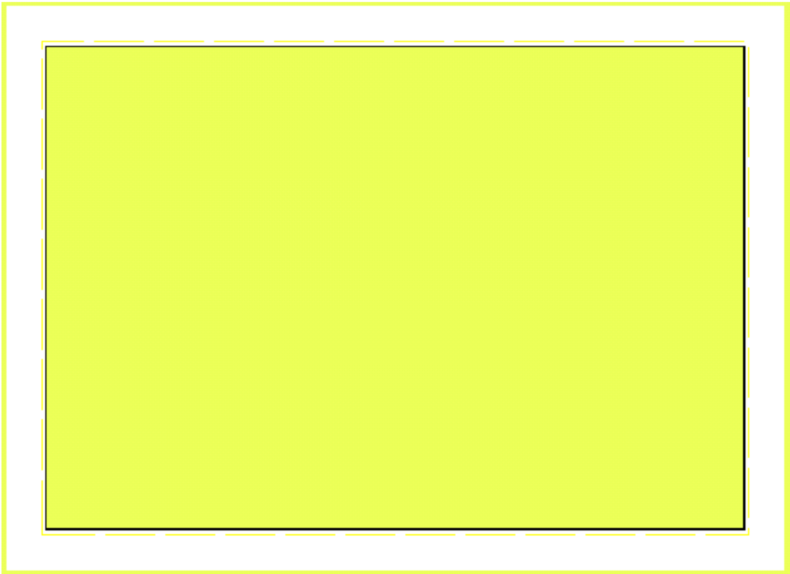


Figure 4-94

18. It is a good idea to save the work done so far. Select *Modify|Select|Window* and place a window to encompass everything on the screen including the fill. Select *Plot Template|Save Template*. Type in a name of your choice then click [OK].

The next part of the process is to place dividing lines and text.

19. Select *Draw|Line|Single*, type **33.33,76** (**10,48**) and click <Enter>. Move the mouse across the screen towards the right side of the border. Click the right mouse button, select *Snaps|Perpendicular* and then click on the right border.

20. Select *Modify|Change*, select the line you just placed and change the "Line Width" to **4**. Don't worry if it appears thicker than the border rectangle. Go to *Draw|Text* and type in **#CONA#**. Select a font, set the size to **13.33ft** (**4m**) and click on "Left" justification. Place the text in right side area of the bottom section. See Figure 4-95. #CONA# is the key word that causes IRRICAD to insert the company name into the design. Many more dividing lines and text can be added to the template.

Figure 4-95

21. Save the template. Select *Modify|Select|Window*) and place a window to encompass everything on the screen including the fill. Select *Plot Template|Save Template*. Type in the same name that you used before.

4.9.2.1 CREATING LEGENDS

The following steps demonstrate how to create a pipe legend and a valve legend in the plot template being used in this exercise:

22. Select *View|Zoom Window* to zoom in on the lower left corner of the template.

23. Select *Draw|Rectangle|2 Point* and draw a rectangle about **4"** (**100mm**) long and just under **150ft** (**45m**) high.

24. Make a copy of this rectangle to the right of the original. Select *Modify|Copy|Linear*, click on the rectangle and then click [OK] for **1** copy. Click on the top left of the rectangle and while holding the <Ctrl> key down, move the copy to the right of the original. Click to place the copy. (Holding the <Ctrl> key down while drawing an object activates the "Ortho Mode"). See Figure 4-96.

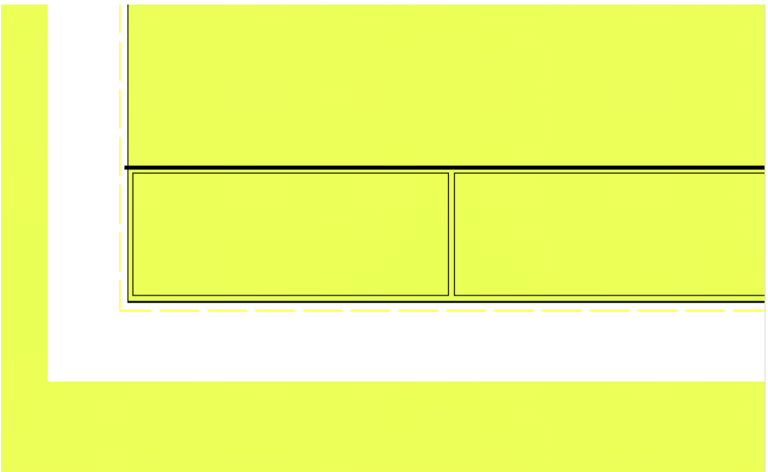


Figure 4-96

25. Go to *Settings|Drawing Items* – "Current Color". Click on the color box to bring up the color palate and select white. Click [OK], [OK] to return to the main screen.

26. Select *Modify|Select Object*. Place the cursor on an edge of the left rectangle and click to highlight the rectangle. Select *Draw|Fill|Selection*. A white fill will appear. Repeat this step completely for the right rectangle. For a more detailed explanation of fills in plot templates see Fills, Section 4.9.2.2.

27. Go to *Settings|Drawing Items* - "Current Color". Click on the color box to bring up the color palate and select black. Click [OK], [OK] to return to the main screen.

28. Select *Modify|Select Object*. Place the cursor just at the top of the left rectangle and click on the edge. Only the rectangle outline should be highlighted. Click the <Delete> key to delete the rectangle outline. Repeat for the right rectangle. See Figure 4-97.

29. Select *Draw|Line|Single* and draw a short line in the top left of the small rectangle. Select *Modify|Select Object*, then *Modify|Change* and then click on the line. Change the "Line Width" to **3**.

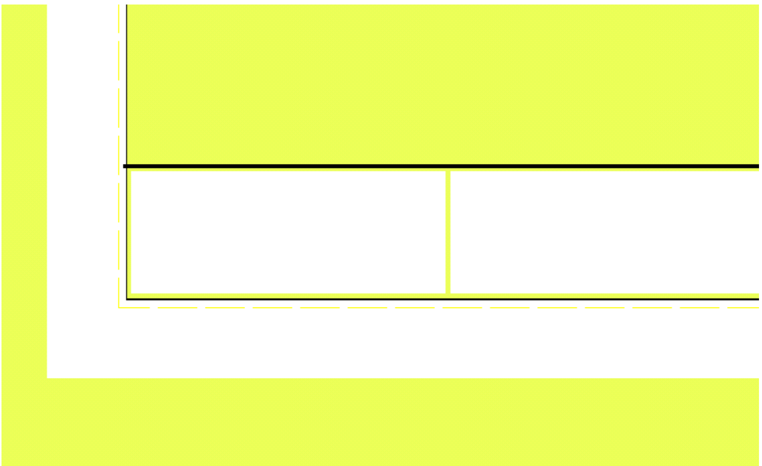


Figure 4-97

30. Select *Draw|Text* and type the word **Pipe**. Set the font to your choice and set the size to **10ft** (**3m**). Place the text to the right of the short line.

31. If at any time the line and text disappear behind the fill, select *View|Redraw*. It is easier to use *Modify|Select|Window* to select an item located within a fill.

32. In the second rectangle insert a symbol placeholder. Go to *Draw|Symbol* and click the [Load] button. Go to the \IRRICAD\symbols\database folder. You may need to go up one level to get to this folder. Browse for a symbol called **PlaceHolder.vcs**. Highlight this symbol file, click [Open], make sure the boxes of "Dynamically Size" and "Maintain Shape" are checked and then click [OK]. This symbol is now be loaded for placement. Move the cursor to the top left of the second rectangle. The symbol needs to be about **20 x 20ft** (**4 x 4m**) in size so click once to define the bottom left of the symbol, move the mouse up and out and click again to define the top right of the symbol.

33. Select *Draw|Text* and type in the word **Symbol**. Set the font and size the same as for the pipe legend. Place the text to the right of the symbol. See Figure 4-98.

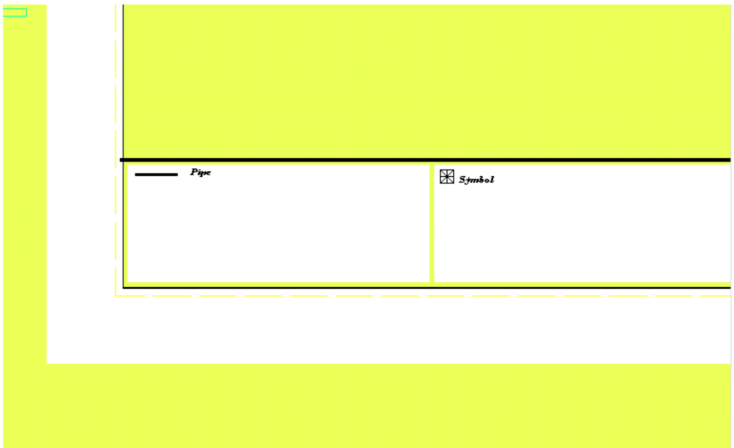


Figure 4-98

Now that the components of the legends are in place it is necessary to group them together and save them as legends.

34. Select *Modify|Select|Window* and place a window to completely encompass the pipe legend, including the fill. Select *Plot Template|Make Legend*. Leave the fields as **Pipe**, **1**, and **50%**. Click [OK].

35. Using *Modify|Select|Window* place a window to completely encompass the symbol legend, including the fill. Select *Plot Template|Make Legend*. Change the legend type to **Symbol** by clicking on the dropdown arrow and selecting **Symbol**. Click [OK].

4.9.2.2 Fills

To complete the plot template in this working example it is necessary to place a fill over the bottom section of the template so parts of the design will not be plotted in the area containing the company name, scale, legends etc. To do this:

36. Select View|Zoom All.

37. Go to *Settings|Drawing Items* – "Current Color". Click on the color box to bring up the color palate and select white. Click [OK], [OK] to return to the main screen.

38. Select *Draw|Fill|Boundary*. Move the cursor to the bottom left of the template.

39. Select *Right-click|Snaps|Endpoint*. Click on the bottom left corner of the black border line.

40. Click the right mouse button and select *Snaps|Endpoint*. Click on the end of the left end of the dividing line above the legends.

41. Select *Right-click|Snaps|Endpoint*. Click on the end of the right end of the dividing line above the legends.

42. Select *Right-click|Snaps|Endpoint*. Click on the bottom right corner of the black border line.

43. Select *Right-click|Done*. The whole area under the dividing line should now be white. Any text and lines will have disappeared behind this fill.

4.9.2.3 Moving Fills to Back

In the example it is necessary to bring the text and lines to the forefront.

Figure 4-99

44. Select *Modify|Select|Window* and place a window that completely encompasses the whole bottom divided section of the template. This should include the legends. See Figure 4-99.

45. Go to *Plot Template* and click on *Move Fills to Back*. The legend symbols, text and #CONA# should now be visible. See Figure 4-100.

46. Save the template for the last time in this exercise. Select *Modify|Select|Window* and place a window to encompass everything on the screen including the fills. Select *Plot Template|Save Template*. Type in the same name that you used before.

47. Reset the drawing color to black by going to *Settings|Drawing Items* – “Current Color”. Click on the color box to bring up the color palate and select black. Click [OK], [OK] to return to the main screen.

The process is complete. Naturally it is possible to customize the plot templates in much more detail. This can be done using the drawing tools.

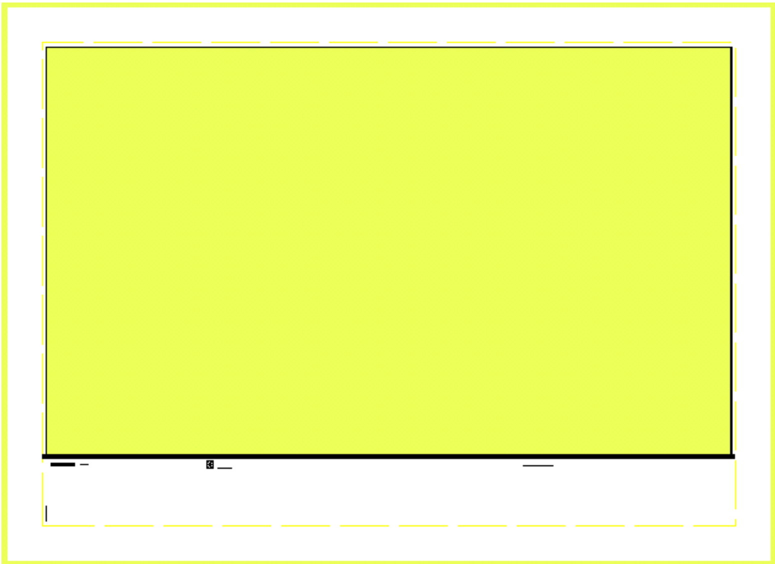


Figure 4-100

4.10 TIPS FOR ADVANCED USERS

4.10.1 USING A PUMP IN A DESIGN

The pump must be placed downstream from the water supply and must not be placed in loops. Remember a water supply can only have one connection. Enter the water supply details to reflect true conditions of the supply – the height of water relative to ground level, or the existing pressure of the water source.

If the water supply is a river or open water source and therefore the pressure may be zero, enter a small number for the water supply design and maximum pressures so that IRRICAD will not calculate the pressure required to run the system (e.g., 0.1).

If the water supply is a tank, enter the height of the water level above ground level as the design and maximum pressures e.g., 2ft (m).

If the water supply is a well, enter the pressure as a negative pressure, indicating the level of the water below ground level e.g., –2ft (m) pressure if the water level is 2 feet (meters) below the ground (i.e. the static water level). If the well is artesian i.e. positive static water level, enter a positive number e.g., 2ft (m).

When a pump is used in a system, there are often more items that result in a headloss. These items such as rising column losses (submersible pump only), drawdown losses (well only), headworks losses, etc. can be entered in to the design and therefore analyzed as close to field results as possible.

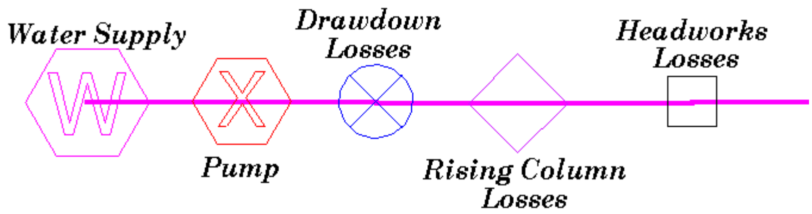


Figure 4-101

If the water supply is a well with a static water level below ground level, there will be a negative pressure in the pipe between the water supply and the pump, which will be reported during analysis. It does not matter in which order the above items are placed on the mainline pipe, only that they are placed so that any losses are accounted for. The items above can be entered at the depth they are at, or left at zero for convenience.

4.10.1.1 ENTERING PUMPS IN TO THE DATABASE

Use the manufacturer's data for the pump. From the pump curve supplied read off the pressure and resulting flow for several points along the 6 stage curve. In IRRICAD databases, select the Utilities menu, the Curve Fitting option and the Pumps option. Enter at least three sets of data into the curve fitting utility for pumps (make sure the units above each column match the units you are using from the graph). Click the Fit Curve button. The curve fitting generates three numbers to use in the database (coefficients of a quadratic). This produces numbers A, B and C that IRRICAD uses in the pump formula to calculate the pressure the pump will produce based on the flow. The pressure provided by the pump can be seen in Hydraulic Object Info.

Enter a new pump into the Tutorial database from a pump curve.

1. Run IRRICAD Databases. Move the open database (check it is **Tutorial.mdb**) down slightly so you can see the menu bar by dragging the open database down by the top blue bar.

2. Select *Utilities|Curve Fitting|Pumps*. Make sure the units match the units you are reading off the graph. Enter at least 3 sets of points from the curve, particularly around the area you wish to operate the pump in the design.

3. Click the [Fit Curve] button. Make sure the R^2 is greater than 90%. If it is not, re-enter the points. Leave this dialog open.

4. Click on the Pump component group tab and click [New Pump]. Enter the “Usage” (**Y**), “Description”, “Warehouse Code”, “Connection Types” (use **PUMP F S** so it easy to identify in the reports) and “Diameters”. You can copy and paste the numbers from the pump curve fitting into the appropriate fields in the Pump Details dialog or write them down and type them in. Enter the “Minimum Flow” and “Maximum Flow” for that pump and

select a “Plotting Symbol”, “Symbol Size” and “Plotting Colour” for the new item. [Save] the new pump.

If a surface pump model is 100 x 65: 100 is the suction diameter, 65 is the diameter of the discharge (outlet). If an extra number is present in the description – size of the impeller. For a submersible pump, enter the inlet and outlet diameter the same.

4.10.1.2 Miscellaneous Hydraulic Items in Your System.

These are items that have a pressure loss in the system. These losses can be based on flow or can be a fixed loss.

If fitting selection is not important, it is convenient to enter the connection type for Misc. Hydraulic items to reflect the description e.g., DD for drawdown. This makes it easier to find them in the Mainline Full Report. Also you can change the connection codes after design but prior to fitting selection easily if required.

Drawdown Losses

Drawdown losses are based on well tests. Determine the drawdown for the well (pumping level - static water level).

Solve the formula used for Misc. Hydraulic items: $H = K \times Q^n$ where H is in meters and Q is in m^3/hr.

The drawdown is equal to the headloss in m (e.g., if the dd = 9.6m, then the headloss = 9.6m).

Q is the flow at the well, e.g., $49m^3/h$. I is the exponent.

For alluvial aquifers: If there is only one well test (Q-dd pair) available estimate the index is around 1.5. For a large flow use 1.7 (> 50 l/s). Find the value of the constant e.g., $K = H/Q^n$.

If there are two points supplied (2 well tests) on the same well can calculate the index (exponent). N = log (D1/D2)/log (Q1/Q2). $K = D1/Q1^n$.

For wells that are uncased in rock or limestone use an index (n) close to 1.0

1. Enter the constant (K) and index or exponent (n) in to the correct edit fields in the Other Hydraulic component group in the database. The intercept (C) is 0.

Enter a new Drawdown loss item in to your database. The data you have is a flow of $49m^3/h$ and with 9.6m drawdown. Calculate the Constant K and the Index (exponent) n.

2. Go to the Other Hydraulics component group tab in the Tutorial database. Click on [New Item]. Enter the "Usage" (**Y**), "Description", "Warehouse Code", "Connection Types" and "Diameters". Enter the "Constant" and "Index" as you have calculated in the correct fields. Leave the "Fitting Type" blank (only used for PRVs). Enter the "Minimum Flow" and "Maximum Flow" for the item and select a "Plotting Symbol", "Symbol Size" and "Plotting Colour" for the new item. [Save] the new item.

Rising Column (Rising Main) Losses in a Submersible Pump

This item can also be the suction pipe loss in a surface pump. Use a friction loss chart for the type of rising column used.

Enter at least three sets of numbers read from the chart for the correct flow and rising column size into the curve fitting utility for valves (same as Misc. Hydraulic but no intercept), making sure the units above each column match the units you are using from the chart. Click the Fit Curve button. The curve fitting generates two numbers to use in the database. This produces constants and intercepts that IRRICAD uses in the Misc. Hydraulic formula to calculate the headloss through the rising column. It is easier to calculate for 100m and then adjust for the actual length.

For galvanized rising columns use the following: These have been calculated for a column 328ft (100m) long

Pipe Size	**Constant**	**Index**
8"	0.0001479	1.834
6"	0.0004907 6	1.84
5"	0.001254	1.810
4"	0.003307	1.852
3"	0.01174	1.855
$2^1/_2$"	0.02448	1.874

Alter the constant relative to the length of the rising column (using the metric)

E.g., constant x length (m)
100m

for an 8" rising column which is 85m long ⇒ 0.0001479 x 85 / 100 = 0.000126 which is the "Constant".

The rising column of the pump we will be using is **6"** (**150mm**) and is 213ft (65m) long. Calculate the constant relative the length (as above).

1. Go to the Other Hydraulics component group tab in the Tutorial database.

2. Click on [New Item]. Enter the "Usage" (**Y**), "Description" (make sure the description specifies the length), "Warehouse Code", "Connection Types" and "Diameters". Enter the "Constant" and "Index" as you have calculated in the correct fields. Leave the "Fitting Type" blank (only used for PRVs). Enter the "Minimum Flow" and "Maximum Flow" for the item and select a "Plotting Symbol", "Symbol Size" and "Plotting Colour" for the new item. [Save] the new item.

Headworks Losses

This Misc. Hydraulic item can be used to account for other losses relative to the flow.

n = 2

H = for example, if you estimate the pressure loss in the headworks to be 5psi @ 26385gph (3.5m @ $100m^3/h$) you can assume n=2 (in most cases) and solve for K.

Solve for K $H= KQ^n$

There is no intercept so leave the intercept field (C) as 0.

You can calculate the headloss through each of the items in the headworks or expected to be in the headworks at a particular flow and therefore calculate the constant and the index. The headloss will change as the flow increases or decreases. Note that existing systems tend to have high headloss at the headworks.

Enter a new Miscellaneous loss item in to your database – where the pressure loss is 5psi @ 26385gph (3.5m @ 100m^3/h).

1. Go to the Other Hydraulics component group tab in the Tutorial database. Click on [New Item]. Enter the "Usage" (**Y**), "Description", "Warehouse Code", "Connection Types" and "Diameters". Enter the "Constant" and "Index" as you have calculated in the correct fields. Leave the "Fitting Type" blank (only used for PRVs). Enter the "Minimum Flow" and "Maximum Flow" for the item and select a "Plotting Symbol", "Symbol Size" and "Plotting Colour" for the new item. [Save] the new item.

Miscellaneous Fixed Losses

Misc. losses can be added to account for any other possible losses. These can be added into the Other Hydraulics component group by entering an intercept and leaving the constant and index as zero. Use only if you want to include a fixed loss regardless of flow.

1. Go to the Other Hydraulics component group tab in the Tutorial database. Click on [New Item]. Enter the "Usage" (**Y**), "Description", "Warehouse Code", "Connection Types" and "Diameters". Enter the "Intercept" as **6.5ft** (**2m**), leaving the "Constant" and "Index" as **0**. Leave the "Fitting Type" blank (only used for PRVs). Enter the "Minimum Flow" and "Maximum Flow" for the item and select a "Plotting Symbol", "Symbol Size" and "Plotting Colour" for the new item. [Save] the new item.

4.10.1.3 Draw a Design with a Pump and All Components

1. Now draw a design with the new pump in it, place the drawdown losses, rising column losses, headworks losses and miscellaneous losses you have just entered in the database.

2. Enter the *Water Supply* "Head" as **-33ft** (**-10m**) for both.

3. Place a **Demand Flow** (*Mainline|Outlet*) with a "Pressure" of **100psi** (**70m**) and a "Flow" of **26385gph** (**100m^3/hr**) on the end of the mainline to represent a hydrant.

4. Place a valve upstream from the Outlet. *Design* the system and view the reports to see the effect on the system the above items have. The best report to see this in is the *Mainline Design Full* report.

4.10.2 MULTIPLE WATER SUPPLIES

If only one water supply exists for a system you can leave the pressure and flow for IRRICAD to calculate based on each system duty.

However, if there are 2 or more water supplies present for the same system and you are not concerned about pumps, you must enter at least the pressure in to all water supplies. You can increase or decrease the pressure to achieve the flow you require from each. If the water supplies are supplying the same system then *LP Design* cannot be used. You must use *Velocity Design* to size the pipes.

Note: *If the multiple Water Supplies are unconnected in your design then they must supply different system flows as set in Management.*

1. Draw a design with 2 water supplies, one on each end of an **8-inch** (**200mm**) mainline pipe. **164ft** (**50m**) long. Enter the pressures for the water supplies to be **90psi** (**65m**).

2. Select the *Mainline|Outlet* **Demand Flow** and set the demand point "Pressure" to be **70psi** (**50m**) and the "Flow" to be **13192gph** (**50m^3/hr**).

3. Use *Right-click|Snaps|Midpoint* to connect the demand point halfway along the pipe.

4. After completing Zone analysis and Management run *Mainline Design|Analyze.* View the *System Duty Report*.

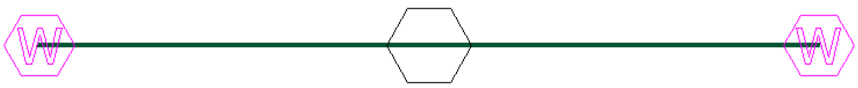


Figure 4-102

5. Now select the demand point and move it closer to the left-hand water supply. Re-analyze the mainline and view the System Duty Report.

Figure 4-103

6. Now select the demand point again and move it closer to the other right-hand water supply. Re-analyze the mainline and look at the *System Duty Report*.

This exercise highlights the effects on the water supplies under changing conditions.

4.10.2.1 PRVs with Multiple Water Supplies on a System

If a PRV on the water supply is required, in a design containing multiple water supplies, do the following:

Make the water supply the PRV – enter the water supply pressure equal to the PRV pressure setting e.g., if the PRV is to be set at 70psi (50m), enter the water supply pressure as 70psi (50m). Never put PRVs in loops. Manually check the PRV is able to regulate at that set pressure and at that flow.

4.10.3 Using Pumps in Parallel

If two pumps are in parallel – they are effectively in a loop – NEVER put pumps in a loop. If this is the case, draw two water supplies with a pump each and connect the mainline after the pumps:

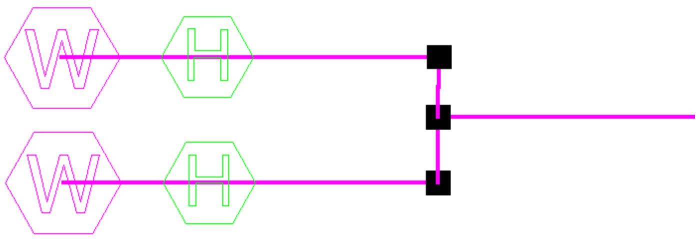


Figure 4-104

Remember using the same pump in parallel doubles the flow.

1. Draw a small design like the above picture using the **Tutorial.mdb**.

2. Enter 25in (**0.1m**) as the "Design Head" and "Max Head" for both water supplies.

3. Select an **8-inch** (**200mm**) pipe for the mainline pipe. Select the **Pump 350gpm @ 70psi** (**1320lpm @ 50m**) as the pump.

4. Use the **Demand Flow** outlet as the *Mainline Outlet* and enter a "Pressure" of **68psi** (**48m**) and a "Flow" of **39578gph** (**150m^3/hr**).

5. *Assign all Zones to One System Flow* and enter system flow 1 to be supplied by both water supplies.

6. Analyze the zone.

7. Run *Mainline Design|Analyze* and view the *Mainline Design Full* report. Click [OK] on both warning messages about not having pumps in loops.

8. Turn *Hydraulic Object Info* on in *Right-click|Object Info* and view the hydraulic results of each component.

4.10.4 PUMPS IN SERIES

Pumps can be placed in series. Once again, no pump should be placed within a loop.

1. Edit the above drawing so that there is only one water supply.

2. Add an extra pump on the same pipeline.

3. Change the demand point to require **128psi** (**90m**) pressure and **19789gph** (**75m^3/hr**).

4. Re-run zone analysis, management, and mainline analysis.

5. Check the *Mainline Design Full* report.

6. Turn *Hydraulic Object Info* on in *Right-click|Object Info* and view the hydraulic results of each component.

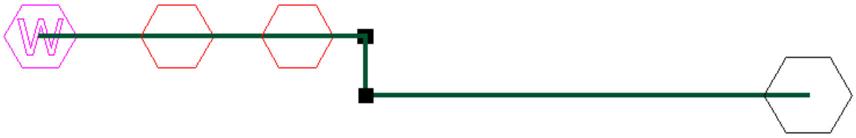


Figure 4-105

Remember using the same pump in series doubles the pressure output.

5 Tool and Command Reference

This reference guide will explain the mechanical use of each item, tool and dialog.

5.1 RIGHT-CLICK MENUS

Right-click menus are context sensitive, that is, they change according to which tool is currently selected.

Hydraulic Right-click menu:

Figure 5-1

Done	See Section 5.1.1
Restart	See Section 5.1.2
Snaps	See Section 5.1.3
Running Snaps	See Section 5.10.16.2
Zooms	See Section 5.1.4
Default Name	See Section 5.1.5
Undo Vertex	See Section 5.1.7
Close	See Section 5.1.9
Stop	See Section 5.1.11

Drawing Right-click menu:

Figure 5-2

Done	See Section 5.1.1
Restart	See Section 5.1.2
Snaps	See Section 5.1.3
Running Snaps	See Section 5.10.16.2
Zooms	See Section 5.1.4
Undo Vertex	See Section 5.1.7
Close	See Section 5.1.9

Selection Right-click menu:

Figure 5-3

Select Object	See Section 5.11.1
Clear Selection	See Section 5.11.2
Invert Selection	See Section 5.11.3
Selection Filter	See Section 5.11.4
Select	See Section 5.11.5
Layers	See Section 5.1.10
Object Info	See Section 5.1.6
Modify	See Section 5.1.8
Zooms	See Section 5.1.4

5.1.1 Done

Found in the *Right-click* menu, this option is used to finish an object that has multiple line segments, e.g., polyline, curve, contour, hatch boundary, tape, etc. Done can also be selected for some hydraulic tools, such as *Zone|Area* where the area has not been closed.

5.1.2 RESTART

Found in the *Right-click* menu, select to restart an action part way through e.g., move, or to stop a pipe so the user can start from another point.

5.1.3 SNAPS

Found in the *Right-click* menu, snaps give the user the ability to place or constrain points in relationship to other objects in the drawing. When using a Snap command while locating a point, the point snaps into position. The following snaps are available:

- Place
- Midpoint
- Endpoint
- Perpendicular
- Percent
- Object
- Intersection
- Tangent
- Closest
- Center
- Quadrant
- Parallel

The user can use a snap whenever a point requires placing. For example, when selecting *Draw|Line|Single,* the user is prompted for the starting point of the line. Before the user clicks the point, the user can choose a snaps option from the *Right-click* menu, which will affect the placement of the starting point. For example, if the user chooses the *Right-click|Snaps|Closest* and clicks near the end of an object, the starting point of the line will be placed exactly at the endpoint of that object.

The *Perpendicular* and *Tangent* snaps can function either as snaps or as drawing constraints. As snaps, these options typically are used to find the ending point of a line or line segment so that the completed line is perpendicular to, or at a tangent to, a specified object. When used as constraints, these options cause the rubber band preview line to maintain a perpendicular (or tangent) relationship to a specified object as the user moves the cursor. The user can place the endpoint anywhere, and the resulting line will be perpendicular or tangent to the specified object.

The *Snaps* options can be invoked from a pop-up *Right-click* menu accessed by clicking the right mouse button.

5.1.3.1 PLACE

Use the *Right-click|Snaps|Place* command to place a hydraulic item instead of connecting it to an existing hydraulic item.

The user would use this command when in "Connect" mode (*Settings|Snap*) when the user wishes to place a single hydraulic item then continue connecting hydraulic items. If the user have a large number of items or points to place set "Place" mode in *Settings|Snap*.

See also:

Snaps *Section 5.1.3*

5.1.3.2 MIDPOINT

Use the *Right-click|Snaps|Midpoint* command in drawing or editing operations to find the midpoint of a line, or along the perimeter of an arc. If the center of the curvature of a circle, arc, or the centroid of a polygon is required, use the *Right-click|Snaps|Center* command. The cursor must be within the snap tolerance (as set in *Settings|Snap*) of the object for the snap to occur.

To find the midpoint of an object:

1. Select *Right-click|Snaps|Midpoint*.
2. Click anywhere on the target line or arc.
3. The point is set at the midpoint of the target object.

See also:

Snaps *Section 5.1.3*

5.1.3.3 Endpoint

Use the *Right-click|Snaps|Endpoint* command to snap to the end point of a previously placed object. The cursor must be within the snap tolerance (as set in *Settings|Snap*) of the object for the snap to occur.

To use the Endpoint command:

1. Select *Right-click|Snaps|Endpoint*.
2. Click near one end of the target object. The cursor immediately snaps to the end point of the target.

See also:

Snaps *Section 5.1.3*

5.1.3.4 Perpendicular

Use the *Right-click|Snaps|Perpendicular* command when a single or continuous line must be drawn perpendicular to a target object. The user can use the *Perpendicular* command as a snap (which terminates the line on the target object) or as a constraint (which sets the originating point on the target object and constrains the line perpendicular to the object).

Valid target objects include lines, continuous lines, circles, arcs, rectangles, polygons, ellipses, elliptical arcs, spline curves, and bezier curves available from the *Draw* menu.

To use as a snap:

1. Select a *Line* command from the *Draw* menu and place the first point. This initiates rubberbanding as the user is prompted to pick the second point.
2. Select *Right-click|Snaps|Perpendicular*. IRRICAD prompts the user to pick an object.
3. Click the target object to set the second point.

IRRICAD terminates the line perpendicular to the target object. If the line cannot be drawn perpendicular to the target object itself, the line is drawn perpendicular to a calculated extension of the object.

To use as a constraint:

1. Start a Line command from the *Draw* Menu.

2. Select *Right-click|Snaps|Perpendicular*.
3. Click the target object.
4. Now set the starting point of the line. Click to place the starting point.

If the user requires the starting end of the constrained line to move freely on the target object, click any point without using a snap command. Then a rubberband line connects the target object to the cursor. This line moves and Stretches as the user moves the cursor, always maintaining a perpendicular relationship between the rubberband line and the target object.

If the user wants the perpendicular line to originate on a specified point on the target object or elsewhere use another snap command to start the line. The snap determines a fixed starting point of the new line, which is free to Stretch along its axis, but not move laterally.

5. Click a point to terminate the line, or type a required length of the line.

See also:

Snaps *Section 5.1.3*

5.1.3.5 Percent

Use the *Right-click|Snaps|Percent* command when a required point is located along an object at a distance from the end equal to a specified percentage of the length of the target object. This can be used on lines, continuous lines, and arcs available from the *Draw* Menu.

To use the *Percent* command:

1. When prompted for a point in any command, select *Right-click|Snaps|Percent*.
2. Click the target object on which the point is to be set. The end nearest the point picked is the 0% end of the target object, and the opposite end is the 100% end.
3. Type the required percent of the length of the target object. Click [OK].
4. Click on the target line near the end the user wishes the percentage to be measured from.

Tips: Do not type the percent symbol (%).

The user can enter percentage values less than 0 or greater than 100 to set points on the extension of the target object.

See also:

Snaps	*Section 5.1.3*

5.1.3.6 Object

Use the *Right-click|Snaps|Object* command in drawing or editing operations to locate a point on an object when the specific location on the object is not critical.

To snap to an object:

1. Select *Right-click|Snaps|Object*.
2. Click the target object to snap to.

The point is set on the target object.

See also:

Snaps	*Section 5.1.3*

5.1.3.7 Intersection

Use the *Right-click|Snaps|Intersection* command in drawing or editing commands where an exact point of intersection must be found.

To snap to the intersection of two objects:

1. Select *Right-click|Snaps|Intersection*.
2. Click near the point where the two target objects intersect.

The point is set at the point of intersection of the two target objects. If there are multiple points of intersection (such as a line passing through a circle), IRRICAD finds the point of intersection nearest the mouse click.

See also:

Snaps	*Section 5.1.3*

5.1.3.8 Tangent

Use the *Right-click|Snaps|Tangent* command primarily when a line must be drawn tangent to a target object. The user can use the *Tangent* command as a snap or constraint to determine whether the tangent line terminates on the target object or originates on the target object. Valid target objects include circles, arcs, ellipses, elliptical arcs, interpolating curves, and Bezier curves.

To use as a snap:

1. Start the *Line* command from the *Draw* menu and place the first point. IRRICAD prompts the user to pick the second point.
2. Instead of immediately picking a terminating point, select *Right-click|Snaps|Tangent*. IRRICAD prompts the user to pick an object.
3. Click the target object.

IRRICAD terminates the line tangent to that object. If the line cannot be drawn tangent to the target object itself, the line is drawn tangent to an imaginary extension of the object.

To use as a constraint:

1. Start a *Line* command from the *Draw* menu.
2. Instead of picking the starting point of the line, select *Right-click|Snaps|Tangent*. IRRICAD prompts the user to pick an object.
3. Click the target object.

If the starting end of the constrained line is required to be able to move freely on the target object, click any point without using a snap command. A rubberband line is drawn connecting the target object to the cursor. This line moves and stretches as the user moves the cursor, always maintaining a tangential relationship between the rubberband line and the target object.

If the user wants the tangent line to originate on a specified point on the target object or elsewhere, use a snap command to start the line. The snap determines a fixed starting point for the new line, which is free to Stretch along its axis, but not move laterally.

3. Click a point to terminate the line or enter a required length of the line simply by typing the required length. The length specified will appear on the status bar. Press the <Enter> key.

See also:

Snaps *Section 5.1.3*

5.1.3.9 Closest

Use the *Right-click|Snaps|Closest* command to find the nearest construction point.

To snap to the closest point:

1. When prompted to pick or snap to a point, select *Right-click|Snaps|Closest*.
2. Click near the target definition point.

IRRICAD locates the new point exactly on the existing definition point.

See also:

Snaps Section *5.1.3*

5.1.3.10 Center

Use the *Right-click|Snaps|Center* command to find the center point of a closed object like a circle or polygon. This command differs from the *Right-click|Snaps|Midpoint* command, which finds the midpoint along the length or perimeter of an object.

To set a point at the center of an object:

1. When prompted for a point, select *Right-click|Snaps|Center*.
2. Click one of the required objects.

IRRICAD sets the point at the center of the target object.

See also:

Snaps Section *5.1.3*

5.1.3.11 Quadrant

The *Right-click|Snaps|Quadrant* command is especially useful when an extreme horizontal or vertical point on a circle or arc is needed. For example, the user can snap a horizontal or vertical dimension directly to the outer edge of a hole or column. The user can also easily measure the diameter of a circle by snapping to opposite quadrant points.

To locate a quadrant point on a circle or arc:

1. When prompted for a point, select *Right-click|Snaps|Quadrant*.

2. Click the circle or arc near the required quadrant point.

IRRICAD sets a point exactly on the quadrant point.

See also:

Snaps — *Section 5.1.3*

5.1.3.12 Parallel

To draw a parallel line starting at an exact, user-placed point:

1. Select the appropriate line drawing command (*Draw|Line|Single, Double* or *Continuous*).
2. Place the starting point of the single line, continuous line or double line.
3. Select *Right-click|Snaps|Parallel*.
4. Click anywhere on the target line. IRRICAD will constrain movement of the rubber band line to be parallel to the target line. The line will start exactly where the user placed it in step 2.
5. Place a point to complete the line.

See also:

Snaps — *Section 5.1.3*

5.1.4 Zooms

The *Right-click* menu offers a short cut to the Zooms available from the *View* menu. Those available in the *Right-click|Zooms* menu are:

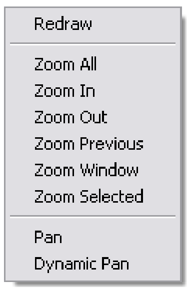


Figure 5-4

See also:

View — *Section 5.1.3*

5.1.5 DEFAULT NAME

When placing *Control Valves* or *Mainline Outlets* select *Right-click|Default Name* and change the Zone name to avoid going to *Settings|Names* to change the "Zone name", for this session of placing *Valves* or *Mainline Outlets*. Once another tool is invoked, the default name reverts to the default zone name as per *Settings|Names*.

5.1.6 OBJECT INFO

Found in the *Right-click* menu and the *Tools* menu, *Object Info* displays a brief summary of the selected objects. If the "Debug Object Info" box is checked (on the dialog or in *Settings|Miscellaneous*), a full description is displayed. The *Change* tool can also be used to view information about a selected object.

This tool can be accessed from the *Tools* menu, or from the *Right-click* menu. In common with other IRRICAD tools *Object Info* can be used to apply to an existing selection (information for multiple objects can be displayed simultaneously), or if no items are selected operated by clicking on individual objects.

See also:

Tools|Object Info *Section 5.12.17*

5.1.6.1 HYDRAULIC OBJECT INFO

If the "Hydraulic Object Info" check box is checked (on the dialog or in *Settings|Miscellaneous*), then *Object Info* will show a summary of the hydraulic information for that particular hydraulic item. The start and end pressure, the dynamic headloss, the elevation change, the inflow and outflow and the flow velocity are all displayed.

See also:

Tools|Object Info *Section 5.12.17*
Settings|Miscellaneous *Section 5.10.12.5*

5.1.7 Undo Vertex

This command allows the user to sequentially 'undo' placement of the line segments while running the *Continuous Polyline* and *Continuous Bezier* tools. The user can correct a misplaced segment without having to erase then redraw the entire line. If desired, *Undo Vertex* can be repeated over and over again until the current line is completely undone.

To use the *Undo Vertex* while running a continuous line, right click and choose *Undo Vertex* from the popup *Right-click* menu.

The last placed-line segment and vertex is removed, and the rubber band line is attached to the previous vertex.

5.1.8 Modify

Found in the Right-click menu, Modify provides a shortcut to modifying tools such as Delete, Delete Type, Change, Change Type, Move, Move Point, Copy, Rotate, Explode, Resize, Break, Adjust Image, Z-Order, Trim and Extend. These tools are also found in the Modify menu.

See also:

Modify menu *Section 5.11*

5.1.9 Close

Found in the *Right-click* menu, select to close a lasso, contour, curve, polyline, double line and areas when at least three points have been entered.

Note: *If the user is drawing an area and selects the Close option, make sure that the closing line, which will return to the starting point, will not cut any of the other boundary lines for the area.*

5.1.10 Layers

The *Right-click* menu offers a short cut to turning layers on and off. The options are:

- Hide <CURRENT> Layer
- Show <CURRENT> Layer

- Layer Bar

Where <CURRENT> is the layer of the currently selected object. These options are only available when a single object is selected.

The Layer Bar can be toggled on and off from the *Right-click* menu.

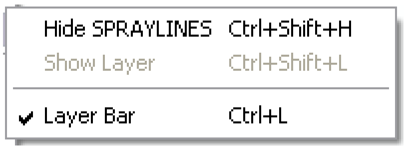


Figure 5-5

See also:

View|Layer Bar *Section 5.5.14*

5.1.11 STOP

Found in the *Right-click* menu, select to stop the drawing of a Pressure Map; Block tools; Cutpipe; or Cut Lasso.

5.2 KEYBOARD COMMANDS

IRRICAD incorporates a number of keyboard shortcuts that help to speed up the operation of various tools.

Shortcut to Change

Double-clicking on an item when in *Select Object* mode brings up the change dialog.

Selection Tool

To assist with selection when items are in close proximity hold the <Ctrl> key down while selecting items with the *Select Object* tool. A context menu will appear that lists all items close to the clicked point. Highlighting each menu item will select that item in the design. A *Modify* tool can then be applied to the selected item.

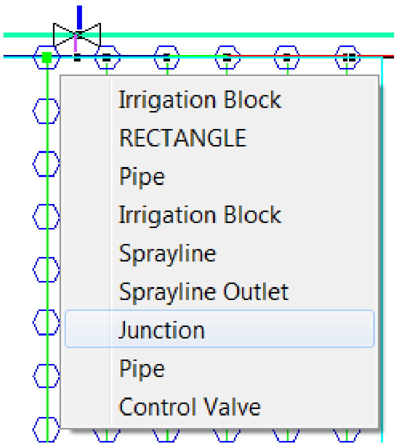


Figure 5-6

Selecting Irrigation Block Entities

To bring up the change dialog, for a Block Entity, hold down the <Alt> key while clicking on any child component of the block entity. For example hold the <Alt> key and click on a block lateral to open the dialog.

Clearing a Selection

Pressing the <Esc> key twice in quick succession clears the current selection and returns to the default *Select Object* tool.

Stopping Redraw

Redrawing a large design may be stopped by pressing the <Esc> key.

Quick Zone Naming

To place control valves and mainline outlets without having to view and "OK" the Zone Name dialog, hold the <Shift> key down when clicking to locate them. The default zone name will automatically be accepted and the dialog will not appear.

Sequential Copying

All *Copy* tools have a "no dialog" shortcut, which repeats the last copy without showing the dialog each time. To action, hold the <Shift> key for the 2nd and subsequent copies.

Ortho Mode

Holding the <Ctrl> key down when in "Ortho Mode" will disengage "Ortho Mode". Holding the <Ctrl> key down when not in "Ortho Mode" will engage "Ortho Mode" and at the angle set in this dialog field. Ortho mode settings can be found in *Settings|Drawing Items.*

When in Single Select Mode

When in "Single Select mode" (see *Settings*|Mouse, Section 5.10.13) multiple selections can be made by holding the <Shift> key.

In the single select mode clicking nothing (empty space) will clear the current selection.

Keyboard Shortcuts to Menu Items

Menu items can be selected by holding the <Alt> key and pressing the letter which is underlined in the menu name e.g., File - hold <Alt> and press the letter 'F'. The File menu will then drop down. To select the required menu item press the underlined letter - e.g., P will open the Print dialog.

Distance Counter

The <F9> key will zero the 'd=' on the status bar and is used to measure distances from where <F9> was invoked. To use a distance counter for any object on the screen, place the cursor over point 1 and press the F9 key to zero the distance counter. Move the cursor to the end of the distance the user to wish to measure and read the status bar. The distance and angle moved since pressing F9 will be displayed.

Note: This tool does not work in all modes. Will function when in Select Object mode, or when in a Drawing tool mode.

Status Bar Panels

To cycle through the Info Panel options use <Ctrl>+<Shift>+<C>.

To cycle through the Snap Panel options use <Ctrl>+<Shift>+<S>.

To cycle through the Selection Panel options use <Ctrl>+<Shift>+<F>.

Accelerator Keys in Database Editor

Accelerator keys for adding, deleting, and editing components are available in the Database Editor.

Add Item can be started by pressing <Shift> + <Enter> keys.

Edit Item can quickly open the item dialog by pressing the <Enter> key.

Delete Item can be achieved by pressing the <Delete> key or the <Backspace> key on the keyboard.

The <Delete> and <Backspace> keys have been enabled in the Database Editor data "grid".

5.3 FILE

The *File* menu has the following commands:

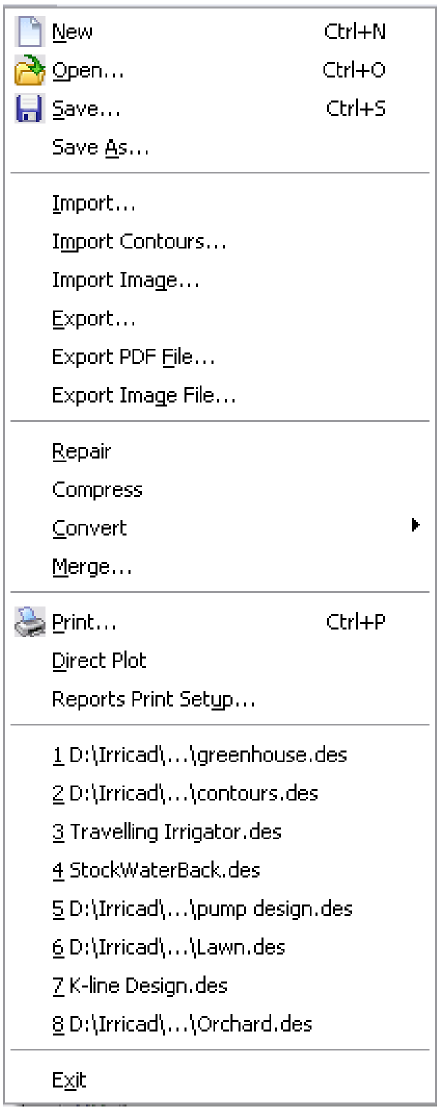


Figure 5-7

5.3.1 NEW

Use *File|New* or click on the clean page icon on the toolbar to start a new design. IRRICAD assigns the name Untitled to the new file.

To start a new design:

1. Select *File|New*.

5.3.2 OPEN...

Use *File|Open* or click on the *Open Folder* icon on the toolbar to continue work on a design, or to load an old design file type .dgt from DOS IRRICAD in the new format

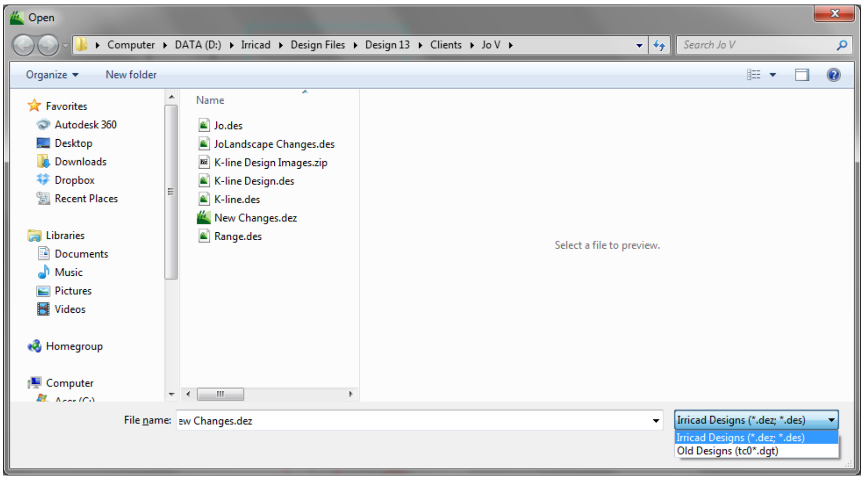


Figure 5-8

To open an existing design file, using the *Open* command:

1. Select *File|Open*.
2. By default, IRRICAD lists files with the .dez or .des extension.
3. To see the list of DOS IRRICAD designs, change the file type from .des to .dgt in the Files of Type list.
4. If necessary, change the path and drive in order to locate the file the user wishes to open.
5. In the list box, double-click the file name, or select the file name and click [Open].

Notes:

Zip files can also be opened directly by IRRICAD thereby avoiding the need to manually extract the design files before opening.

*The *.dez file can be uncompressed with any zip utility (e.g., 7-Zip, PKZip, WinZip). If extracting the design manually, the *.dbm file should be renamed *.mdb before opening the design in IRRICAD. Note internal databases should not be used as the component database for the design.*

It is beneficial to convert the old database (.dbs files), which belong to an old style design prior to converting the design. This is also applicable for any symbols that may be contained in the design. Use the File|Convert menu item to do these conversions.

5.3.3 SAVE

Use *File|Save* to save the design. Save during and at the end of a session, before exiting IRRICAD. This command saves the design to disk under the current name.

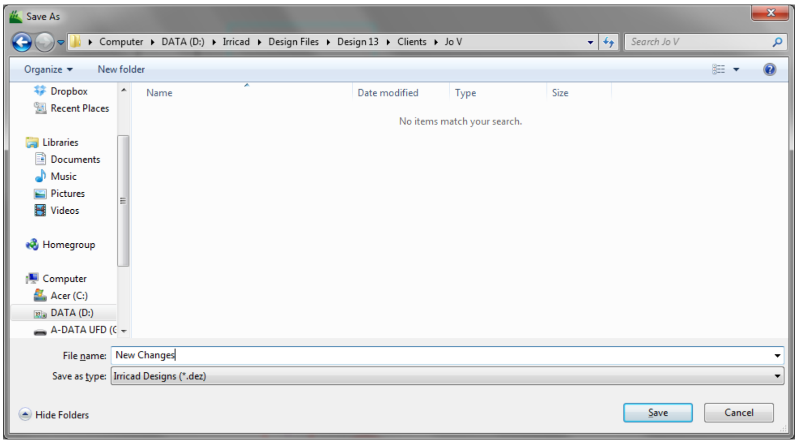


Figure 5-9

To save the current design:

1. Select *File|Save*.

2. If a Save File dialog box appears, give the design a file name and specify where the user would like the file stored.
3. Click [Save].

If the file has been previously saved in an older version IRRICAD automatically saves the file under the current name, path and .des file type. If the design is being saved for the first time it will be saved as a .dez file type unless manually changed. The .dez file is a ZIP compressed archive containing all the files for the design.

The name of the database used for a design is automatically saved with the design.

<u>Note</u>: *To save a design created in an older version as a .dez file in the* "File name" *field of the dialog overwrite ".des" with ".dez".*

5.3.4 Save As...

Use *File|Save As* to save a new design, to save a new version of the current design after making changes or to make a copy of an existing design (which may then be used as the base of a new design).

To save the file in a different file format, so that it can be used with other computer-aided design (CAD) programs or older versions of IRRICAD, use the *Export* command.

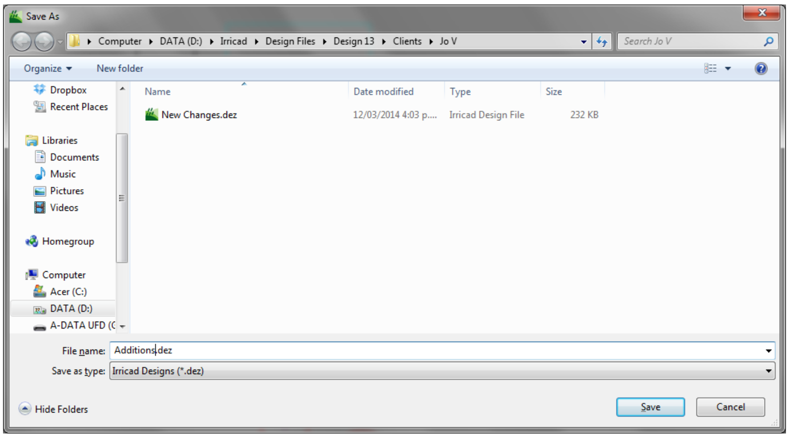


Figure 5-10

To save a design under a new name:

1. Select *File|Save As*.

2. A dialog box appears with a list of existing designs displayed in the current path.
3. If necessary, change drives or paths to place the design in the location of the choice.
4. Type a name for the file in the "File Name" box.
5. Click [OK].

The design is saved with the selected name, in the selected folder. The new file name is displayed at the top of the design window. The name of the database used for a design is automatically saved with the design.

Note: To save the design as a ZIP archive .dez file in the "File name" field of the dialog overwrite the .des with .dez.

5.3.5 IMPORT…

Use the Import command to load files from other programs into an IRRICAD design file. The file formats supported by IRRICAD are:

- .dxf (DXF format)
- .dwg (AutoCAD)
- .gcd (Generic CADD)
- .vcd (Visual CADD)
- .shp (ESRI Maps)
- .mif (Mapinfo Maps)
- .csv, .txt, .xyz (CSV Files)
- .kml, .kmz (Google Earth)

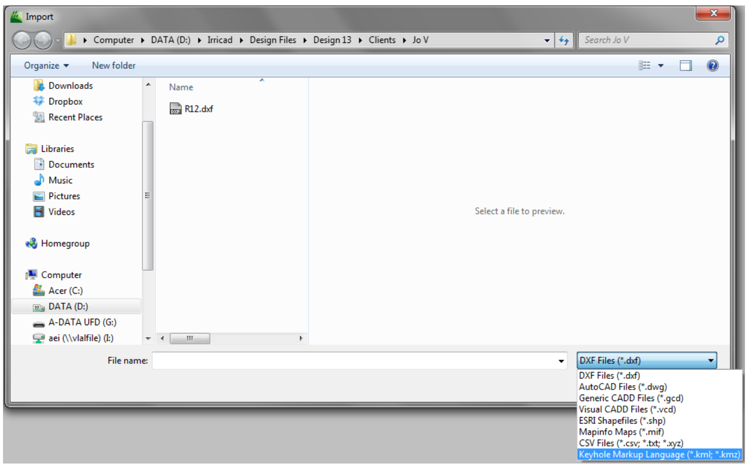


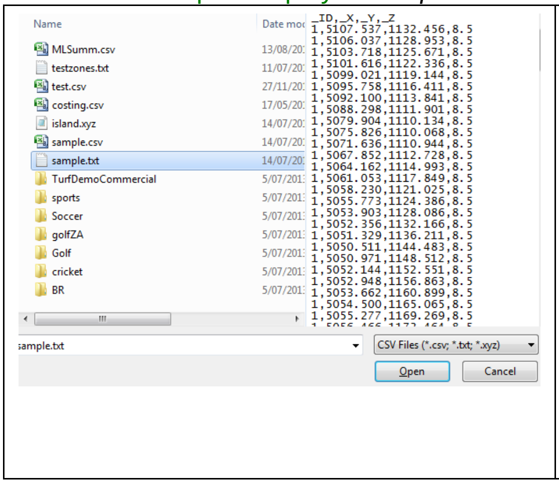
Figure 5-11

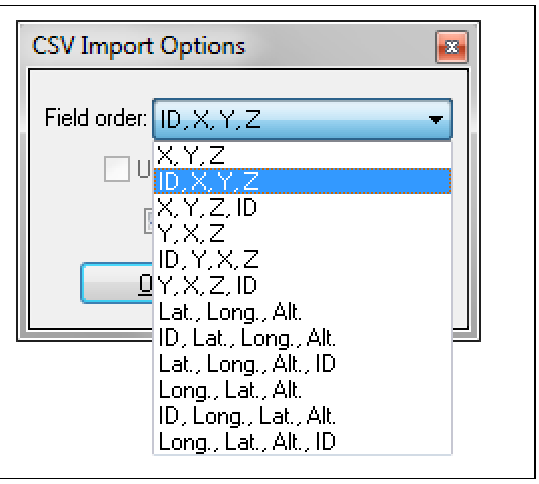
To open an existing drawing file, using the *Import* command:

1. Select *File|Import*.
2. By default, IRRICAD lists files with the .dxf extension. The user can select other files types from the dropdown list.
3. If necessary, change the folder in order to locate the file to open.
4. In the dialog, double-click the file name, or select the file name and click [Open].

<u>Tip</u>: *Data in CSV or TXT files is written in a particular order and for IRRICAD to read and display the information correctly this order needs to be specified. The "Field order", or order of the column headings, can be seen in the Windows Explorer preview as seen above or by opening the file in Notepad prior to importing.*

<u>Note</u>: *If the same ID is repeated in the file (see the above tip) this indicates the data contains polylines rather than points. Enable the "Import as polylines" option.*





5.3.6 Import Contours

Elevations can be imported from other design packages through DXF, CSV, SHP or KML/KMZ files.

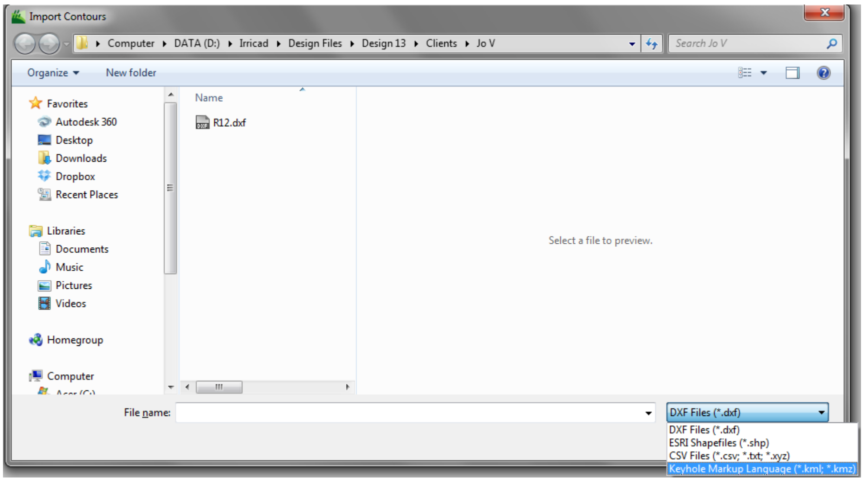


Figure 5-12

5.3.6.1 To Import Elevations from a DXF File:

1. Select *File|Import Contours*.
2. Type in the name of the file to import, or search for the file.
3. Click [Open] or double-click on the highlighted file. IRRICAD will search the file for layers and pop up a list from which contour layers may be selected.
4. Select the layers that are contour layers. Click [OK].

IRRICAD will read the file and convert all lines and polylines in the selected layers to contours and all points and symbols to spot heights. These are displayed on the screen as they are converted. All height data is imported; this can be seen if *Right-click|Object Info* or *Modify|Change* are used on the selected contour or spot height.

Notes:

If the elevation layers chosen do not have elevation data associated with the drawn item, the elevation will be displayed as 0 or as -328,000 (-1,000,000).

IRRICAD requires elevations to be stored with the items as a Z vertex, so they are 3-D items.

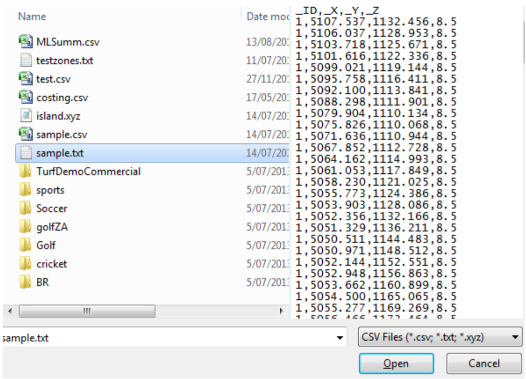
5.3.6.2 To Import Elevations from a SHP File:

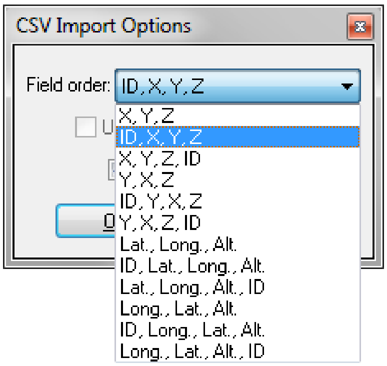
1. Select *File|Import Contours*.
2. Change the file type to **ESRI Shapefiles (*.shp)**.
3. Select the required file and click [Open] or double-click on the highlighted file.
4. Select the Elevation Field. Click [OK].
5. IRRICAD will search the file for layers and pop up a list from which contour layers may be selected. Select the layers that are contour layers. Click [OK].

For more information on what projections IRRICAD supports see GIS Options, Section 2.4.1.1.

5.3.6.3 To Import Elevations from a CSV, TXT or XYZ File:

1. Select *File|Import Contours*.
2. Type in the name of the file the user wants to import, or search for the file.
3. Click [Open] or double-click on the highlighted file.
4. Select the correct "Field Order" for the file.
5. Enable the "Import as Polylines" for contours, or uncheck for spot heights. Click [OK].
6. IRRICAD will search the file for layers and pop up a list from which contour layers may be selected. Select the layers that are contour layers. Click [OK].





Tip: Data in CSV or TXT files is written in a particular order and for IRRICAD to read and display the information correctly this order needs to be specified. The "Field order", or order of the column headings, can be seen in the Windows Explorer preview as seen above or by opening the file in Notepad prior to importing.

Note: If the same ID is repeated in the file (see the above tip) this indicates the data contains polylines rather than points. To import as polylines enable the "Import as polylines" *option.*

If importing latitudes and longitudes from a CSV, TXT or XYZ file, these values need to be in decimal degrees.

5.3.7 IMPORT IMAGE

To import an Image file into IRRICAD select *Import Image* from the *File* menu. Choose the format required from the "Files of Type" dropdown box, allowable formats are:-

- BMP
- JPEG
- TIFF
- GEOTIFF
- Windows Metafile
- Paintbrush
- PNG

For an explanation of the merits and features of the various image formats see the Export Image File, Section 5.3.11. Now select the file from the file explorer window (or type the name into the "File Name" dialog box).

To import an image:

1. Select *File|Import Image*.
2. Type in the name of the image file to import or search for the file.
3. Check the "Show Preview" option if required
3. Click [Open] or double-click on the highlighted file.
4. Left click to place the bottom left corner.
5. Draw the rectangle to the required size and click again to place the top right corner.

6. If required, trace over features in the image using any drawing tools.

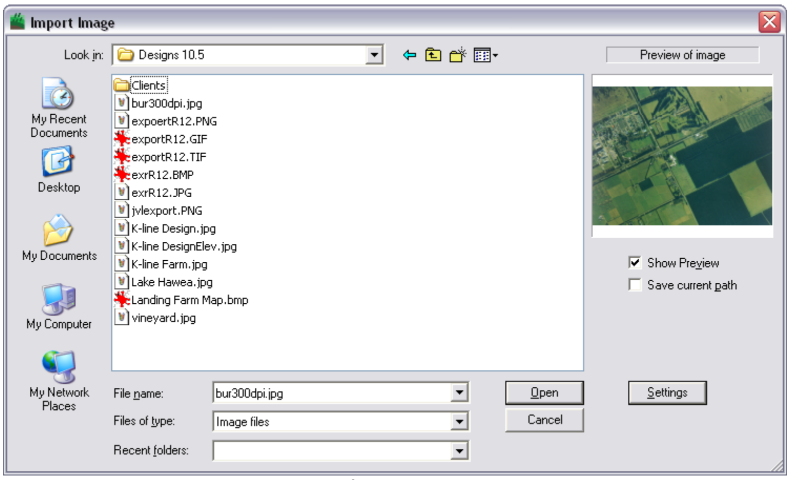


Figure 5-13

During the *Import Image* action if geographical location is contained in the (GEOTIFF) file the message shown in Figure 5-14 will appear:

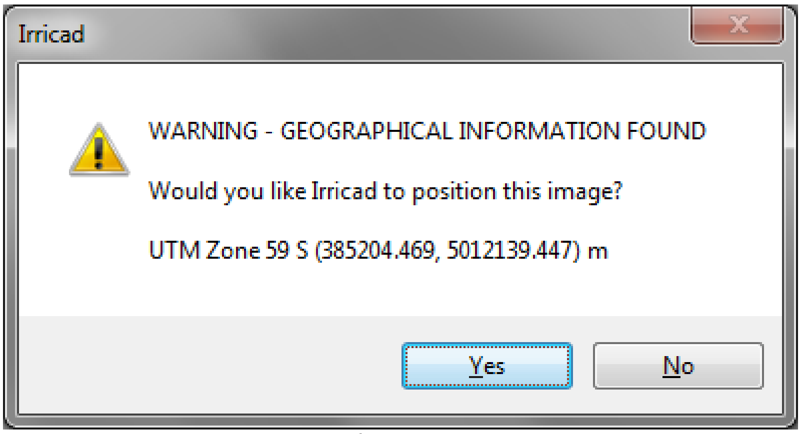


Figure 5-14

Click [Yes] to accept and the image will be placed at the specified coordinates and at the correct scale.

Tips: When prompted for the bottom left corner, the user may type in coordinates e.g., 0,400 (in world units).

When prompted for the top right corner, the user may type in coordinates e.g., 300,0, or the user may type in a distance (diagonal distance from top left corner) in world units.

The user may simply place the bottom left and top right at any scale (make sure "Lock Aspect Ratio when placing the image is checked in [Settings]) and scale using Modify|Scale Image.

Note: *This tool can be used to import any image into IRRICAD including logos etc.*

If the image is not placed using the 'bottom-left, top right' order, then it will be flipped horizontally and/or vertically as appropriate.

Images can be saved in Plot Templates if they are linked and not embedded.

5.3.7.1 Show Preview

If this box is checked a preview of the selected image will be shown.

5.3.7.2 Save Current Path

If this box is checked then the current folder is retained and the next time *Import Image* is selected the folder will default to this location.

5.3.7.3 Image Settings

Prior to importing an image, the Settings can be accessed via the [Settings] button.

Embed Image (save with drawing file)

When "Embed Image" is checked, the image is embedded in the design file. This feature is very useful if the design is shifted to another computer, drive or folder. If an image is embedded this will increase the design file size dramatically. Though this may be a preferred option if sending designs from branch to branch, it may not be the best option.

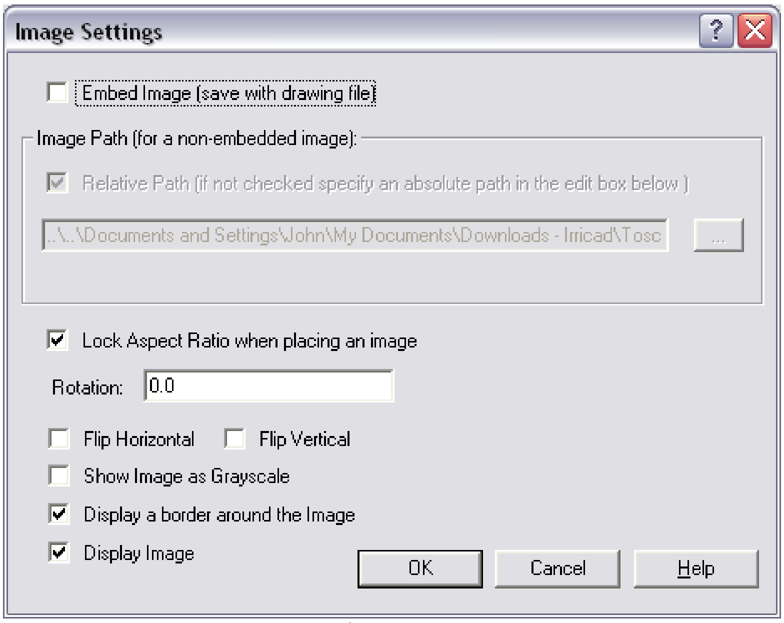


Figure 5-15

Relative Path

This option is not editable until after the image has been imported.

When an Image is imported into IRRICAD a link to the image file is inserted into the design rather than embedding the entire image. When "Use relative path" is checked, the link (i.e., folder path) will be relative to the location of the IRRICAD design.

Notes:

> *"Use relative path" cannot be set when initially importing the image but can be checked when accessing the image settings through the Change dialog.*
>
> *"Use relative path" cannot be used for an 'Untitled' design, if it is a warning message will be displayed.*

Lock Aspect Ratio when Drawing an Image

If this item is checked, the image rectangle will be constrained to the aspect ratio (height/width) of the original image during placement. If unchecked then the image can drawn so that it is distorted compared to the original.

Once the Image file has been selected (by clicking the [Open] button) the image can be placed on the screen using the mouse or keyboard entry. The lower left corner is located first (with a left mouse click or keyboard coordinates), a rectangle is then drawn out (when using the mouse the left button should NOT be depressed during this stage) and then the upper right corner is placed. Note that in previous versions the upper left, and then lower right, corners of the image were specified.

Rotation

This option is not editable until after the image has been imported.

After importing, the image can be rotated by entering degrees of Rotation.

Flip Horizontal

The image can be flipped horizontally.

Flip Vertical

The image can be flipped vertically.

Display a Border Around the Image

Borders can now be turned on or off by the "Display Border" check box. This is most used when overlapping multiple images.

Display Image

Images can be individually turned off for display by unchecking the "Display Image" option. If the image is turned off in "Display Image" the border automatically displays.

5.3.7.4 Changing Settings After Placement

After an image has been imported, the settings can be edited by double-clicking on the image when in *Select Object* mode, or by using *Change*.

These settings are the same settings as found in *Import Image*.

To scale an image after placement, use *Modify|Scale Image*.

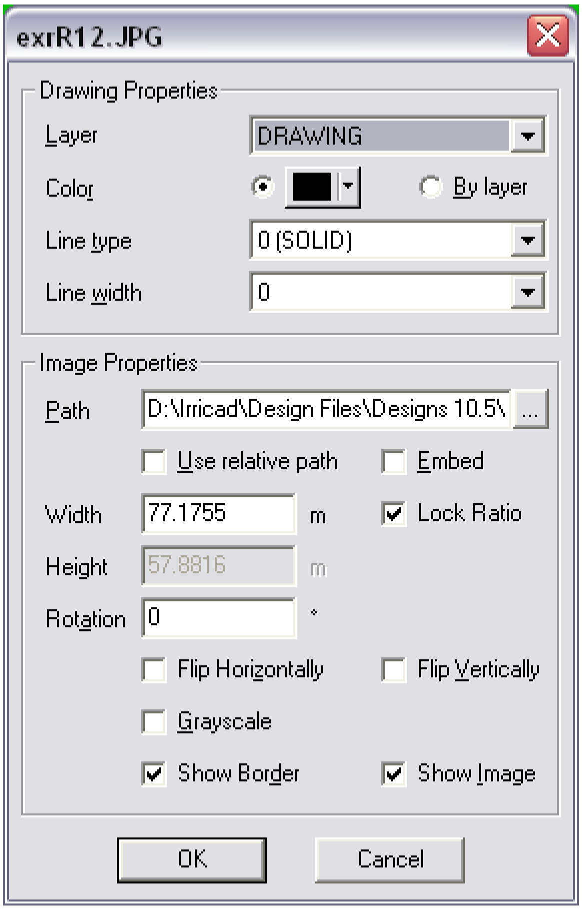


Figure 5-16

See also:

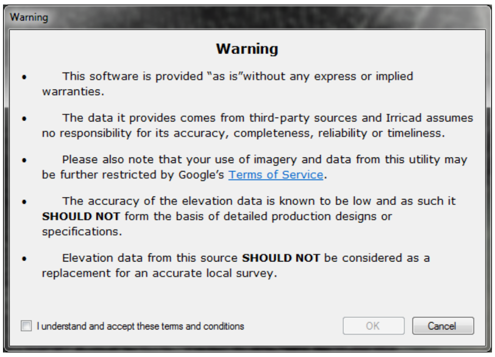
Scale Image *Section 5.11.17*

5.3.8 IMPORT FROM GOOGLE EARTH

To import an Image and spot heights from Google Earth select *Import from Google Earth* from the *File* menu. The image and data will be geo-located in the IRRICAD design.

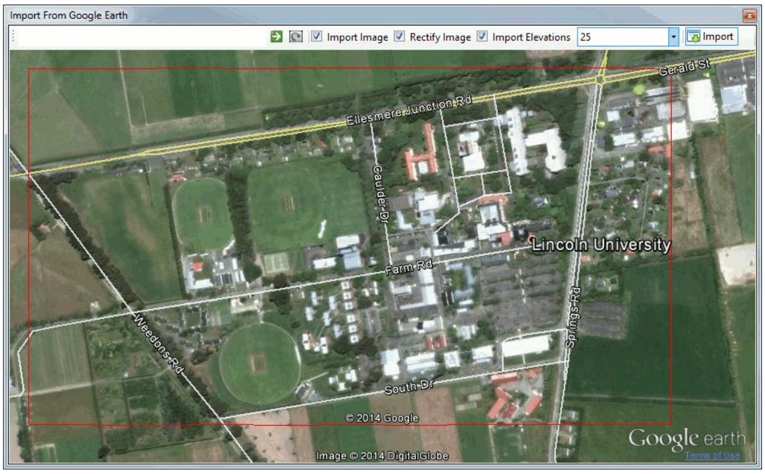
To Import Images and Elevations From Google Earth:-

1. From the *File* menu, select *Import from Google Earth…*. The import utility will then start.
2. Navigate to the area of interest and specify the required importation options; Import Image, Rectify Image, Import Elevations, Number of elevations.
3. Click the [Import] button. A disclaimer message will appear to be read and accepted.

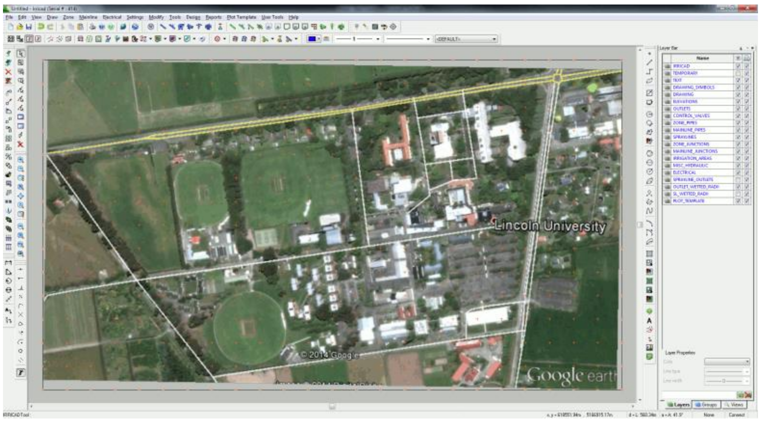


Google Earth elevations are known to be of low accuracy. If possible use surveyed data instead.

4. Now in selection mode, refine the area of interest by drawing a rectangle. Click the first corner.
5. Drag out the selection rectangle.



6. Click the second corner.
7. The utility will close and the specified information will be imported into IRRICAD.



If elevation data has been imported, optionally calculate contours (*Tools|Calculate Contours).*

5.3.8.1 IMPORT FROM GOOGLE EARTH DIALOG

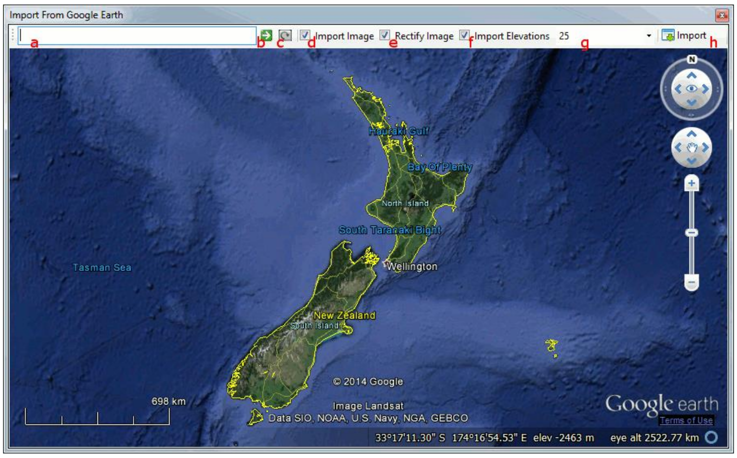


Figure 5-17

a. Navigation – type general destination name here
b. Go to destination
c. Refresh

d. Check this box to import an image
e. Check this box to use a rectified image – to accurately convert an image from spherical coordinates (latitudes and longitudes) to planar coordinates (X and Y) the image must be re-shaped
f. Check this box to import elevation data
g. Specify the number of elevations to import – the number of divisions along the largest dimension
h. Import action button.

5.3.8.2 SETTING UP THE IMPORTING FROM GOOGLE EARTH UTILITY

With the changes made to Google Earth in 2016/2017 an API key will be required for your computer or branch to enable continued access to the Google Earth imagery and elevation data. To create an API key please follow the steps on the IRRICAD Announcements forum post - How To Acquire a Google Maps API Key.

5.3.9 EXPORT…

Exporting is used to save a design in a different file format, which can then be read into other CAD programs. The file can be saved as:

- .dxf (DXF format)
- .dwg (AutoCAD)
- .gcd (Generic CADD)
- .vcd (Visual CADD)
- .shp (ESRI Maps)
- .wmf (Windows Metafile)
- IRRICAD v12.x Designs
- IRRICAD v10.5/v11x Designs
- IRRICAD v10.x Designs
- IRRICAD v9.5x Designs
- IRRICAD v9.x Designs
- IRRICAD v7.x Designs

To export a file:

1. Select *File|Export*.
2. By default, IRRICAD exports .dxf files. To save as a different format select a format from the "Save as Type" list. If necessary, change the folder the user wishes to save the file to.
3. Click [Save].

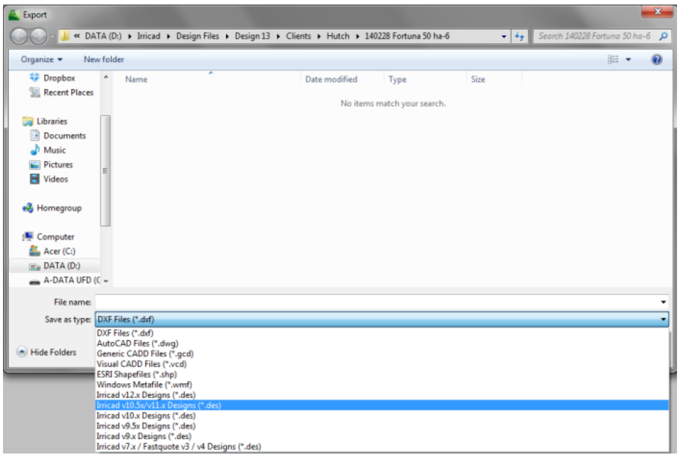


Figure 5-18

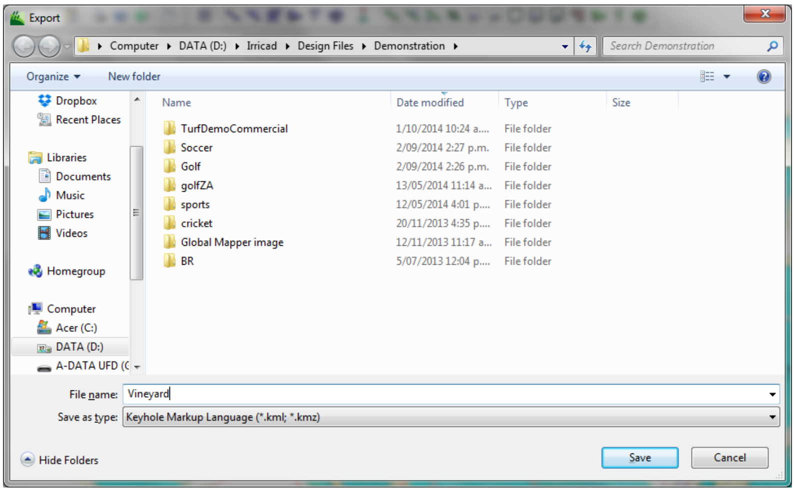
Note: Note that after exporting to an older version of IRRICAD the current design remains as the current version.

5.3.9.1 Export to Google Earth File Format (KML)

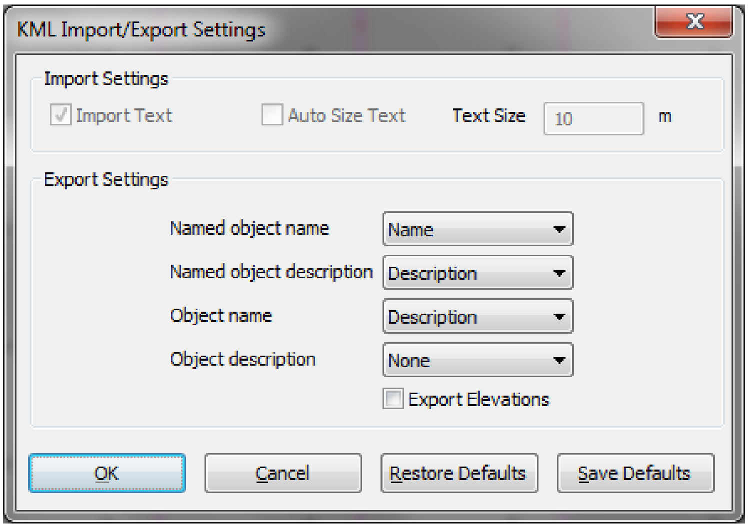
Export directly to Google Earth file format KML.

To export to KML/KMZ:-

1. Select *File|Export*.



2. In the “Save as type” field select the **Keyhole Markup Language (*.kml, *.kmz)** option.
3. Give the file a name and click [Save].
4. In the KML Import/Export Settings select the required export settings and click [OK].
5. Import the file into Google Earth.



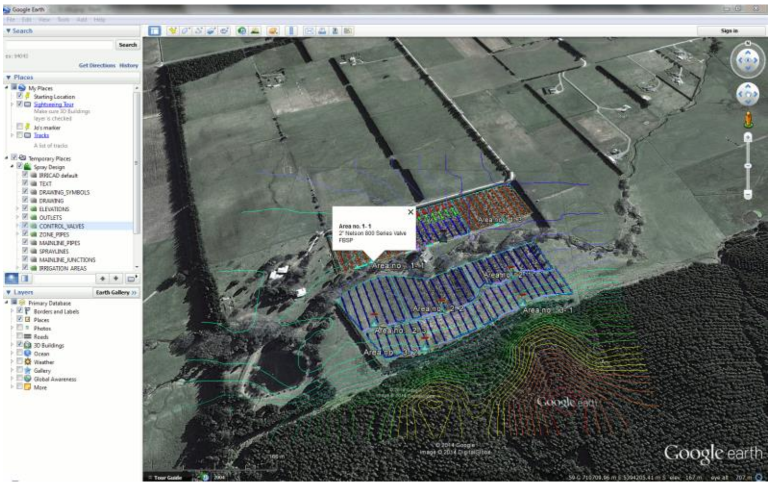
KML/KMZ Export Settings

Named object name: Select the option to export the required data for items that have zone names (valves and mainline outlets), water supply names, etc. Select **Name** to label the items with its zone/water supply name, **Description** to label the items with its description, **Unique identifier** to label the items with its UID number, **Label Set 1** to label the items with its existing label from label set 1, **Label Set 2** to label the items with its existing label from label set 2, or **None** to export no information with the items**.**

This information will be available in Google Earth on the image and under “Places”. Expand the tree on the left-hand side to turn layers on or off and, under the appropriate layers, see the list of names.

Named object description: Select the option to export the descriptive information for items that have zone names (valves and mainline outlets), water supply names, etc. Select **Name** to label the items with its zone/water supply name, **Description** to label the items with its description, **Unique identifier** to label the items with its UID number, **Label Set 1** to label the items with its existing label from label set 1, **Label Set 2** to label the items with its existing label from label set 2, or **None** to export no information with the items.

This information will be available in Google Earth on the image when clicking on a named item and under "Places". Expand the tree on the left-hand side to turn layers on or off and, under the appropriate layers, see the list of names and descriptions.

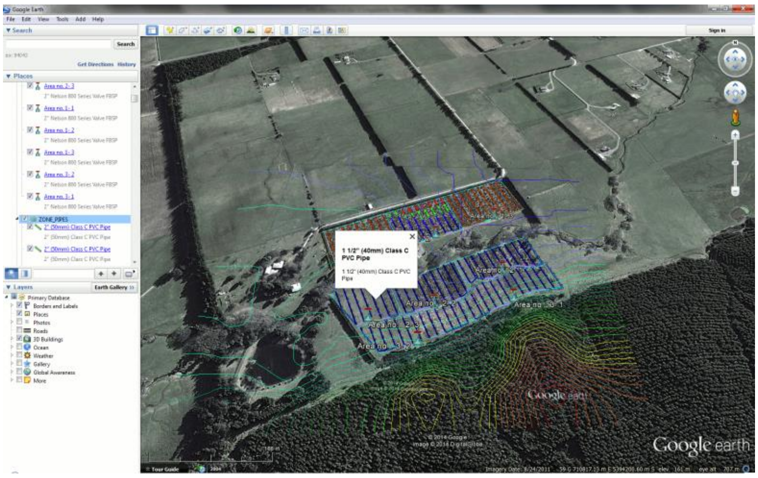


Object name: Select the option to export the required data for hydraulic items that do not have names such as pipes, zone outlets and Misc. Hydraulic items. Select **Description** to label the items with its description, **Unique identifier** to label the items with its UID number, **Label Set 1** to label the items with its existing label from label set 1, **Label Set 2** to label the items with its existing label from label set 2, or **None** to export no information with the items. Note the **Name** option has no effect for this field.

This information will be available in Google Earth on the image and under "Places". Expand the tree on the left-hand side to turn layers on or off and, under the appropriate layers, see the list of names.

Object description: Select the option to export the descriptive information for items that have do not have names such as pipes, zone outlets and Misc. Hydraulic items. **Description** to label the items with its description, **Unique identifier** to label the items with its UID number, **Label Set 1** to label the items with its existing label from label set 1, **Label Set 2** to label the items with its existing label from label set 2, or **None** to export no information with the items. Note the **Name** option has no effect for this field.

This information will be available in Google Earth on the image when clicking on a named item and under "Places". Expand the tree on the left-hand side to turn layers on or off and, under the appropriate layers, see the list of names and descriptions.



Export Elevations: Enable this option to export the elevations with the design.

<u>Notes</u>:

The coordinates need to be in UTM and the UTM zone specified in Settings|Grid/Origin/GIS.

The UTM zone grid can be enabled in Google Earth via View | Grid and the correct UTM zone determined. In Settings|Grid/Origin/GIS select "North" for northern hemisphere and "South" for the southern hemisphere.

If the coordinates of any items are beyond the limits of UTM the following message will appear and those items will not be exported to Google Earth.

5.3.10 EXPORT PDF FILE

Drawings can be exported to the Portable Document File format and shared with customers. PDF files preserve the look and integrity of IRRICAD drawings and can be shared with anyone electronically, regardless of hardware and software platforms.

PDF files are compact and complete, and can be shared, viewed, and printed by anyone with the free Adobe Reader® software which can be downloaded at www.adobe.com. Customers that have the full Adobe Acrobat software can redline the drawings and return them for revisions.

PDF output from IRRICAD also has optional security features to protect sensitive drawings. If desired password protection can be set for opening PDF files, as well as permissions for printing, editing and copying.

5.3.10.1 EXPORT PDF DIALOG

Although several of the settings options are unique to PDF, the PDF Export dialog will be familiar as the layout is based on the Print dialog. A description of the fields in the dialog follows:-

Page Size: A number of common page sizes are available in the dropdown list. Add page sizes that the user defines by clicking on [Edit...] at the bottom of the list. This pops up the "Custom Paper Sizes" dialog.

Use Compression: The checkbox enables compression, which can reduce the file size by up to 60%. The only drawback to compression is that the file will not open as quickly as an uncompressed version.

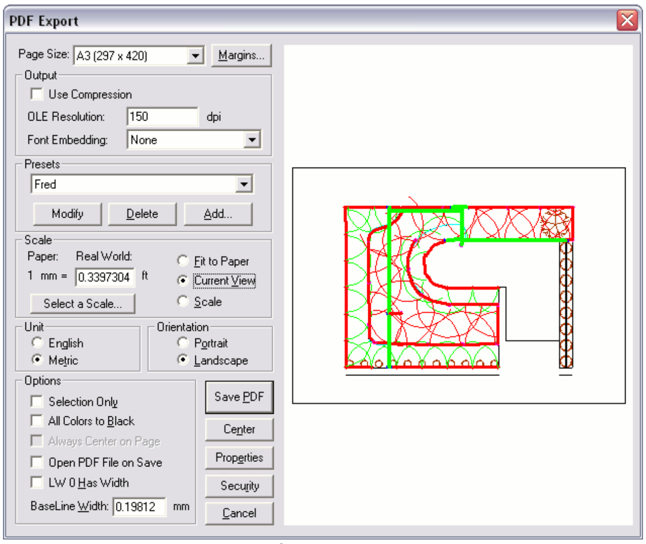


Figure 5-19

OLE Resolution: OLE Objects (e.g., reports, Excel tables etc.) are rendered as images into the PDF file. The resolution of this rendering process is controlled by this setting. If OLE objects appear 'fuzzy' in the PDF file, the user may need to increase this resolution. Note, however, that setting the resolution too high could drastically increase the size of the PDF file.

Font Embedding: Applies only to TrueType fonts, vector fonts are always embedded with the PDF. If the drawing has a TrueType font, and if the receiving person of the PDF may not have the font on their machine, select ALL so that the font will be embedded with the PDF. Embedding fonts will increase the file size.

Presets: When the user creates a Preset a 'snapshot' of all the current settings on the PDF dialog is taken. They are stored to disk and can quickly be called up from the dropdown list. When opening the dialog, Default will always show the settings that were in effect the last time the user saved a PDF with the Default Preset. For more information read the topic on Print Presets, as PDF Presets work in exactly the same way.

Print Scale: The print scale edit box displays the current scale factor that will print to a PDF file. The value is only used when the Scale mode is selected (Fit to Paper and Current View by definition can have no scale). Values are entered in paper units versus real world coordinates. For example, 1 in = 48 in, will print the drawing at quarter inch scale (48"/12" = 4'). Click on the [Select a Scale] button to open a dialog where the user can select and set a scale from a dropdown list displaying many of the most commonly used scales.

Fit to Paper, Current View or Scale: Defines the mode the PDF will use to save to file. The drawing can be scaled so that the entire drawing will fit on the current paper size, scaled to display the current onscreen view to fit the page, or to a scale factor entered in the Print Scale edit box.

English or Metric Unit: Selects the unit to measure output to the PDF file.

Orientation:	Portrait or Landscape - determines the PDF orientation either landscape (horizontal) or portrait (vertical).
Selection Only:	Prints only the selected entities to the PDF file.
All Colors to Black:	Prints all entities in black regardless of their color in the drawing.
Always Center on Page:	When checked, centers the drawing in the Preview window. It does the same thing as clicking the [Center] button, and is intended for use as part of a Preset. It is disabled (grayed out) when the user have "Fit To Paper" or "Current View" set, as it only applies when setting a Scale.
Open PDF File on Save:	When checked, the PDF file automatically opens in the PDF software on the machine when the file is saved.
LW 0 Has Width:	Sets the finest line width in the drawing. Unchecked, IRRICAD prints the finest line the printer can output. Checked, IRRICAD prints the smallest line width with LW0. The same paradigm applies to PDF Export.
Base Line Width:	Sets the base or minimum width for line output for the PDF file output.
Center button:	Centers the drawing on the given page based on the current margin settings.

5.3.10.2 Properties Dialog

Click the [Properties] button to bring up this dialog. The user can add information to the PDF file that can be viewed by the end user when they open the file in a PDF viewer.

Title:	Name of the drawing. It can be different than the PDF filename.
Subject:	Optional further information about the drawing.
Author:	Name of the person or company that prepared the drawing.
Keywords:	Arbitrary words that the user would find relevant to the drawing. Keywords are used in some PDF viewer software as a search mechanism for finding files.
Use Watermark:	When checked, adds a faint gray text string diagonally across the drawing that conveys

	information without intruding on the drawing objects. One example of how this might be used is the string 'Preliminary - Not for Construction'.
Watermark Text:	The text string that will appear as the watermark. Maximum number of characters is 63.
Text Desity %:	This slider controls how dark the watermark text will appear in the PDF.
Layer Export:	Not used in IRRICAD.

5.3.10.3 SECURITY DIALOG

Click the [Security] button to bring up this dialog. The user can specify security settings to give permissions to the customers for viewing and outputting the PDF file.

Password required to open drawing document: When checked, the PDF file cannot be viewed unless the correct password is supplied.

Document Open Password: The password required to view the PDF file. The password is only required if the *Password required to open document* checkbox is checked.

Permissions Password: The password required to override the permission denials set by the checkboxes below. The end user of the PDF does not require this password to view the PDF file. But if any of the permission denial checkboxes are checked, this password must be provided to override the denial.

No Printing Allowed: When checked, the PDF file cannot be printed.

No editing/annotation allowed: When checked, no editing of the PDF file is allowed. Comments and other annotation cannot be added. Also, the PDF file cannot be combined with other PDF files.

No copying to clipboard allowed: When checked, graphics and text in the PDF file cannot be copied to the clipboard for pasting into other applications.

5.3.11 EXPORT IMAGE FILE

Vector-based IRRICAD designs may be exported to a raster image file so that they can be used for display on websites or in printed materials such as brochures, reports and other documents. The *Export Image* dialog has a wide range of settings to help control the file type, size and other options for image output.

Although many of the settings options are unique to images, the *Export Image* dialog layout is based on the *Print* dialog.

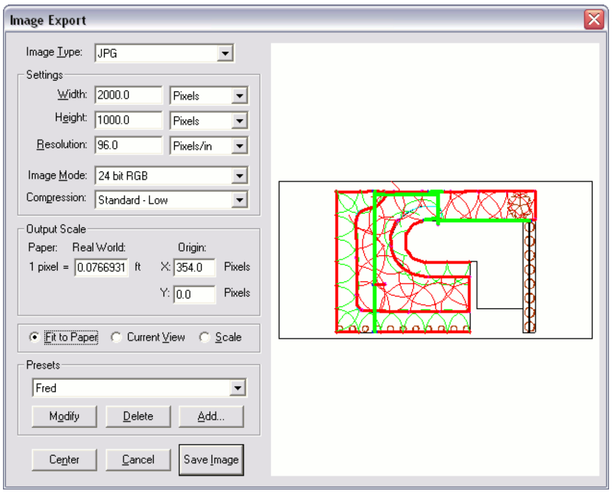


Figure 5-20

5.3.11.1 IMAGE TYPE

There are six options for image type.

BMP (bitmap): BMP is Windows' native format. It is a relatively simple format that can be viewed by many applications. IRRICAD can write 24, 16, 8, or 1-bit BMPs. The 1-bit BMPs can be exported as either black lines on a white background or white lines on a black background. In general, BMP is not compressed, or when it is, the level of compression is small. Consequently BMP files are usually large but, as BMP is lossless, it does well for archival or temporary storage.

JPG (JPEG): is designed for compressing either full color or grey-scale images of natural, real-world scenes. It works well on photographs, naturalistic artwork, and similar material, but it is not the best choice for line drawings such as CAD. JPEG is ‘lossy’, meaning that the decompressed image isn't quite the same as the one the user started with. JPEG is designed to exploit known limitations of the human eye, notably the fact that small color changes are perceived less accurately than small changes in brightness. Thus, JPEG is intended for compressing images that will be looked at by humans. IRRICAD can write 24-bit RGB JPEGs, 32-bit CYMK or 8-bit grayscale JPEGs. There are three levels of compression, to allow the user vary the amount of compression at the expense of image detail accuracy. Although it has very good compression it is not recommended for images of IRRICAD designs

TIFF: TIFF is a long established format that produces quality images which can be read by a wide variety of programs. TIFF files exported by IRRICAD can be uncompressed or compressed with deflate, JPG, PackBits or CCITT (fax). TIFFs are exported as 32-bit RGBA, 24-bit RGB, 8-bit 256 color or 1-bit. The 1-bit TIFFs can be exported as either black lines on a white background or white lines on a black background. TIFF is generally the format of choice for quality on published pages.

PNG: is a lossless, compressed image format. It is supported by most modern browsers. The compression it uses is similar to that used in GIF files, or in the various ZIP utilities. This means it's really good at compressing images with lots of sequences that repeat exactly and is terrible at things like photographic images where the data changes gradually and continuously. IRRICAD will write 32-bit RGBA, 24-bit RGB, 8-bit 256 color, 8-bit grayscale and 1-bit PNG. The 1-bit PNGs can be exported as either black lines on a white background or white lines on a black background. One of the PNG's major benefits is its ability to store an alpha channel. An alpha channel tells image renderers how to blend the image with the

	image beneath it, allowing for subtle transparency effects. IRRICAD currently sets the alpha channel to opaque for all output. Because PNG is lossless and has decent compression, it is an excellent choice for image archival or temporary storage.
EMF:	Enhanced Metafile. In Windows, a metafile is a group of graphics device commands stored in a file for playback as a single graphic object. In that sense, they are essentially vector files. However because EMF is a combination of metric and US measurements precision is sometimes lost in the conversion between one system and the other. This results in unfortunate scaling effects and therefore there are much better formats for storing image data than metafiles. The IRRICAD export of metafiles has an option to include the background color or not.
WMF:	Windows Metafile. In Windows, a metafile is a group of graphics device commands stored in a file for playback as a single graphic object. The other options create a better image file.

5.3.11.2 SETTINGS DIALOG:

Width:	Sets the width of the image to be saved to file. Unit options for "Width" and "Height" include pixels, inches, millimeters and centimeters.
Height:	Sets the height of the image that will be saved to a file.
Resolution:	Sets the resolution of the exported Image. The higher the resolution, the more pixels per inch and the better the display of the image. 96 pixels is fine for an image such as JPG or PNG that will normally only be displayed on a monitor. Files that will be used in print media will need higher resolutions for higher quality output. The higher the resolution, the larger the file size.
Image Mode:	Affects both the display of the image and the file size. Depends on the Image type. Some allow the user to set white on black background or

black on white background; many also allow the user to set the number of colors displayed. Note that because IRRICAD only supports 256 colors, a setting with additional colors will not improve the image but will likely increase the file size.

Compression: Has the effect of making the file size smaller. Some formats have a single setting to always compress the file; others do not support compression. The BMP, JPG and TIFF formats offer different options for compression levels.

Output Scale: The output scale edit box displays the current scale factor that will used when saving to an Image file. The value is only used when the "Scale" mode is selected ("Fit to Paper" and "Current View" by definition can have no scale). Values are entered in paper units versus real world coordinates. For example, 1 in = 48 in, will output the Image at quarter inch scale (48"/12" = 4'). Paper units are based on the setting for the Width of the image: pixels, inches, mm or cm.

Origin: Sets the drawing origin relative to the lower left corner of the Image. The offset is by default shown as pixels and not real world coordinates. Note that while the display of the "Origin" can be in Inches, Millimetres or Centimeters (depending on which units the user set in the "Width" or "Height" settings), image dimensions are always stored internally as pixels.

Fit to Paper, Current View or Scale: Defines the mode the Image will use to save to file. The drawing can be scaled so that the entire drawing will fit on the current 'page' (as defined by width and height), scaled to display the current onscreen view to fit the page, or to a scale factor entered in the "Output Scale" edit box.

Presets: When a Preset is created a 'snapshot' of all the current settings on the *Export Image* dialog is taken. They are stored to disk and can quickly be called up from the dropdown list. When opening the dialog, Default will always show the

	settings that were in effect the last time the user saved an Image with the Default Preset.
Center button:	Centers the image in the print preview window.

5.3.12 REPAIR

This utility attempts to repair the current design. It runs through all objects in the design looking for invalid objects, invalid connections, misplaced objects and so on. Some of the problems which may occur and which may be solved by *File|Repair* are:

- IRRICAD objects which have lost their corresponding CAD entity.
- Junctions with nothing connected to them remain on the screen.
- Hydraulic objects with insufficient or invalid connections.
- Looped or zero length pipe.
- Mainline objects in a zone or zone objects in a mainline.
- Connected objects which have different coordinates.
- Pipe or sprayline end points do not match their connections.
- Invalid or missing links between associated objects (e.g., outlets and wetted radii).

Repair also cleans up the internal (design) database, removing unused items then updates entities from the database, in case any items have become lost. Repair generates a log of its actions in the file errorlog.txt. This may be viewed by selecting *Reports|View Errors*. Repair's actions cannot be undone but any changes it makes to the design are not saved until the *File|Save* is selected.

5.3.13 COMPRESS

When hydraulic entities are deleted in a design gaps will be left in IRRICAD's internal structures. These gaps take up space both in memory (i.e. while the program is running) and also on disk when the design is saved. Other situations, such as importing dxf / dwg / vcd files into a design containing hydraulic entities, can also give rise to this situation.

File|Compress reorders the internal IDs of all entities in a design, removing all gaps in the process.

5.3.14 Convert

The Convert options allow the user to convert Version 6 files to Pro format for use in IRRICAD. Select the type of file the user wishes to convert.

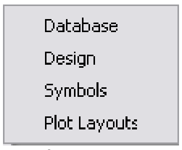


Figure 5-21

5.3.14.1 Convert Database

This tool will convert old database file types .dbs to the new database file type .mdb.

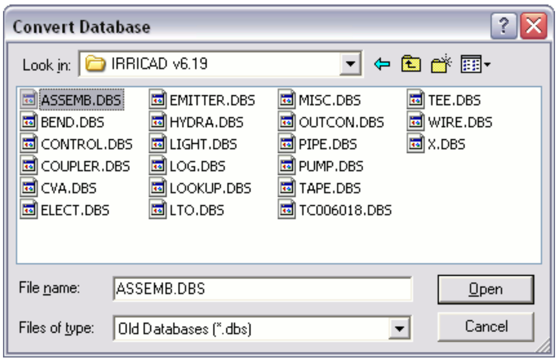


Figure 5-22

To convert a database:

1. Select *File|Convert|Database*.
2. Find the correct folder where the old database files are stored, e.g., IRRICAD5 folder. Click on one .dbs item in the folder.
3. Click [Open].
4. Select where to save the converted file (e.g., \IRRICAD\database).

IRRICAD will convert all the .dbs files present in the first folder to one .mdb file in the second folder. The new .mdb database can be selected for use in new designs in *Settings|Irrigation – Design Specific*. The original Version 6 files remain unchanged.

5.3.14.2 Convert Designs

This tool will convert old design file types .dgt to the current design file type .des. Convert the database used by the old design prior to converting the design itself.

To convert a design:

1. Select *File|Convert|Design*.
2. To use the currently selected database (i.e. the default database) select [Yes]. Select [No] if a different database is to be used. A dialog will appear in which you can browse for and select the required database as shown in Figure 5-23. Click [Open].

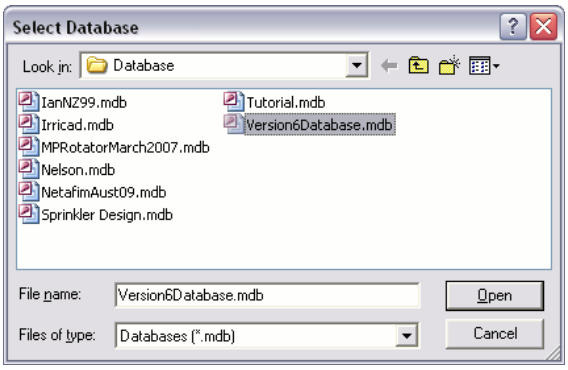


Figure 5-23

3. Find the folder where the design file is stored, e.g., IRRICAD5 folder on C drive. Click on the .dgt design the user requires.

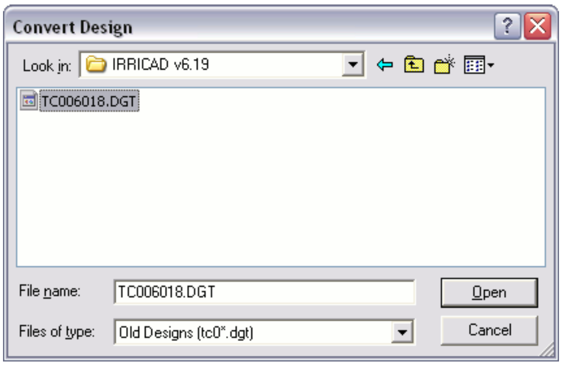


Figure 5-24

4. Click [Open]. IRRICAD will convert the .dgt file and display it as the current design. The original .dgt file remains unchanged.

Tips: *Convert the relevant database and any symbols or plot layouts prior to converting the design.*

If the old designs exist in Version 5 format, open the design in Version 6 before converting. If the user does not have Version 6, ask for technical support.

Note: *The converted design is not saved until File|Save is selected.*

5.3.14.3 CONVERT SYMBOLS

This tool will convert the old symbol files (.blk) or default symbol library (Symbols.dat) to the new .vcs files.

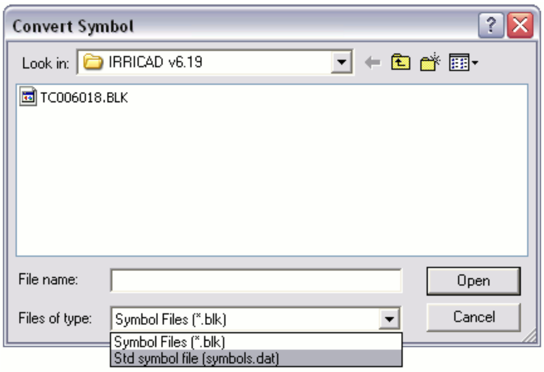


Figure 5-25

To convert a symbol file:

1. Select *File|Convert|Symbols*.
2. Find the folder where the file is stored, e.g., IRRICAD5 folder on C drive.
3. Select the symbol library the user wants to convert (.blk file or Symbols.dat). Click [Open].
4. Select where to save the converted symbols (e.g., \IRRICAD\symbols \drawing).

Each symbol in the .blk file will be converted to a .vcs file with the same name as the symbol and can be selected using *Draw|Symbol*. The original Version 6 file remains unchanged.

5.3.14.4 Convert Plot Layouts

This tool will convert old plot layout files (.lay) or the standard plot layout file type (pl_def.dat) to the new .vcs files.

Note: *If the user has symbols associated with a plot layout file (e.g., company logo), convert the appropriate symbol libraries prior to converting plot layouts.*

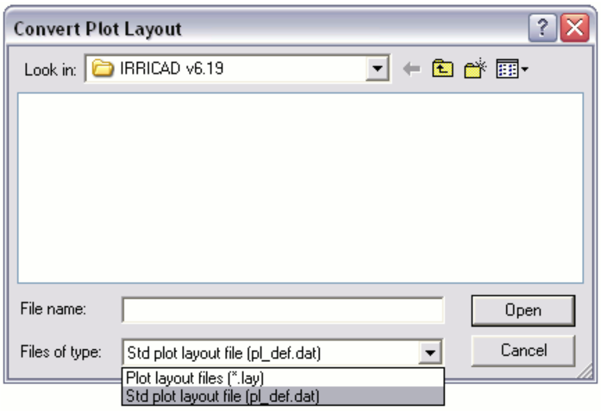


Figure 5-26

To convert a plot layout:

1. Select *File|Convert|Plot Layout*.
2. Find the folder where the file is stored, e.g., IRRICAD5 folder on the C drive. Select the .lay or pl_def.dat item in the folder. Click [Open].
3. Select where to save the converted layouts (e.g., \IRRICAD\symbols\template. Click [OK].

For each plot layout in the .lay or pl_def.dat file, select the paper size for which the template will be used, e.g., D (A3). If the "Convert this Layout" check box is unchecked, that particular layout will not be converted and the conversion process will skip to the next layout in the file. To stop the conversion process click [Cancel].

If a layout contains symbols (e.g., a company logo) and the symbol is not found in the default symbols folder, the user will be prompted to select the folder where the symbol is to be found.

Each plot layout in the .lay or pl_def.dat file will be converted to a .vcs file with the same name as the plot layout and can be selected using *Draw|Plot Layout*.

5.3.15 MERGE

IRRICAD designs may now be merged together using the *Merge…* option in the *File* menu. This function will merge the drawing and hydraulic objects, as well as the fittings, management and design information.

To merge designs:

1. With *Design A* open, select *File|Merge*.
2. Select the design to be merged into the open design.

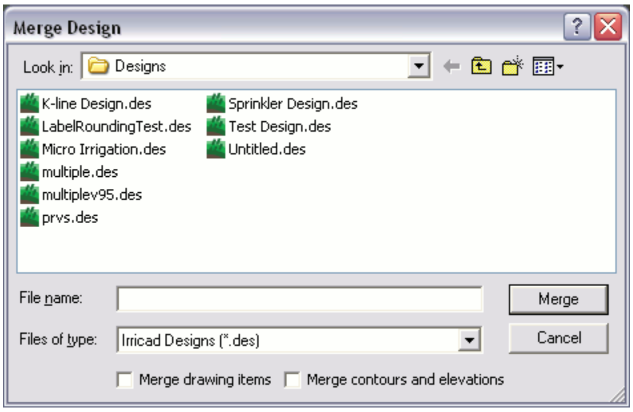


Figure 5-27

3. View *Reports|View Errors* to see any water supply renaming, zone renaming or other conflicts.

Given the case where *Design B* is merged into *Design A*, the user should be aware of the following:

- **Name Conflicts** – water supplies, zones and areas may all be subject to name conflicts when merged. If a conflict is found the entity in *Design B* is renamed by adding an underscore to the start of the name.
  - The user is encouraged to check all names prior to merging to ensure that no undesirable renaming occurs.

- **Symbol Conflicts** – IRRICAD cannot load two different symbols with the same name and existing symbol definitions cannot be renamed. As such *Design A* contains the master list of symbols. If both designs have a (different) *Symbol X*, the merged design will use the symbol from *Design A*.
  - Users are strongly encouraged to ensure that, if merging is intended, both 'source' designs use the same symbol set.
- **Label Conflicts** – IRRICAD labels are symbols. Given the restrictions on renaming symbols described above, there is a small possibility that label names in the merged design will conflict and therefore be out of date. In v10.0, label symbols are given a unique name and the probability of label name conflicts when merging two v10.0 designs is very, very small indeed. However, label symbol names in versions prior to v10.0 are more likely to conflict. If any 'old style' label symbol names are detected during the merge the user is warned of possible conflicts.
  - For merging older designs, it is suggested that labels be remade in v11.0 either prior or post merge.
- **Databases** – merging will copy items from *Design B*'s internal database into the internal database of *Design A*.
  - For maximum compatibility and minimum post-merge problems, users should ensure that the external database for both 'source' designs is the same.

5.3.16 PRINT…

Select *File|Print* to print the current design. If a Plot Layout (Section 5.6.14) is selected prior to printing, the user will not need to change any properties in the print dialog. Simply click *Print* as IRRICAD will have inserted into the print dialog the required information based on the choices in the *Draw|Plot Layout* dialog.

If printing without a plot layout, set the print dialog fields as required, before clicking [Print].

A Preview is always displayed on the left hand side.

<u>Note</u>: *The printing of an image is controlled by the Image Settings (Section 5.3.7.3) and Settings|Layers.*

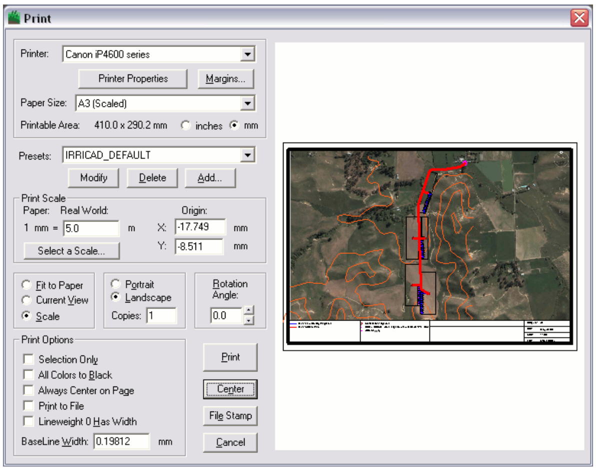


Figure 5-28

5.3.16.1 PRINT DIALOG

Printer: The printer currently selected. To change the printer click on the printer description or click [Setup] and select another printer.

Printer Properties: Click [Setup] to select the printer to use. Click [Options] to edit printer properties. These vary between printer drivers and printers.

Margins: Shows the current margin values. To change the margins click on the description or click the [Margins] button and enter new margins as required. Click [Printer Default] to reset the margins to the default values for the selected printer.

Paper Size: Shows the dimensions of the currently selected paper. To change the page size, click on the description and select another paper size.

Paper Unit: The units for paper size and margins. Select Metric units or English (Imperial) units.

Printable Area: Based on the select page size. Inches or mm are selected.

Presets: Presets take a ‘snapshot’ of all the current settings on the *Print* dialog. They are stored to disk and can quickly be called up from the dropdown list. The buttons are be used to perform the following functions:

Add - Used to add a new "Preset". Make the changes required for the new preset click the button and select a new preset name.

Modify - Used to modify an existing "Preset". Select the "Preset" to be modified, make the changes then click the [Modify] button.

Delete - Select the "Preset" to be deleted then click the [Delete] button.

Print Scale: The scale factor for printing. The value is only used when the Scale option is selected e.g., 1 inch = 100ft will give the user a scale of 1":100 (1mm = 1.0m will give the user a scale of 1:1000).

Origin: The origin relative to the lower left corner of the margin in paper units (not world coordinates).

Fit to Paper, Current View or Scale: Defines the type of scaling used when printing. "Fit to Paper" automatically scales the whole design to fit the current paper size. "Current View" automatically scales the design as seen on the current screen to fit the current paper size. "Scale" uses the scale entered in the "Print Scale" field.

Portrait, Landscape: Select the paper orientation "Portrait" for vertical or "Landscape" for horizontal orientation.

Copies: Enter the number of "Copies" to print.

Rotation Angle: The angle which a design can be rotated on the page. Click on the arrows to select from 0, 90, 180 and 270 degree angles or enter the angle as required.

Selection Only: Check this option to print only selected (highlighted in green) objects.

All Colors to Black: Check this option to print in black and white printout. Use this option with caution if using a Plot Layout (Section 5.6.14).

Always Center on Page: When checked, centers the drawing in the Preview window. It does the same thing as clicking the [Center] button, and is intended for use as part of a Preset.

Print to File: Check this option to print to a file. Click [Print] to print the design. Select the file name and folder and click [Save] to save as a print file (*.prn).

Line Width 0 has Width: By default lines with a width of zero are drawn with the minimum line width possible on the current printer. Checking this option ensures that lines with zero width are easily visible, in practice this normally makes them thicker.

Base Line Width: Sets the base or minimum width for line output from the printer.

Print: Click [Print] to print the design using the current print settings.

Center: Click this button to center the design on the page based on the current margin settings.

File Stamp: Includes a File and Date stamp on the printed page. Pressing the [File Stamp] button opens a dialog to set the options for the stamp. Options include font, font height, format of the date, and location on the drawing sheet. A Watermark can also be set here by checking the "Use Watermark" check box and entering the required watermark, e.g., confidential and the required text density (darker to the right-hand-side of the scale).

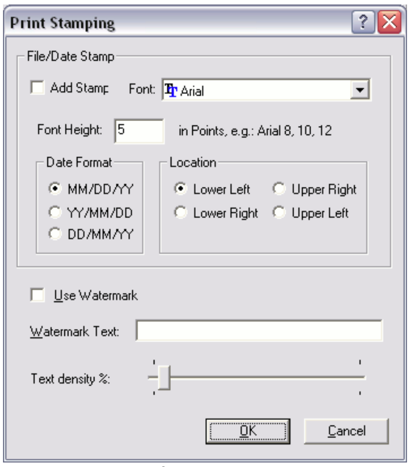


Figure 5-29

Cancel: Click [Cancel] to cancel the print.

See also:

Plot Layout *Section 5.6.14*

5.3.17 DIRECT PLOT

IRRICAD contains both a *Print* and *Plot* command. The *Print* command utilizes the standard Windows drivers for output to the device. The *Plot* command is an internal routine allowing more control over vector output devices by bypassing the Windows drivers. Each of these commands maintains separate default settings for the print output such as scale, orientation and page size.

The *Direct Plot* option should not be used unless the following situations are evident:

- If a Windows driver for the plotter / printer is not available.
- The user has a Windows driver for an HPGL plotter but it does not work very well.

If a Plot Layout is required select *Draw|Plot Layout* before *File|Direct Plot*. Select a Windows printer driver by clicking the [Printer] button in the *Plot Layout* dialog that will support the paper size the user wishes to print.

The Plot routine is designed to enhance the control over vector output devices (old style pen plotters). By using *Direct Plot*, the Windows drivers are bypassed allowing IRRICAD to send information directly to the plotter or to printers not supported through standard Windows drivers.

The *Direct Plot* dialog can be accessed from the *File* menu. In order to use direct plot, the plotter should be configured to hardware flow control. Direct plot does not support TrueType fonts. Vector fonts will be substituted for TrueType fonts when direct plot is used.

The *Direct Plot* dialog contains many of the same settings found in the normal print command along with specific settings for controlling pen mapping and language output. The basic controls allow for standard output features such as orientation and size. In addition to these settings, there are many advanced settings for accessing the plotter pens and the language code for controlling the plotter.

Plotter:	The plotter currently selected. To change the plotter click on the plotter description or click [Setup] and select another plotter.

Page Size: Shows the dimensions of the currently selected paper. To change the page size, click on the description and select another paper size.

Plot Scale: The scale factor for printing. The value is only used when the "Scale" option is selected e.g., 1 inch = 100ft will give the user a scale of 1":100 (1mm = 1.0m will give the user a scale of 1:1000).

Origin: The origin relative to the lower left corner of the margin in paper units (not world coordinates).

Fit to Paper, Current View or Scale: Defines the type of scaling used when printing. "Fit to Paper" automatically scales the whole design to fit the current paper size. "Current View" automatically scales the design as seen on the current screen to fit the current paper size. "Scale" uses the scale entered in the "Plot Scale" field.

Plot to File: Check this option to plot to a file. Click [Plot] to plot the design. Select the file name and folder and click [Save] to save as a plot file (*.prn).

File / Date Stamp: Check this option to plot the design file name or date stamp on the page. The location is controlled by settings in the Windows registry.

Fast Preview: Check this option to see only an outline of the entire design in the preview window. Speeds display of complex drawings.

Selection Only: Check this option to plot only selected (highlighted in green) objects.

All Colors to Black: Check this option to plot in black and white printout. Use this option with caution if using a Plot Layout (Section 5.6.14).

Paper Units: The units for paper size and margins. Select "Metric Paper Unit" or "English (Imperial) Paper Unit".

Center: Click this button to center the design on the page based on the current margin settings.

Plot: Click [Plot] to plot the design using the current plot settings.

Rotation Angle: Sets the rotation of the drawing relative to the paper.

Preview: Shows a preview of the drawing as it will plot using the current settings. After changing the "Plot Scale" of a drawing, the preview window allows the drawing to be dragged into the required position. For example, to plot a detail of a drawing at a specific scale, set the required scale and then drag the image on the preview using the mouse until the required detail is shown.

Center: Centers the drawing on the given page based on the current margin settings.

Setup: Click [Setup] to select the plotter to use. Click [Options] to edit plotter properties. These vary between plotters. In most cases, IRRICAD provides a common set of driver information for popular plotters. If the plotter is not supported, the settings can be easily manipulated to achieve the required output by trial and error.

Update: Used to update the plot preview screen after changes have been made to the plot settings.

5.3.17.1 PLOTTER SETTINGS

The plotter tab contains specific settings describing the device including hardware ports and number of carousels. When modifying settings for the communication settings, ensure that the hardware itself is configured for hardware flow control.

Port: Displays the communications port to which the plotter is connected.

Baud Rate, Data Bit, Parity and Stop Bit: Specifies the communication settings for the current port. Please refer to the hardware documentation for more information.

 # Pens: Sets the number of pens in each carousel.

Total: Sets the number of pen carousels to be used.

Use Multiple Carousels: If using more than one carousel this box must be checked for IRRICAD to switch during plotting.

New: Creates a new plotter definition.

Default: Sets the current plotter driver as the default for direct plot.

Sort Color: Activates pen sorting when active. Pen Sorting will improve plot time by reducing pen changes and assuring that each pen is only used once.

Optimize Plotting: Activates motion optimization when active. Motion optimization will improve plot time by

	minimizing unnecessary pen movements and drawing from one end of the paper to the other.
Origin at Lower Left:	Places the origin at the lower left corner of the paper when checked, otherwise the origin is placed at the center of the paper.
Page Size:	Selects the size of the plotter media. This size reflects the printed area on the page and not the actual sheet size.
Add:	Adds a new page size to the list by using the values entered in the Length and Width boxes.
Remove:	Deletes the current page size from the list.
DPI:	Specifies the maximum resolution of the plotter in dots per inch.

5.3.17.2 PEN MAP

Pen mapping allows colors in the IRRICAD drawing to represent different pens in the plotter effectively giving precise line width control to the plotter. Pen mapping involves assigning pens from the plotter carousel to colors that exist in the drawing. In addition to simply setting a pen, the map can set the pen width and speed that can improve the output for the plotter. When using pen mapping, it is important to remember that many ink jet plotters use pen numbers to represent different line types. Certain pen numbers or ranges of pens may refer to lines that are not solid or that are created using gray-scale fills. If the All Colors to Black option is checked in the plot dialog, all colors will plot using the pen mapped to color 0, normally black.

New:	Creates a new map. The direct plot routine can store multiple pen mappings for creating different sets of output.
Default:	Sets the current pen map as the default.
IRRICAD Color:	The entity color in the drawing the user wishes to map.
Pen Number:	Specifies the pen number assigned to the individual color.
Pen Width:	Adjusts the width of the pen. The width setting is used to create solid fills and is measured in millimeters.
Pen Speed:	Sets the speed at which the pen moves across the paper. Speed is measured in millimeters per second. Specifying a high speed may result in damage to the pen tip.

5.3.17.3 LANGUAGE

IRRICAD supports many common plotter languages. However, if the required language is not available, the user can create a language directly through the interface. A plotter language consists of a delimiter, initialization string, de-initialization string, pen up, pen move, pen draw, pen speed and pen change commands. Each of these needs to be specified when creating a language. The required control codes are generally listed in the output device's documentation and set to a specific plotter type.

Delimiter: Specifies the character that separates commands sent to the plotter. This field can be left blank.

Init. String: Describes the commands that are sent to the plotter for initialization.

De-Init. String: Describes the commands that are sent to the plotter after the plot is complete.

Pen Up: Specifies the characters that raise the pen from the paper.

Pen Down: Specifies which characters lower the pen to the paper for drawing.

Pen Move: Specifies the characters that signal the plotter to move the pen from one location to another in the up position.

Pen Draw: Specifies the characters that signal the plotter to move the pen from one location to another in the down or draw position.

Pen Speed: Specifies the characters that set the pen speed for the current pen.

Pen Change: Specifies the characters that signal the plotter to change to a new pen.

New: Creates a new plotter language setting.

Default: Restores the plotter language settings to the default values for a HP-GL plotter.

Use HP-GL/2 Commands: Enables the use of HP-GL/2. This setting can improve the quality of arcs and circles and decrease plot time if the plotter supports HP-GL/2 graphics language. When utilized the Init. String must contain values for the plotter to recognize HP-GL/2 commands.

5.3.18 REPORTS PRINT SETUP

These options allow the settings for the printer to be modified if required in *File|Reports Print Setup*. These settings will affect the printing of reports only.

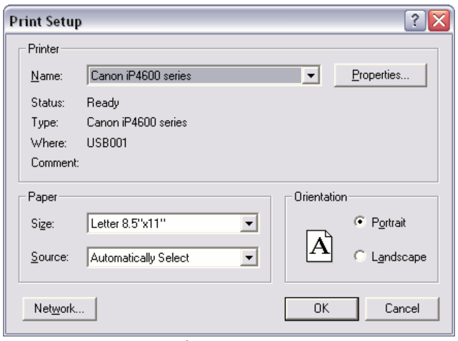


Figure 5-30

Printer: Selects the Printer to be used to print the report.

Properties: This button allows editing the specific properties for the printer.

Paper Size: Selects the paper size for the reports.

Paper Source: Selects paper tray required.

Orientation: Select either "Portrait" or "Landscape" orientation for report printing.

5.3.19 RECENT FILE LIST

Recently used files are listed under the *File* menu for ease of re-opening. Simply click on the name of the file the user wishes to reopen.

Note: The file name in the MRU list may be abbreviated, but the full path and file name can be seen in the application status bar.

5.3.20 EXIT

Use the *Exit* command the exit IRRICAD. If an unsaved design is loaded, IRRICAD prompts the user to save the design file before closing IRRICAD.

To exit IRRICAD:

1. Select *File|Exit*.

5.4 EDIT

The *Edit* menu contains:

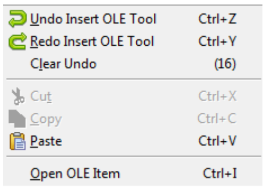


Figure 5-31

5.4.1 UNDO

Multiple actions mistakenly performed can be reversed.

Undo can also be accessed using the standard Windows <Ctrl>+<Z> keyboard shortcut or via the File toolbar or File menu. The File toolbar and menu display the next action which can be undone as seen below:

Figure 5-32

Note that the toolbars can be modified via *View|Toolbars* Commands.

These actions can be undone:-

- The drawing of geometric items
- The drawing of *Zone* items
- The drawing of *Mainline* items
- *Zone Design* sizing options (the pipes will be returned to their previous state)
- *Mainline Design* sizing options (the pipes will be returned to their previous state)
- *Computer Selection of Fittings* (the fitting selection will be returned to the previous state)
- *Modify* tools (Moving, Changing, Copying, Exploding, Resizing, Scaling, Breaking, Trimming, Extending). Note *Move to Back*/*Move to Front* cannot be undone
- IRRICAD *Tools* (*Cut Lasso*, *Trim Spraylines*, *Move Sizes*, *Create Wetted Radii*/*Sprayline Outlet* (one by one), Create Symbol ("Replace original" option only), *Calculate Contours*,

Convert to Elevations, *Highlight Elevations*, *Trim Elevations*, *Create*/*Undo Labels*, *Tapes to Sprayline*, *Spraylines to Tapes*, *Subdivide Block*, *Connect Valves*, *Connect Outlets*).

These actions cannot be undone:-

- Management (Assign Zones... options)
- *Zone Design Configuration*
- Design results as displayed in Reports. Re-run the appropriate Design process to update the reports after setting pipe sizes back to the previous state.

Undo retains actions for the open design, however some actions will cause the list of undo-able tasks (the undo stack) to be cleared.

These actions will clear the undo stack:-

- *Clear Undo*
- *Repair*
- Compress
- Unloading symbols via the *Symbol* dialog
- Opening a new design
- Saving a new plot template symbol.

5.4.2 REDO

Actions that have been undone can be redone. *Redo* is located in the *Edit* menu.

Redo can also be accessed using the standard Windows <Ctrl>+<Y> shortcut or via the File toolbar or File menu. The File toolbar or menu will display the next action that can be redone as seen in the image below:

Figure 5-33

5.4.3 CLEAR UNDO

Located in the *Edit* menu this removes all the undo actions from memory.

Note: *The number in parentheses shows the current number of undo actions stored.*

See also:

Settings|Miscellaneous|Undo — *Section 5.10.12.4*

5.4.4 PASTE

Use the Paste command to paste copied items on the IRRICAD screen.

To use Paste:

1. Copy the item required. This may be a report which the user can copy by using the *Edit|Copy* option in the Report Viewer.
2. Select *Edit|Paste*.
3. On the screen click for the bottom left corner.
4. Move the mouse (do NOT drag) and then click to place the top right corner.

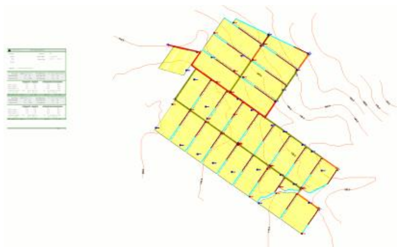


Figure 5-34

Notes:

This option allows only a single instance of the object to be inserted.

The required data needs to have been copied to the clipboard in the appropriate application (e.g., the IRRICAD report viewer) or a file copied in My Computer or Windows Explorer.

Although there is no restriction on the shape of the OLE rectangle it is advisable to ensure that the relative dimensions of the rectangle approximate those of the OLE object to be displayed.

It is a restriction of OLE that only the first page of the copied data can be displayed. IRRICAD allows OLE data to be displayed, printed and exported to PDF. NOTE: in order for

IRRICAD reports to be displayed correctly an application that can render RTF data, including tables, must be installed on the system - examples of suitable applications are MS Word, Open Office etc.

OLE items can be printed or exported to PDF files. In both cases only the enclosing rectangle is displayed in the Print/PDF preview screens.

OLE items are not exported to VCD/DXF/DWG files.

OLE items are selected by using a select tool and clicking on the bounding rectangle for the item. This rectangle is white and therefore will be invisible when using a white background. It is normally not difficult to select it but an alternative is to use a non-white background color.

See also:

Tools|Insert OLE Section *5.12.18*

5.4.5 OPEN OLE ITEM

OLE items that have previously been added can be opened and altered in the appropriate application. To do this simply, select the OLE item and then use *Open OLE Item* from the *Edit* menu. Any changes made will be reflected in the inserted item.

To Open the OLE Item

1. Select the rectangle encompassing the OLE Item.
2. Select *View|Open OLE* Item.

The item, such as the pasted report, will be opened in an appropriate application.

Note: *Any changes made to the opened OLE item will immediately be reflected on the pasted OLE item on the IRRICAD Screen.*

See also:

Tools|Insert OLE Section *5.12.18*
Edit|Paste Section *5.4.4*

5.5 VIEW

The *View* menu has the following commands:

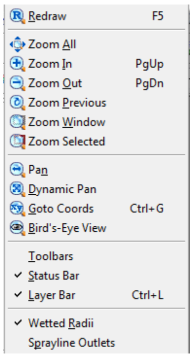


Figure 5-35

5.5.1 REDRAW

Use the *Redraw* tool to refresh the screen. When the user moves or erases an object, its old location is re-drawn with the background color. This effect tends to break up or obscure remaining objects that it overlapped or intersected. The user can use the *Redraw* tool to clean up the screen after this happens. This tool is especially useful when editing lines drawn on top of each other or objects that overlap.

The objects are re-drawn in the order they were created or edited

To redraw the display:

1. Select *View|Redraw*.

The screen is immediately re-drawn.

5.5.2 ZOOM ALL

Use the *Zoom All* tool to see the entire design. This helps the user get an overview of what the has been drawn, and also helps the user find objects far from the main drawing area that may have been created inadvertently. These objects can cause problems when the user loads a design or tries to plot or print using the "Fit to Page" option (*File*|*Print*).

Only currently visible layers are displayed and used to calculate the appropriate zoom factor (see *Settings*|Drawing Items, Section 5.10.5).

To zoom all:

1. Select View|Zoom All.

The screen is re-drawn at the highest zoom value that will entirely show all displayed objects.

See also:

View	*Section 5.5*

5.5.3 Zoom In

Use the *Zoom In* tool to quickly magnify the current screen image. This tool's zoom is at a set magnification. The user can set or edit this magnification in *Settings*|*Drawing Items*. The center of the screen stays constant during zooming in.

To zoom in:

1. Select *View*|*Zoom In*.

The drawing is re-drawn at the new magnification.

See also:

View	*Section 5.5*

5.5.4 Zoom Out

Use the *Zoom Out* tool to quickly reduce the magnification of the current screen image. The user can set or edit this magnification in *Settings*|*Drawing Items*. The center of the screen stays constant during zooming out.

To zoom out:

1. Select *View*|*Zoom Out*.

The drawing will be re-drawn at the new magnification.

See also:

View	*Section 5.5*

5.5.5 Zoom Previous

Use the *Zoom Previous* tool to quickly revert to the previous view. This tool is especially useful during drawing or editing operations where selecting a point or object accurately requires that the user zoom in close for detail work. When finished with the detail work, use *Zoom Previous* to return to the prior view to continue drawing or editing. Select the tool again to toggle back to the same enlarged view for accurate point or object selection.

To return to the previous view:

1. Select *View|Zoom Previous*.

The previous view is displayed.

See also:

View	*Section 5.5*

5.5.6 Zoom Window

Use the *Zoom Window* tool to zoom in on only a portion of the screen. IRRICAD will take the selection window and enlarge it uniformly until the width or height meets the limits of the screen. If the zoom window is very small, the magnification will be large. If the zoom window is large, the magnification will be small. In the case of a rectangular window where the width or height is very large relative to the other, the larger dimension will limit the magnification.

To zoom in to a windowed area:

1. Select *View|Zoom Window*.
2. Left click to place a corner point.
3. Move the cursor and left click again to place the opposite corner point.

The area enclosed by the window is enlarged to fill the screen.

Note: Do not hold the left mouse button down and drag the cursor, as this will not work.

See also:

View *Section 5.5*

5.5.7 ZOOM SELECTED

Use the *Zoom Selected* tool to increase the magnification by a factor determined by the selected objects. Only the selected objects are used to determine the appropriate zoom factor and view. Unselected objects may be outside the screen boundaries, even though they are on visible layers. *Zoom Selected* can also be used to verify what the user has selected, since it will fully display all selected objects.

To zoom to view all selected objects:

1. Select the objects the required to zoom in on.
2. Select *View|Zoom Selected*.

The view will change so that the selected objects just fill the screen.

See also:

View *Section 5.5*

5.5.8 PAN

Use the *Pan* tool to pan across the design without changing the magnification.

To use the *Pan* tool:

1. Select *View|Pan*.
2. Place a point where the new view is to be centered.

The screen view is shifted to center about this point.

See also:

View *Section 5.5*

5.5.9 DYNAMIC PAN

When *Dynamic Pan* is selected, it allows the drawing to be panned by clicking and dragging with the left mouse button depressed.

To use Dynamic Pan:

1. Select *View|Dynamic Pan*.
2. Left click on the screen and keeping the left mouse button depressed drag the screen in the required direction.

Tips: The dynamic pan tool can be accessed directly by clicking and holding the center mouse button (or wheel) while dragging the mouse to move the drawing.

See also:

View *Section 5.5*

5.5.10 GOTO COORDS

This tool will pan to the x and y coordinates entered.

To use Goto Coords:

1. Select *View|Goto Coords*.
2. Type in the x and y coordinates for the item / place the user wishes to go to.
3. Click [OK].

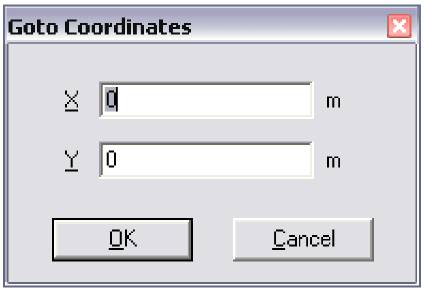


Figure 5-36

The new view will be centered on the x and y coordinates entered.

Tips: The user can use the tab key between the X and Y coordinate fields.

Two numbers from the clipboard can be pasted directly into the X and Y fields using the <Ctrl>+<V> shortcut key combination in either field.

Do not use the mouse to click [OK], instead use the <Enter> key, and the crosshairs will then go to the coordinates specified.

The dialog retains the last set of coordinates visited.

The dialog can be opened with the <Ctrl>+<G> shortcut key combination.

See also:

View *Section 5.5*

5.5.11 BIRDS EYE VIEW

The *Birds Eye View* tool opens a small window that displays a thumbnail outline of the whole design. If zoomed in, the area currently displayed on the screen is shown as a red display box on the *Birds Eye View*. The user can change the displayed area by manipulating the red box on the *Birds Eye View*. To resize the red window in the *Birds Eye View*, click outside the existing red window, and holding the left mouse button down, drag a new window. When the user release the left mouse button, the red window will be moved to the position and size the user has drawn.

To center the view (at the current zoom state) over any particular point on the design, just click on that point in the *Birds Eye View*. The display box can also be dragged to any new position by left clicking anywhere inside the box and dragging it to the required position. Right-clicking anywhere in the *Birds Eye View* brings up a *Right-click* menu that gives access to a set of zoom tools that can also be used to re-size or re-position the view. Using these tools can greatly speed up moving around a large design by eliminating unnecessary re-draws.

The *Birds Eye View* window can be resized like any other window by dragging an edge or corner using the mouse. To close the *Birds Eye View* window click on the X or reselect *View|Birds Eye View*.

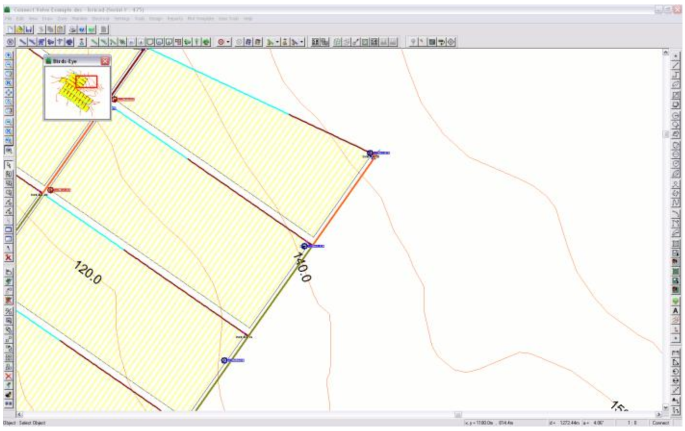


Figure 5-37

To use Birds Eye View:

1. Select *View|Birds Eye View*.
2. Click in the *Birds Eye View* window to center the view on that point or right-click for zoom tools.

See also:

View	*Section 5.5*

5.5.12 TOOLBARS

Toolbars provide a fast and convenient way of accessing commonly used commands and tools, IRRICAD Pro includes many more Toolbars and Toolbar buttons than previous versions. The location, style and content of these Toolbars can be customized to suit individual users' preferences in *View|Toolbars* or by right-clicking on any toolbar.

5.5.12.1 TOOLBAR LOCATION AND SHAPE

IRRICAD Toolbars conform to the Windows docking standards. They can be moved from their default locations by left clicking in the toolbar, anywhere apart from a button, and then dragging. If the toolbar is dragged into the main view area it will become 'floating' and can be moved by dragging and also resized by clicking and dragging the frame of the toolbar window. Dragging the Toolbar into one of the frame areas of the IRRICAD window will cause it to 'Dock' to that frame.

5.5.12.2 CUSTOMIZING TOOLBARS

Toolbars can be customized and their viewing controlled through the *View|Toolbars* menu. A shortcut is also available by right-clicking on any toolbar. The operation of this facility is described below.

Toolbars Tab

The display of individual Toolbars may be toggled using the check boxes provided. At any time when the Toolbar "Customize" dialog is open buttons may be 'dragged' from one toolbar to another, dragging a button onto the main view area or any other area that is not a Toolbar will remove a button.

New Button:	IRRICAD contains a set of default Toolbars (Design, Dimension, Drawing, Electric, File, Hydraulic, Modify, Select, Snap, Tool, and Zoom). It is possible to add new blank Toolbar by clicking the [New] button.
Reset Button:	When one of the default IRRICAD toolbars is highlighted the reset button is available. Clicking this will repopulate the current Toolbar with its default buttons. If any buttons have been previously moved to other Toolbars then copies of these buttons will be retained in those Toolbars.
Delete Button:	User defined Toolbars (created with [New]) can be removed by selected the desired Toolbar and clicking the [Delete] button which will be available. Note that it is not possible to remove the default IRRICAD Toolbars although they can be depopulated or hidden.
Show ToolTips:	Controls whether tooltips are displayed when the mouse cursor is paused above a Toolbar button.
Cool Look:	This check box changes the appearance of the Toolbars to a 'flat' style.
Large Buttons:	This button will increase the size of the buttons on the screen.

Commands Tab

This tab contains the commands that can be represented by a button; they are grouped in a way that matches the default Toolbars. Clicking on a category shows the buttons that are available; these buttons can then be dragged onto any existing Toolbar (default or user defined). Note that the same command/button can exist in more than one Toolbar.

Winicad.ini

The current Toolbar configuration for IRRICAD is stored in an initialization file called Winicad.ini in the Irricad config folder commonly located in C:\Program Files\AEI Software\Irricad Pro.

5.5.12.3 CURRENT DRAWING PROPERTIES TOOLBAR

Displays the currently selected drawing properties (colour, line thickness, line type, and layer) and provides quick access to *Settings|Drawing Items|Geometric Items*.

Figure 5-38

The toolbar can be enabled or disabled by selecting *View|Toolbars* or by right-clicking on any toolbar, check or uncheck **Current** as required.

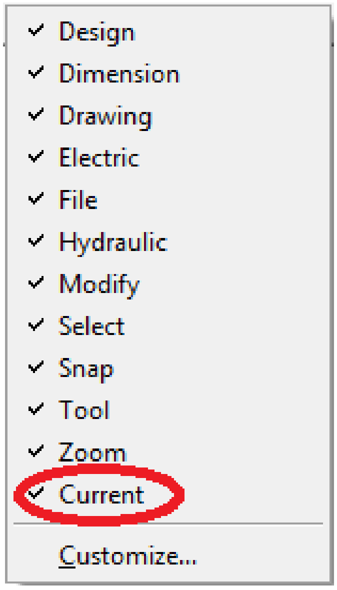


Figure 5-39

The **Current** toolbar can be customized in the normal way via the *View|Toolbars* Commands tab.

> <u>Note</u>: *This toolbar cannot be docked vertically because of the horizontal nature of the included dropdown fields.*

5.5.13 STATUS BAR

The status bar is located at the bottom of the drawing screen. It can be switched on or off by checking or unchecking the *View|Status Bar* option.

The status bar serves several functions. It is broken into sections, each of which can give the user valuable visual feedback about the entity or tool currently in use. The status bar displays messages during design, flow through connected hydraulic items, prompts for using tools, distances and angles from the last mouse click and the X and Y coordinates of the current mouse position.

5.5.13.1 INFO PANEL

This panel displays a variety of information about the currently selected objects. This includes UID, connections, selected item count, cumulative length of selected items, elevation and depth, cumulative area and cumulative nominal flow. The *Right-click* menu also allows the user to select the items connected to the current item. The options may also be cycled with the shortcut key combination <Ctrl>+<Shift>+<I>, while <Ctrl>+<Shift>+<C> will select the connected items. Note that the current values of all options are displayed on the popup *Right-click* menu.

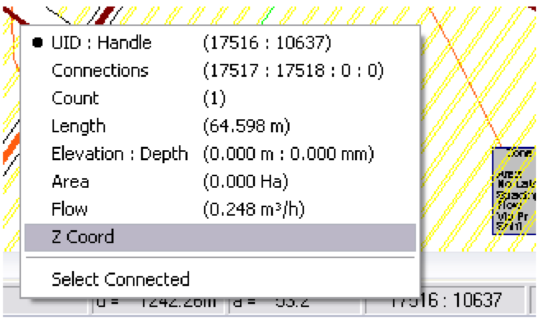


Figure 5-40

5.5.13.2 SNAP PANEL

This panel shows the currently selected default snap mode (Connect, Place or Grid) and, through the popup *Right-click* menu, allows quick access to the Snap and Grid settings. May be cycled with <Ctrl>+<Shift>+<S>.

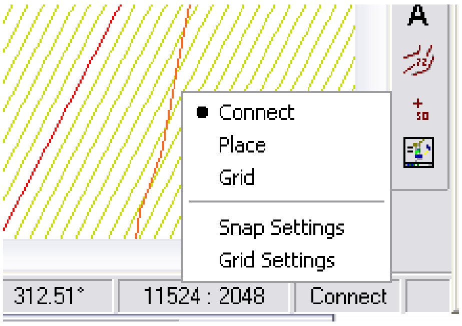


Figure 5-41

5.5.13.3 SELECTION FILTER PANEL

This panel shows the status of the selection filter - a red panel indicates that the filter is active. The user can also access the filter settings through the popup *Right-click* menu and flip the filter status using <Ctrl>+<Shift>+<F>.

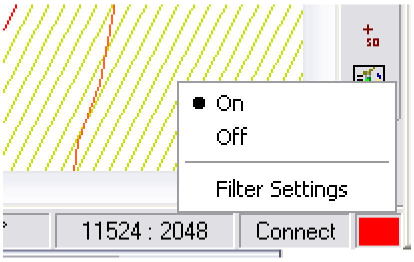


Figure 5-42

When active, a summary of the current filter settings is shown in the tooltip for this panel:

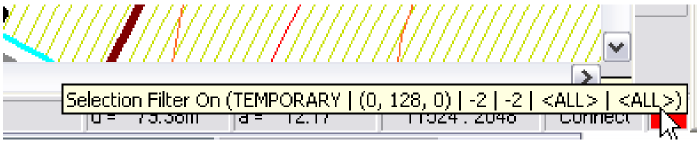


Figure 5-43

Shown filtering the TEMPORARY layer, items with RGB (0, 128, 0), all line types (-2), all line widths (-2), all types (<All>) and all groups (<All>).

5.5.14 LAYER BAR

The dockable layer manager can be access through the main View menu (*View|Layer Bar*), through the *Right-click|Layers* menu or can be toggled with the shortcut key combination CTRL+L. The layer manager has three panes:

- **Layers** – this tab display information about the layers in the current design. It allows the user to see whether a layer is visible, whether it will print and whether it contains data. Layers may be added and/or removed and all items on a given layer may be selected. Any selection of items can be easily moved to any layer.
- **Groups** – layer groups define sets of visible layers that may be associated under a single name and provide a quick way to access these. A group may relate to different aspects of the design – an 'Electrical' layer group, for instance, could show topography and electrical items while hiding hydraulic items. A default set of layer groups can be defined and saved to the registry. These defaults will be included in any new designs and can be 'loaded' into existing designs.
- **Views** – named views are shortcuts to different views of a design. They can be used to move quickly between different areas of a design, and might typically be defined for each stage of a multi-stage development, or for each hole of a golf course, for example. Views can be linked with layer groups (views and groups with identical names are automatically linked). When a view with a linked group is activated, that layer group is also activated.

5.5.14.1 LAYERS TAB

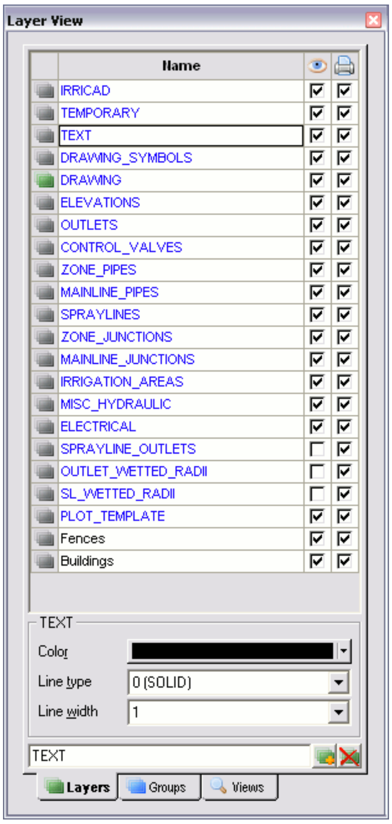


Figure 5-44

- IRRICAD layers are displayed in blue, extra layers in black.
- - this column indicates the visibility of the layers.
- - this column indicates whether a layer will print.
- These check boxes can be toggled individually, by making a multiple selection with the mouse or by selecting the full column by clicking the icon. The selection can also be toggled by pressing the space bar.
- - indicates an empty layer.
- - indicates that the layer has data.
- The lower panel shows the color, line type and line width associated with the selected layer.
- The bottom edit box and buttons (and) can be used to add or remove layers. Layers may also be deleted by selecting them and pressing the <Delete> or <Backspace> key.
- Layers can be renamed *in situ* by clicking in the name column and typing the new name. Use the <Esc> key to cancel an edit.
- A context menu allows layers to be deleted, all entities on a layer to be selected and a selection to

be moved to a layer.

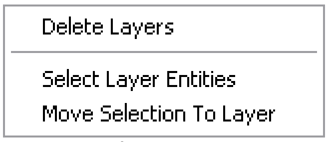


Figure 5-45

5.5.14.2 GROUPS TAB

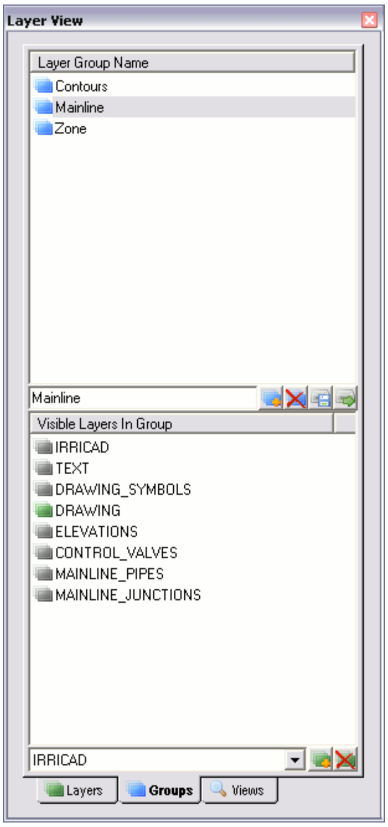


Figure 5-46

- The top panel shows the name of the group, the bottom panel shows the list of visible layers that belong to the selected group.
- Groups can be created and deleted using the edit box and buttons under the top panel (…).
- Layers can be added and removed from groups using the combo box and buttons under the bottom panel (…).
- - indicates an unlinked group.
- - indicates a group with a linked view.
- - indicates an empty layer.
- - indicates that the layer has data.
- - this button will save the currently defined groups as the default set. These groups will also be automatically added to new designs.
- - this button will load the default set of groups.
- Layer groups can be

activated by double-clicking the group name in the top panel, or selecting it and hitting <Enter>.

- Groups can also be deleted by selecting and pressing delete or backspace in the top panel.
- Layers can be removed from groups by selecting and pressing delete or backspace in the bottom panel.
- Functions are also accessible through context menus:

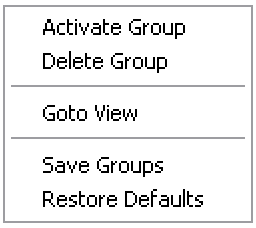


Figure 5-47

- The *Goto View* command switches the focus to the linked view on the **Views** tab.

5.5.14.3 VIEWS TAB

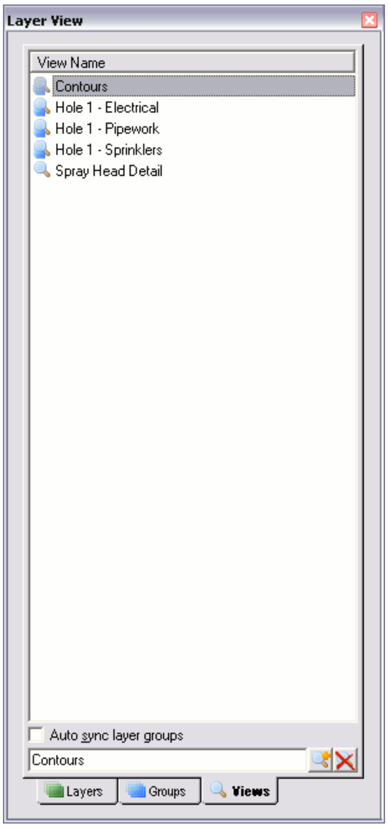


Figure 5-48

- Views can be created and deleted using the edit box and buttons under the top panel (…).
- - indicates an unlinked view.
- - indicates a view with a linked group.
- Checking the “Auto sync layer groups” option will automatically create a group to go with new named views.
- Views can be activated by double-clicking the name in the panel, or selecting it and hitting <Enter>. If a view has a linked layer group, the group will also be activated.
- Views can also be deleted by selecting and pressing delete or backspace in the top panel.
- Functions are also accessible through context menus:

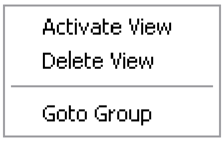


Figure 5-49

- The *Goto Group* command switches the focus to the linked group on the **Groups** tab.

5.5.15 WETTED RADII

This option can be turned on or off to quickly show or hide the arcs associated with outlets (*View|Wetted Radii*). It shows or hides the default layer that the wetted radius arcs are placed in.

Wetted radii need to be created before this tool will work. Wetted radii can be created with the outlets, or after outlets have been drawn on the screen.

> *Note: To turn off sprayline wetted radii, the user must turn off the SL_WETTED_RADII layer in Settings|Layers.*

See also:

Create Wetted Radii	*Section 5.12.4*
Spraylines Settings	*Section 5.10.8.2*

5.5.16 SPRAYLINE OUTLETS

This is a tool that can be turned on or off to quickly show or hide the outlets associated with connected spraylines (*View|Sprayline Outlets*). It shows or hides the default layer that the sprayline outlets are placed in.

Sprayline outlets need to be created before this tool will work. Sprayline outlets can be created with the drawing of spraylines or created after the sprayline has been drawn on the screen. If creating sprayline outlets, turn the layer on by selecting *View|Sprayline Outlets*.

See also:

Create Sprayline Outlets	*Section 5.12.5*
Spraylines Settings	*Section 5.10.8.2*

5.5.17 VIEW IN GOOGLE EARTH

The *View|View in Google Earth* option is a one step process for exporting the design, with the default KML Import/Export settings, directly into Google Earth. Similarly to the *Export to KML* function the coordinates need to be in UTM and the UTM zone specified. See Export to Google Earth File Format (KML), Section 5.3.9.1.

5.6 DRAW

The *Draw* menu contains tools that can be used to place geometric objects on the screen. The *Draw* menu also has options to enhance the appearance of the design.

Tools available from the *Draw* menu are:

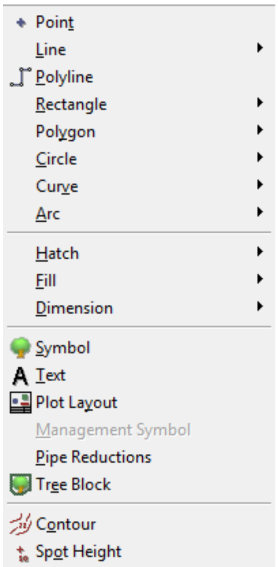


Figure 5-50

5.6.1 POINT

Use the Point tool to place a point for use during the construction of another object or to mark a particular spot.

To place a point:

1. Select *Draw|Point*.
2. Place a point where the point marker is to be located.
3. Repeat step 2 as required.

Tip: *Type in coordinates to place the points (e.g., 30,40) and then press the <Enter> key. Note that the coordinates the user type* *are displayed on the status bar in the left-hand corner before the user presses <Enter>.*

This tool uses the current values of layer, color, line type and line width to draw the point. These current values are set in *Settings|Drawing Items*. To change the properties of a particular point, select *Modify|Change* and click on the point the user wishes to change.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*

5.6.2 LINE

A line can be drawn on the screen by selecting one of the *Draw|Line* options:

- Single
- Double
- Continuous

This tool uses the current values of layer, color, line type and line width to draw the line. These current values are set in *Settings|Drawing Items*. To change the properties of a particular line, select *Modify|Change* and click on the line the user wishes to change.

Tip: *To draw a line a specified length:*

- Select the line from the *Draw* menu, click to place the start point on the screen, and type in the length of the line. This number will appear on the status bar in the left-hand corner. Press <Enter> on the keyboard and the line will complete the required distance. Note that the angle the user move the cursor from the first point, is the angle at which the line will continue at (see a= on the status bar).
- An angle can be set by following the required length of the line by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a line 30ft (m) at an angle of 180˚).
- Alternatively, type in coordinates to place the first and subsequent points (e.g., 30,40) then press the <Enter> key.

See also:

Single Line	*Section 5.6.2.1*
Double Line	*Section 5.6.2.2*
Continuous Line	*Section 5.6.2.3*
Geometric Properties	*Section 5.10.5.1*

5.6.2.1 SINGLE LINE

Use the *Single Line* tool to draw a single line segment with a start and end point.

To draw a single line:

1. Select *Draw|Line|Single*.
2. Place the starting point.
3. Place the ending point.
4. Repeat steps 2 and 3 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Line Tips	*Section 5.6.2*

5.6.2.2 DOUBLE LINE

Double lines are useful for drawing walls, roads, and other parallel lines.

To draw a double line:

1. Select *Draw|Line|Double*.
2. A dialog box will appear where the right and left offsets can be entered.

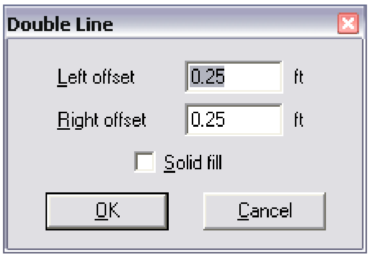


Figure 5-51

3. The user may also check the "Solid Fill" box to have the space between the lines filled with the current drawing color.
4. Click [OK].
5. Place the starting point.
6. Place points to define each new bend in the set of double continuous lines.
7. Finish the line by selecting *Done* from the pop up *Right-click* menu, double-clicking or pressing the <Esc> key. Selecting *Right-click|Close* can close the line.
8. Repeat steps 5 to 7 as required.

<u>Note:</u> *The left and right offset directions are defined relative to the movement of the cursor; the left offset applies to the left of the cursor's forward direction, and the right offset applies to the right. This applies whether the cursor is moving up, down, left or right on the screen. For example, if drawing from the bottom of the screen to the top, the left offset line is on the left side of the double line as the user view the screen. If, however, drawing from the top to the bottom, the left offset is actually on the right side of the double line as the user view the screen.*

<u>Tip:</u> *The user can select, modify and delete each line of a double line separately.*

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Line Tips	*Section 5.6.2*

5.6.2.3 CONTINUOUS LINE

Use the *Continuous Line* tool to create a continuous line consisting of one or more line segments.

To draw a continuous line:

1. Select *Draw|Line|Continuous*.
2. Place the starting point.
3. Place the end point of the first line segment. This is also the starting point for the second segment.
4. Place additional points to create the line segments of the continuous line.

5. Select *Right-click|Done*, double-click, or press the <Esc> key to stop drawing line segments. Alternatively, select *Right-click|Close* to create a closed boundary.
6. Repeat Steps 2 to 5 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Line Tips	*Section 5.6.2*

5.6.3 Polyline

Polyline is another name for *Continuous Line* and is used in exactly the same way.

See also:

Continuous Line	*Section 5.6.2.3*
Geometric Properties	*Section 5.10.5.1*
Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Line Tips	*Section 5.6.2*

5.6.4 Rectangle

A rectangle can be drawn on the screen by selecting one of the *Draw|Rectangle* options:-

- *2 Point* (horizontal or vertical rectangles)
- *3 Point* (rectangles at any angle)

This tool uses the current values of layer, color, line type and line width to draw the rectangle. These current values are set in *Settings|Drawing Items*. To change the properties of a particular rectangle, select on the *Modify|Change* and select the rectangle the user wishes to change.

Tips: *To draw a side of a rectangle a specified length:*

- Select the rectangle from the Draw menu, click to place the start point on the screen, and type in the length of the side. This number will appear on the status bar in the left-hand corner.

Press <Enter> on the keyboard and the line will complete the required distance. Note that the angle the user move the cursor from the first point, is the angle at which the side will continue at (see a= on the status bar).

- An angle can be set by following the required length of the side by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a side 30ft (m) at an angle of 180°).
- Alternatively, type in coordinates to place the first and subsequent points (e.g., 30,40) then press the <Enter> key.

See also:

2 Point Rectangle	*Section 5.6.4.1*
3 Point Rectangle	*Section 5.6.4.2*
Geometric Properties	*Section 5.10.5.1*

5.6.4.1 2 Point Rectangle

A two-point rectangle is a rectangle that has been drawn on the screen by using only two points – the starting point, and the end point. The end point is the corner diagonally opposite the starting point. Use the *2 Point Rectangle* tool to create a horizontal or vertical rectangle.

To draw a two-point rectangle:

1. Select *Draw|Rectangle|2 Point*.
2. Place any corner (vertex) of the rectangle.
3. Place the opposite corner.
4. Repeat steps 2 and 3 as required.

Tips: *To draw a 2 Point rectangle with a specified diagonal distance:*

- Select the rectangle from the Draw menu and click to place the start point on the screen. Type in the length of the diagonal line. This number will appear on the status bar in the left-hand corner. Press <Enter> on the keyboard and the line will complete the required distance.
- Alternatively, type in coordinates to place the first and second points (e.g., 30,40) then press the <Enter> key.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*

Rectangle Tips *Section 5.6.4*

5.6.4.2 3 Point Rectangle

A three-point rectangle is one that is drawn using three points. The first two points control the length and direction of one of the sides. The third point is used to size the width or length of the rectangle. Use the *3 Point Rectangle* tool to create a rectangle by defining its width and height with three points.

To draw a three-point rectangle:

1. Select *Draw|Rectangle|3 Point*.
2. Place a point at any corner (vertex) of the rectangle.
3. Place the endpoint of the line.
4. Move the cursor perpendicular to the line the user just drew.
5. Place a third point to complete the rectangle.
6. Repeat steps 2 to 5 as required.

Note: *In most cases, the second and third points can be placed using a snap tool.*

Tips: *To draw a 3 Point Rectangle with specified lengths and widths:*

- Select the rectangle from the Draw menu and click to place the start point on the screen. Type in the length of one side. This number will appear on the status bar in the left-hand corner. Press <Enter> on the keyboard and the line will complete the required distance. Note that the angle the user move the cursor from the first point, is the angle at which the line will continue at (see a= on the status bar). Type in the length of the other dimension and press <Enter> to complete the rectangle.
- An angle can be set by following the required length of the line by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a line 30ft (m) at an angle of 180°).
- Alternatively, type in coordinates to place the first, second and third points (e.g., 30,40) then press the <Enter> key.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Rectangle Tips	*Section 5.6.4*

5.6.5 Polygon

A polygon can be drawn on the screen by selecting one of the *Draw|Polygon* options:

- Center
- Side
- Irregular
- Seed

This tool uses the current values of layer, color, line type and line width to draw the polygon. These current values are set in *Settings|Drawing Items*. To change the properties of a particular polygon, select *Modify|Change* and click on the polygon the user wishes to change.

Tips*: To draw a polygon with specified lengths:*

- Select the polygon from the Draw menu, click to place the start point on the screen, and type in the length of one side. This number will appear on the status bar in the left-hand corner. Press <Enter> on the keyboard and the polygon side will measure the required distance. Note that the angle the user move the cursor from the first point, is the angle at which the side will continue at (see a= on the status bar).
- An angle can be set by following the required length of the side by a comma, a less than sign (<)and the angle required (e.g., 30,<180 will result in a side 30ft (m) at an angle of 180°).
- Alternatively, type in coordinates to place the first and second points (e.g., 30,40) then press the <Enter> key.

5.6.5.1 Polygon Dialog

Number of Sides:	The number of sides required for the polygon.
Circumscribe:	The second point will represent the midpoint of a side of the polygon.
Inscribe:	The second point used to define the polygon will represent a vertex of the polygon.

See also:

Center Polygon — *Section 05.6.5.2*
Side Polygon — *Section 5.6.5.3*
Irregular Polygon — *Section 5.6.5.4*
Seed Polygon — *Section 5.6.5.5*

Geometric Properties	*Section 5.10.5.1*

5.6.5.2 CENTER POLYGON

A center polygon is one that uses the center of the object as the pivoting point for rotation and sizing. Use the *Center Polygon* tool to draw a regular polygon.

To draw a regular polygon using center construction:

1. Select *Draw|Polygon|Center*.
2. Enter the number of sides for the polygon and select circumscribe or inscribe in the dialog that pops up. Click [OK].
3. Place a point to locate the center of the polygon.
4. Place a point to complete the polygon.
5. Repeat steps 3 and 4 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Polygon Tips	*Section 5.6.5*

5.6.5.3 SIDE POLYGON

Use the *Side Polygon* tool to draw a regular polygon when the length, orientation and location of one side are known.

To draw a regular polygon using one-side construction:

1. Select *Draw|Polygon|Side*.
2. Select the number of sides for the polygon. Click [OK].
3. Place the starting point for one side of the polygon.
4. Place an end point for one side of the polygon.
5. Move the cursor to either side of this line to flip the polygon if required and click the left mouse button to complete the polygon.
6. Repeat steps 3 to 5 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*

Polygon Tips	*Section 5.6.5*

5.6.5.4 Irregular Polygon

Use the *Irregular Polygon* tool to create a polygon of three or more sides, each side being of any length or angle. In effect, this tool creates a closed continuous line.

To draw an irregular polygon:

1. Select *Draw|Polygon|Irregular*.
2. Click to place the first point.
3. Place additional vertex points around the perimeter of the polygon.
4. Select *Right-click|Done*, or double-click to complete the polygon.
5. Repeat steps 2 to 4 as required.

An end point does not have to be placed on top of the starting point; IRRICAD connects the first and last vertices automatically.

See also:

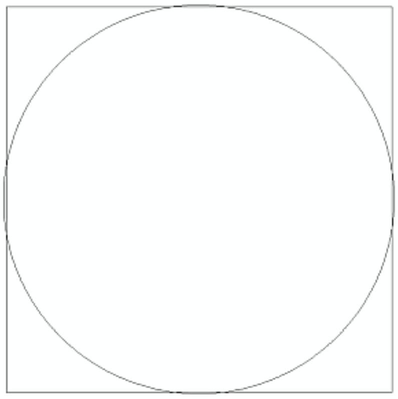
Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Polygon Tips	*Section 5.6.5*

5.6.5.5 Seed Polygon

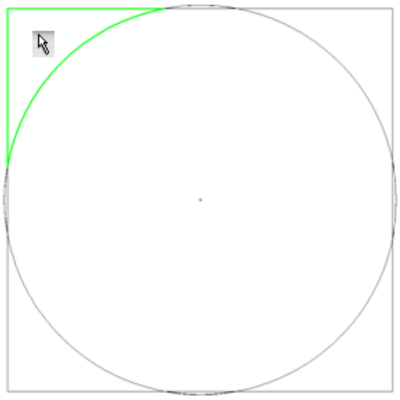
Draw|Polygon|Seed creates new polygons, from regions defined by existing concurrent or crossed geometric entities, with a single click.

To use Polygon Seed

1. Select *Draw|Polygon|Seed* and click inside an unconnected region.
2. IRRICAD will create an additional polygon matching the shape of the region.



Draw the objects



Click inside the required region using *Draw|Polygon|Seed*

Figure 5-52

The new polygon can subsequently be converted into to an irrigation block or *Zone|Area*.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Polygon Tips	*Section 5.6.5*

5.6.6 CIRCLE

A circle can be drawn on the screen by selecting one of the *Draw|Circle* options:

- 3 Point
- Diameter
- Center Radius
- Ellipse

This tool uses the current values of layer, color, line type and line width to draw the circle. These current values are set in *Settings|Drawing Items*. To change the properties of a particular circle, select *Modify|Change* and click on the circle the user wishes to change.

Tips: *The user can specify the distance between two points by typing in a length and pressing the <Enter> key to place the second point. This number will appear on the status bar in the left-hand corner. Note that the angle the user move the cursor from the first point, is the angle at which the line will continue at (see a= on the status bar).*

An angle can be set by following the required length of the side by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a minimum diameter of 30ft (m) at an angle of 180°).

Alternatively, type in coordinates to place the first, second and third points (e.g., 30,40) then press the <Enter> key.

Use any if the snap tools to place a point precisely at any location (see Snaps, Section 5.1.3).

See also:

3 Point Circle	*Section 5.6.6.1*
Diameter Circle	*Section 5.6.6.2*
Center Radius Circle	*Section 5.6.6.3*
Ellipse Circle	*Section 5.6.6.4*
Geometric Properties	*Section 5.10.5.1*

5.6.6.1 3 POINT CIRCLE

A three-point circle is a circle that needs to have three points in order to draw it on the screen. When this tool is chosen, the first two points draw a line, which becomes the smallest possible diameter of the circle. The third point can be anywhere on the circumference of that circle, and determines size and placement. The circle can be placed anywhere about the third point, which acts as a central pivot.

Use the *3 Point Circle* tool to create a circle when the center and radius are not known. The circumference must pass through three specific points in the drawing.

To draw a three-point circle:

1. Select *Draw|Circle|3 Point*.
2. Place the first of the three points for the circle to pass through.

3. Place the second point. As the user move the cursor, a new rubberband connects the second point to the cursor.
4. Place a third point to complete the circle.
5. Repeats steps 2 to 4 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Circle Tips	*Section 5.6.6*

5.6.6.2 Diameter Circle

A diameter circle is a circle that uses the starting point as a pivot for placement and sizing, with the distance of the cursor from the starting point determining the size of the circle. Use the *Diameter Circle* tool to create a circle whose diameter the user specify by placing two points.

To draw a diameter circle:

1. Select *Draw|Circle|Diameter*.
2. Place a point that will be on the circumference of the circle. As the cursor is moved, the user sees a dynamic preview of the circle.
3. Place a second point to define the circle.
4. Repeat steps 2 and 3 as required.

Tip: *If the user know the diameter, simply type it while the user are dragging the preview circle in the required direction and press the <Enter> key.*

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Circle Tips	*Section 5.6.6*

5.6.6.3 Center Radius Circle

A center radius circle is one that uses the center of the circle as a pivoting point for sizing, the distance of the cursor from the center determining the size of the circle.

Use the *Center Radius Circle* tool to create a circle when the user know the location of the center point, and the circle's radius or the location of any point on the circumference of the circle.

To draw a center radius circle:

1. Select *Draw|Circle|Center Radius*.
2. Place the center point of the circle.
3. Place the second point on the circumference of the circle.
4. Repeat steps 2 and 3 as required.

Tips: *If the radius is known simply type it as the circle is being dragged and then press the <Enter> key.*

If the diameter is known, type the expression (d)/2 e.g., if the diameter is 10ft type (10)/2.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Circle Tips	*Section 5.6.6*

5.6.6.4 ELLIPSE CIRCLE

Use the *Ellipse Circle* tool to draw an ellipse defined by the length and width at its principal axes.

To draw an ellipse:

1. Select *Draw|Circle|Ellipse*.
2. Place the starting point of the first axis.
3. Place the endpoint of the first axis. This defines the length and orientation of the ellipse. As the user move the cursor perpendicular to the first axis, a preview of the ellipse follows the cursor.
4. Place a third point to complete the ellipse.
5. Repeat steps 2 to 4 as required.

Tip: *If the user know the length of the first axis, simply type it while the user are dragging the preview circle in the required direction and press the <Enter> key.*

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
Circle Tips	*Section 5.6.6*

5.6.7 CURVE

A curve is a line that is not straight. It can be manipulated to any size or shape. A curve can be drawn on the screen by selecting one of the following *Draw|Curve* options:

- Single Bezier
- Continuous Bezier
- Spline

This tool uses the current values of layer, color, line type and line width to draw the Curve. These current values are set in *Settings|Drawing Items*. To change the properties of a particular curve, select *Modify|Change* and click on the curve the user wishes to change.

Tip: *IRRICAD provides extensive support for snap and break tools involving both Bezier and Spline curves. For example, the user can trim a continuous Bezier curve to a line, circle, or even another Bezier curve. The user can also use* Right-click|Snaps|Tangent *and* Right-click|Snaps|Perpendicular *to each of these entities.*

See also:

Single Bezier Curve	*Section 5.6.7.1*
Continuous Bezier Curve	*Section 5.6.7.2*
Spline Curve	*Section 5.6.7.3*
Geometric Properties	*Section 5.10.5.1*

5.6.7.1 SINGLE BEZIER CURVE

Use the *Single Bezier Curve* tool to create a curved line. Two control points determine the shape of the curve. These control points define lines that are tangent to the curve at the end points. IRRICAD constructs a smooth curve connecting the end points and meeting the tangency constraints.

To draw a single Bezier curve:

1. Select *Draw|Curve|Single Bezier*.
2. Place the starting and ending points of the curved line. A preview curve appears, connecting the two end points. Moving the cursor controls the slope and bulge of the curve at the starting end.
3. Place the first control point to fix the slope of the curve at the starting point. The cursor now controls the location of the second control point. Moving the cursor changes the slope and bulge at the end of the curve.
4. When the curve is shaped as required, place the second control point.
5. Repeat steps 2 to 4 as required.

Tip: *The user can place the points of the curve by typing in the coordinates and pressing the <Enter> key.*

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
CurveTips	*Section 5.6.7*

5.6.7.2 CONTINUOUS BEZIER CURVE

Use the *Continuous Bezier Curve* tool to create a continuous curved line, consisting of individual Bezier curves joined at each construction point, but behaving as one entity.

To draw a continuous Bezier curve:

1. Select *Draw|Curve|Continuous Bezier*.
2. Place the starting point of the curve.
3. Place points to define the remaining segments of the curve (the curve will pass through these points). Each segment of the curve is adjusted when the user place the second line of the line segment, creating a smooth, continuous curve.
4. Select *Right-click|Done*, double-click, or press the <Esc> key to complete the curve.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
CurveTips	*Section 5.6.7*

5.6.7.3 Spline Curve

Use the *Spline Curve* tool to draw a spline curve. The user can move construction points on a spline curve, but the user cannot move control points independently.

To draw a spline curve:

1. Select *Draw|Curve|Spline*.
2. Place the starting point of the curve.
3. Place additional construction points to create the required curve.
4. Select *Right-click|Done*, double-click, or press the <Esc> key to complete the curve.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
CurveTips	*Section 5.6.7*

5.6.8 Arc

An arc is a part of a circle. An arc can be drawn on the screen by selecting one of the *Draw|Arc* options:

- Start Mid End
- Center Start End
- Elliptical

This tool uses the current values of layer, color, line type and line width to draw the arc. These current values are set in *Settings|Drawing Items*. To change the properties of a particular arc, select *Modify|Change* and click on the arc the user wishes to change.

Tips: *If the user know the length of the radius or first axis, simply type it while the user are dragging the preview arc in the required direction and press the <Enter> key.*

An angle can be set by following the required length of the side by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a radius 30ft (m) at an angle of 180°). The same rules can apply for the third point.

Alternatively type in coordinates to place the first, second and third points (e.g., 30,40) then press the <Enter> key.

See also:

Start Mid End Arc	*Section 5.6.8.1*
Center Start End Arc	*Section 5.6.8.2*
ArcTips	*Section 5.6.8*
Elliptical Arc	*Section 0*
Geometric Properties	*Section 5.10.5.1*

5.6.8.1 START MID END ARC

Use the *Start Mid End Arc* tool to create an arc when the beginning point, a point on the arc, and the endpoint is known.

To draw a three-point arc:

1. Select *Draw|Arc|Start Mid End*.
2. Place the starting point for the arc.
3. Place any intermediate point on the arc. A preview of the arc appears, connected on one end to the cursor.
4. Place the endpoint of the arc.
5. Repeat steps 2 to 4 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
ArcTips	*Section 5.6.8*

5.6.8.2 Center Start End Arc

Two points are placed on the screen that becomes the radius about which an arc can be drawn. Use the *Center Start End Arc* tool to create an arc when the user know its center point, the starting point of the arc, and any point on the line connecting the center point with the end of the arc (or the extension of that line).

To draw a center start end arc:

1. Select *Draw|Arc|Center Start End*.
2. Place a point at the center of the arc. A rubberband connects the center with the cursor, representing a preview of the radius.
3. Place the first endpoint of the arc. This point determines the radius as well as one endpoint of the arc.
4. When the arc has been opened to the required angle or alignment, place another point.
5. Repeat steps 2 to 4 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
ArcTips	*Section 5.6.8*

5.6.8.3 Elliptical Arc

Use the *Elliptical Start-Span Arc* tool to create an elliptical arc based on a parent ellipse. First the parent ellipse is created by defining its major and minor axes. Then define the beginning and end of the elliptical arc using an angular span originating at the center of the ellipse.

To draw an elliptical start-span arc:

1. Select *Draw|Arc|Elliptical*.
2. Draw the parent ellipse. Follow the procedure included for the *Ellipse Circle* tool (Section 0). When the ellipse is completed, a rubberband connects the center to the ellipse to the cursor. The rubberband line represents a cutting line; the intersection of this line and the ellipse will be the start of the elliptical arc.
3. Place the first endpoint of the elliptical arc.
4. Place a point to complete the elliptical arc.
5. Repeat steps 2 to 4 as required.

See also:

Snaps	*Section 5.1.3*
Running Snaps	*Section 5.10.16.2*
ArcTips	*Section 5.6.8*

5.6.9 HATCH

A hatch is a pattern drawn within an area on the screen to represent different materials or textures. A hatch can be drawn on the screen by selecting one of the *Draw|Hatch* options:

- Selection
- Boundary
- Seed

In order for the hatch to be displayed, the "Display Hatch" check box must be checked in *Settings|Drawing Items*.

This tool uses the current values of layer and color to draw the hatch. These values are set in *Settings|Drawing Items*.

5.6.9.1 HATCH DIALOG

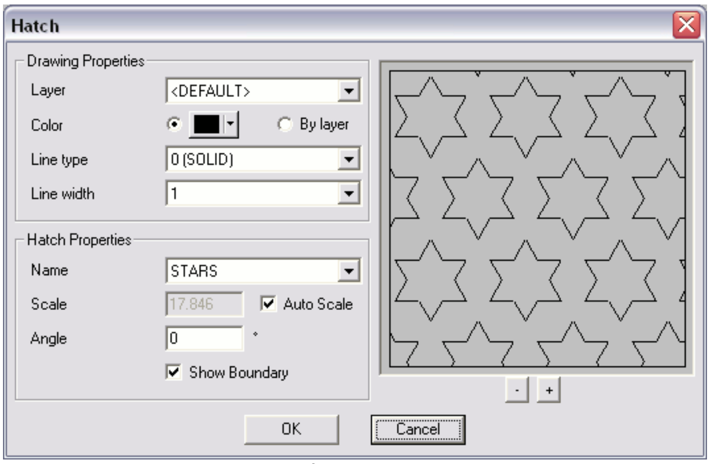


Figure 5-53

Name:	This is the name of the style of hatch to use. Select from the dropdown list to change the current style.
Scale:	Sets the size of the hatch pattern. If the hatch tool seems to be unsuccessful, increase the scale.
Angle:	Type in an angle from 0º to 360º to rotate the hatch pattern as required.
Show Boundary:	This option has no effect with *Hatch Selection* or *Hatch Seed*. Displays hatch boundaries as a line on the screen.

See also:

Hatch Selection	*Section 5.6.9.2*
Hatch Boundary	*Section 5.6.9.3*
Hatch Seed	*Section 5.6.9.4*
Geometric Properties	*Section 5.10.5.1*

5.6.9.2 Hatch Selection

Use the *Hatch Selection* tool to draw a hatch pattern when closed objects such as circles, polygons, connected single lines, etc. define the hatch boundaries. Closed objects located inside other closed objects remain unhatched when all are selected.

To draw a hatch pattern within selected objects:

1. Select the closed objects the user wishes to hatch.
2. Objects the user select must be closed (sharing the same beginning and end point).
3. Select *Draw|Hatch|Selection*.
4. Select a hatch pattern and enter a scale and angle in the dialog. Click [OK].

See also:

ArcTips	*Section 5.6.8*
Hatch Properties	Section *0*

5.6.9.3 Hatch Boundary

Use the *Hatch Boundary* tool to draw a hatch pattern within an area specified by placing points.

To draw a hatch pattern using points to define a boundary:

1. Select *Draw|Hatch|Boundary*.
2. Select a hatch pattern and enter a scale and angle in the dialog. Click [OK].
3. Place points to define an imaginary irregular polygon that would enclose the hatch pattern.
4. Rubberbands are displayed connecting the cursor to the last point placed and to the first point placed. These lines provide a preview of the area to be hatched.
5. When finished defining the area to be hatched, select *Right-click|Done*.
6. Repeat Steps 3 to 5 as required

The defined area will be hatched.

Tips: *To draw a hatch boundary with specified lengths:*

- Select the hatch boundary from the Right-click menu, click to place the start point on the screen, and type in the length of one side. This number will appear on the status bar in the left-hand corner. Press <Enter> on the keyboard and proceed to enter the length of each side followed by pressing the <Enter> key. Note that the angle the user move the cursor from the first point, is the angle at which the side will continue at (see a= on the status bar).
- An angle can be set by following the required length of the side by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a side 30ft (m) at an angle of 180°).
- Alternatively type in coordinates to place the first, second and consecutive points (e.g., 30,40) then press the <Enter> key.

See also:

ArcTips	*Section 5.6.8*
Hatch Properties	Section *0*

5.6.9.4 Hatch Seed

Use the *Seed Hatch* tool to add a hatch to closed objects such as circles, polygons, connected single lines, etc. Closed objects located inside other closed objects remain unhatched.

To draw a hatch pattern within selected objects:

1. Select *Draw|Hatch|Seed*.
2. Select a hatch pattern and enter a scale and angle in the dialog. Click [OK].
3. Click inside the area to be hatched. Remember that the objects must be closed (sharing the same beginning and end point).
4. Repeat Step 3 as required.

The objects will be filled with the current hatch.

Tips: *If there are 100 or more objects on screen when the user selects Hatch|Seed, IRRICAD will not fill the object.*

If the user is not having success with Hatch|Seed, select both objects and use Hatch|Selection.

See also:

ArcTips	*Section 5.6.8*
Hatch Properties	*Section 0*

5.6.10 FILL

Fill is a tool that can be used to add a solid-color fill to objects.

A fill can be drawn on the screen by selecting one of the *Draw|Fill* options:

- Fill Selection
- Fill Boundary
- Fill Seed

In order for the fill to be drawn the "Display Fills" check box must be checked in *Settings|Drawing Items*.

This tool uses the current values of layer and color to draw the hatch. These values are set in *Settings|Drawing Items*.

See also:

Fill Selection	*Section 5.6.10.1*
Fill Boundary	*Section 5.6.10.2*
Fill Seed	*Section 5.6.10.3*
Geometric Properties	Section 5.10.5.1

5.6.10.1 Fill Selection

Use the *Fill Selection* tool to add a solid-color fill to selected closed objects such as circles, polygons, connected single lines, etc. Selected closed objects located inside other closed objects will also be filled.

To draw a solid fill within selected objects:

1. Select the objects the user wishes to fill. Remember that the objects must be closed (sharing the same beginning and end point).
2. Select *Draw|Fill|Selection*.

The selected objects will be filled with the current drawing color.

See also:

Fill Properties *Section 5.6.10*

5.6.10.2 Fill Boundary

Use the *Fill Boundary* tool to create a solid-color fill within boundaries defined by points that the user place. Fills are placed on the current drawing layer and filled with the current drawing color.

To fill an area using points to define the boundary:

1. Select *Draw|Fill|Boundary*.
2. Place points to define an imaginary, irregular polygon that encloses the fill. Rubberbands connect the cursor to the last point placed and to the first point placed. These lines provide a preview of the area to be filled.
3. When finished defining the area to be filled, select *Right-click|Done*.
4. Repeat Steps 2 and 3 as required.

The defined area will be filled.

Tips: *To draw a fill boundary with specified lengths:*

- Select the fill boundary from the Right-click menu, click to place the start point on the screen, and type in the length of one side. This number will appear on the status bar in the left-hand corner. Press <Enter> on the keyboard and proceed to enter the length of each side followed by pressing the <Enter> key. Note that the angle the user move the cursor from the first point, is the angle at which the side will continue at (see a= on the status bar).

- An angle can be set by following the required length of the side by a comma, a less than sign (<) and the angle required (e.g., 30,<180 will result in a side 30ft (m) at an angle of 180°).
- Alternatively type in coordinates to place the first, second and consecutive points (e.g., 30,40) then press the <Enter> key.

See also:

Fill Properties *Section 5.6.10*

5.6.10.3 FILL SEED

Use the *Seed Fill* tool to add a solid fill to closed objects such as circles, polygons, connected single lines, etc. Closed objects located inside other closed objects remain unfilled.

To draw a solid fill within selected objects:

1. Select *Draw|Fill|Seed*. Remember that the objects must be closed (sharing the same beginning and end point).
2. Click inside the area to be filled.
3. Repeat Step 2 as required.

The objects will be filled with the current drawing color.

Tips: If there are 100 or more objects on screen when the user selects Seed Fill, IRRICAD will not fill the object.

If the user is not having success with Fill|Seed, select both objects and use Fill|Selection.

See also:

Fill Properties *Section 5.6.10*

5.6.11 DIMENSION

Use *Dimension* tools when the user requires an exact measurement to be displayed.

Selecting one of the first five *Dimension* tools will bring up the *Dimension* Settings dialog.

Linear Dimension	Section 5.6.11.4
Angular Dimension	Section 5.6.11.5
Radial Dimension	Section 5.6.11.6
Diameter Dimension	Section 5.6.11.7
Ordinate Dimension	Section 5.6.11.8

Selecting either *Leader* or *Datum Dimension* tools will bring up the *Leader* / *Datum* Settings dialog.

Leader Dimension	Section 5.6.11.9
Datum Dimension	Section 5.6.11.10

Tip: *IRRICAD gives the user extensive control over the appearance and other properties of each part of a dimension. The user can set and edit these properties when selecting any of the Dimension command tools.*

5.6.11.1 Dimension Settings - Dimension

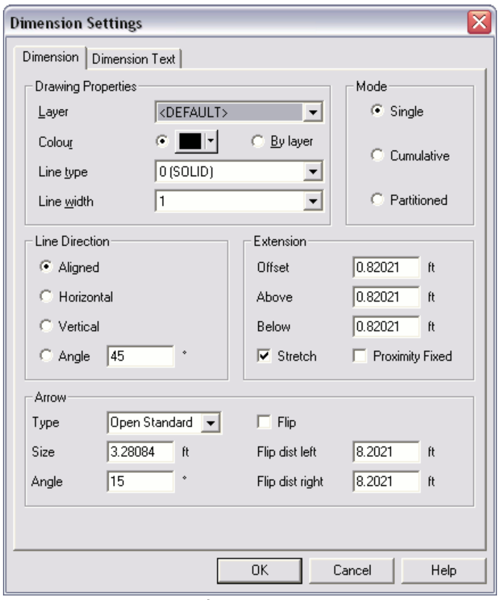


Figure 5-54

Drawing Properties

The drawing properties can be altered in the preferences.

Layer: Specifies the layer which the item will be placed. The <DEFAULT> layer for dimension items is DRAWING. Select a different layer from the dropdown list if required.

Color: Specifies the color of the displayed element. Select a new color from the color chart by clicking on the color edit box, or select the By Layer option to use the default layer color.

Line Type: Specifies the line type of the displayed element. Select a different line width from the dropdown list.

Line Width: Specifies the line width of the displayed element. Select a different line width from the dropdown list.

Mode

The options in this section determine whether dimensions are to be placed individually or in connected groups, and how grouped dimensions are related.

Single: Dimensions are placed one at a time, as individual entities. Once a single dimension is placed, the dimension command is completed.

Cumulative: Places a sequence of dimensions, each originating from the same point, or baseline.

Partitioned: Places a string or chain of connected dimensions, placed end-to-end. Dimension lines are co-linear for the entire chain.

Line Direction

The line direction is the orientation used when measuring a distance and drawing dimension lines. This direction is not necessarily aligned with the object being dimensioned. Measured distances on the object are projected onto the dimension direction. For example, the horizontal dimension of a line drawn at a 30^{o} angle represents the horizontal component of the true length of that line.

Horizontal: Sets the dimension direction to horizontal. Only the horizontal component of the selected object is measured.

Vertical: Sets the dimension direction to vertical. Only the vertical component of the selected object is measured.

Aligned: Sets the dimension direction to parallel the line selected (or aligned with the points placed). Aligned dimensions always represent the true length of the selected line (or distance between the placed points).

Angle: Sets the degree at which to slant an angled dimension line.

<u>Note:</u> *A horizontal dimension is equivalent to a 0º dimension, and a vertical dimension is equivalent to a 90 º dimension.*

Extension

Extension lines, also called witness lines, visually connect the dimensioned object to the dimension line. They are always drawn perpendicular to (and usually beyond) the dimension line. IRRICAD allows extension lines to be configured as follows:

Offset: Adjusts the space between the drawing object and the end of the extension lines.

Above: Adjusts the distance that the extension line extends past the dimension line and away from the drawing object.

Below: When Stretch is unchecked, adjusts the distance the extension line extends beyond the dimension line and toward the drawing object.

Stretch: When checked, the extension lines stretch to reach the drawing object (minus the Offset distance). When unchecked, the Offset setting is ignored, and the extension lines follow the setting of the Below distance.

Proximity Fixed: Places the dimension line at a fixed distance (Offset plus Below) from the drawing object.

When "Proximity Fixed" is off, the user can place the dimension line at any distance away from the dimensioned object. This means that either the **Offset** distance or the **Below** distance must give. If "Stretch" is checked, the **Below** section of the extension line will Stretch to fill the gap between the **Offset** distance and the dimension line. If "Stretch" is unchecked, the **Below** distance will remain constant and the **Offset** distance will give to fill the gap.

Arrow

These options determine the type and angle of arrowheads that will terminate the ends of each dimension line. If terminators are added to the lines, the user can end lines with arrowheads, circles, or slashes.

Type:	Lists the types of arrowhead to place at the end of the leader.
Size:	Sets the length of the arrow, slash, or radius of circle in real-world drawing units.
Angle:	Adjusts the shape of the arrowhead or the angle of the slash.
Flip:	Flips the dimension line so that the arrows point inward. Use this option when the extension lines interfere with the dimension text.
Flip Dist Left:	Sets the length of the left dimension line segment when arrowheads are reversed by checking the Flip box (see above). The left and right sides of dimension lines correspond to the view of the dimension if it were to be rotated so that aligned dimension text would be horizontal.
Flip Dist Right:	Sets the length of the right dimension line segment when arrowheads are reversed by checking the "Flip" box. The left and right sides of dimension lines correspond to the view of the dimension if it were to be rotated so that aligned dimension text would be horizontal.

5.6.11.2 Dimension Settings - Dimension Text

Tolerance

Tolerances specify allowable variations in dimensions, and are often used in high-precision work. IRRICAD lets the user specify and display tolerances.

Type:	None. Turns off tolerance display.
Stacked:	Tolerance is displayed in stacked-type format, showing measured distance, followed by allowable oversize tolerance stacked on top of allowable undersize tolerance.
Fixed:	The measured distance is shown, followed by the tolerance value. Only a single tolerance distance is allowed - the +ve and -ve tolerances are identical.

Min / Max: Shows the maximum allowable distance stacked on top of the minimum allowable distance. Measured distance is not shown.

Lower: Sets the maximum distance permitted for a dimension to be under the specified value measured by IRRICAD.

Upper: Sets the maximum distance permitted for a dimension to be over the specified value measured by IRRICAD.

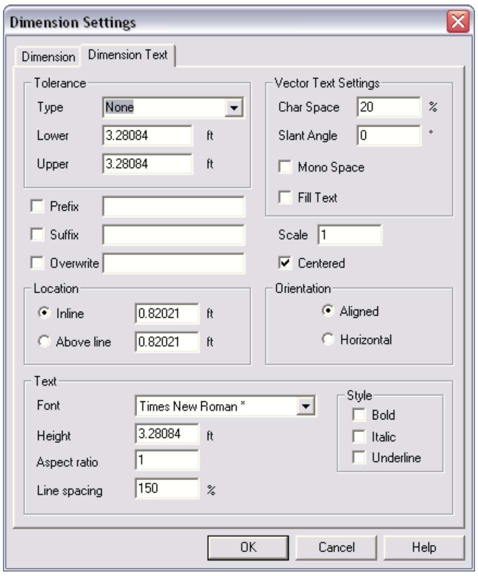


Figure 5-55

Vector Settings

Char Space: Specifies the spacing between characters of a text line as a percentage of the character size. The default is 20%. This option only applies to vector text.

Slant Angle: Specifies the angle at which vector text is slanted to emulate italics. The angle must be between -45º and 45º. This option only applies to vector text.

Mono Space: When checked, all characters are the same width. When unchecked, wide characters (M and W) take up more space than narrow characters (I and L).

Fill Text: When checked, characters are solid filled. When unchecked, characters are displayed in outline, making both redrawing and printing faster.

Prefix, Suffix and Overwrite

Normally, the text in a dimension is calculated automatically by IRRICAD. The Prefix / Suffix options let the user add a custom prefix and / or suffix to the angle or distance that IRRICAD calculates, without losing the associative property of the dimension. The box also includes an Overwrite control that lets the user completely replace the text that IRRICAD calculates for the dimension.

Prefix: When checked, the text in the adjacent text box is displayed before the distance or angle text calculated by IRRICAD. Be sure to add a space or other appropriate characters after the prefix text to separate the prefix and the calculated text.

Suffix: When checked, the text in the adjacent text box is displayed after the distance or angle text calculated by IRRICAD but before the tolerance. Be sure to add a space or other appropriate characters before the suffix text to separate the calculated text and the suffix.

Overwrite: Checking this box replaces the calculated dimension text with text that the user types in the adjacent text box.

Scale

Sets the real-world size of dimension text in current drawing units.

Centered

When checked, dimension text is placed at the midpoint of the dimension line, regardless of the orientation or mode chosen above. When unchecked, the user positions the dimension text by moving the cursor to position the line. Thus, for the first dimension in a chain, the user will simultaneously position both the dimension line and the dimension text.

Location

In Line: Dimension text is inserted and centered in a break in the dimension line. The gap from the dimension line to the dimension text is the Offset distance defined above. Can be used whether Horizontal or Aligned dimension text option is chosen.

Above: Specifies that dimension text is placed parallel to and offset from the dimension line. Automatically sets dimension text to Aligned mode.

Orientation

Horizontal: Specifies that dimension text is horizontal regardless of orientation of the dimension line. Applies only if dimension text placement is set to the In Line Dist option (see description below).

Aligned: Specifies that dimension text will always be oriented parallel to the dimension line. This option is set automatically if the dimension text relationship to the dimension line is set to the Above option (see description below).

Dimension Text

These options let the user set the font and size of dimension text, and its orientation with respect to the dimension line. The dimension text is set in the Dimension Font box in the Dimension Text tab.

Font: Sets the font used for dimension text.

Height: Specifies the size (height) of text characters in the current drawing unit. The height of the text is measured in real-world scale.

Aspect Ratio: Adjusts the height-to-width ratio of characters in text blocks created using a vector font. For example, with a text height of 1 and an aspect of 2, the text character will be twice as wide as it is tall.

Bold: Specifies bold type when checked. This option applies only to TrueType text.

Italic: Specifies italic type when checked. This option applies only to TrueType text.

Underline: Specifies underlined type when checked. This option applies only to TrueType text.

Line Spacing %: Sets the spacing (as a percentage of one line height) between lines of text for stacked tolerance display.

5.6.11.3 Leader / Datum Settings

This dialog appears when the Leader or Datum Dimension options are selected (*Draw|Dimension|…*).

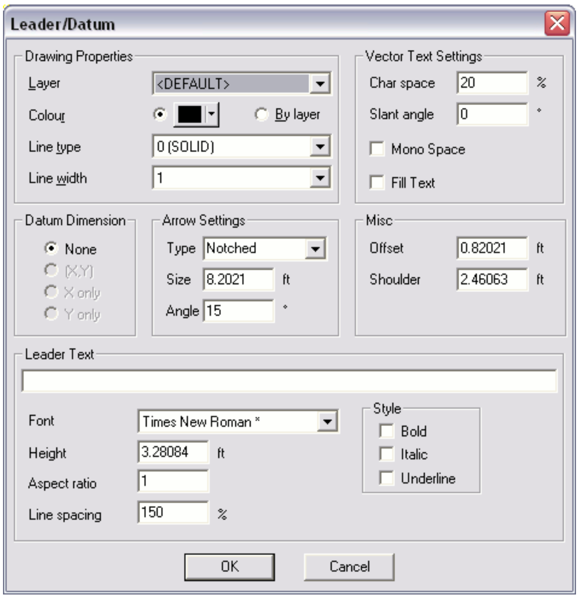


Figure 5-56

Drawing Properties

The drawing properties can be altered to the preferences.

Layer: Specifies the layer which the item will be placed. The <DEFAULT> layer for dimension items is DRAWING. Select a different layer from the dropdown list if required.

Color: Specifies the color of the display element. Select a new color from the color chart by clicking on the color edit box, or select the By Layer option to use the default layer color.

Line Width:	Specifies the line width of the display element. Select a different line width from the dropdown list.
Line Type:	Specifies the line type of the display element. Select a different line width from the dropdown list.

Vector Text Settings

Char Space:	Specifies the spacing between characters of a text line as a percentage of the character size. The default is 20%. This option only applies to vector text.
Slant Angle:	Specifies the angle at which vector text is slanted to emulate italics. The angle must be between -45° and 45°. This option only applies to vector text.
Mono Space:	When checked, all characters are the same width. When unchecked, wide characters (M and W) take up more space than narrow characters (I and L).
Fill Text:	When checked, characters are solid filled. When unchecked, characters are displayed in outline, making both redrawing and printing faster.

Text Edit Box

Enter the text the user wishes to be placed with the Leader or Datum dimension as applicable.

Datum Dimension

Datum Dimension options set the datum dimension style to display X values, Y values, or both.

Offset

Sets the distance between the tail end of the leader shoulder, and the leader text.

Shoulder

Adjusts the size of the leader tail's horizontal segment that is nearest the text.

Arrow Settings

These options determine the type and angle of arrowheads that will terminate the ends of each dimension line. If terminators are added to the lines, the user can end lines with arrowheads, circles, or slashes.

Type:	Lists the types of arrowhead to place at the end of the leader.
Size:	Sets the length of the arrow, slash, or radius of circle in real-world drawing units.
Angle:	Adjusts the shape of the arrowhead or the angle of the slash.

Leader Text

These options let the user set the font and size of dimension text, and its orientation with respect to the dimension line. The dimension text is set in the Dimension Font box in the Dimension Text tab.

Font:	Sets the font used for dimension text.
Height:	Specifies the size (height) of text characters in the current drawing unit. The height of the text is measured in real-world scale.
Aspect Ratio:	Adjusts the height-to-width ratio of characters in text blocks created using a vector font. For example, with a text height of 1 and an aspect of 2, the text character will be twice as wide as it is tall.
Bold:	Specifies bold type when checked. This option applies only to TrueType text.
Italic:	Specifies italic type when checked. This option applies only to TrueType text.
Underline:	Specifies underlined type when checked. This option applies only to TrueType text.
Line Spacing %:	Sets the spacing (as a percentage of one line height) between lines of text for stacked tolerance display.

5.6.11.4 LINEAR DIMENSION

Use the *Linear Dimension* tool to display a length. Typically, linear dimensions are used to show the length of an object, but they can also show the distance between objects, or any other distance. Once placed, a linear dimension is associative - if the dimensioned items are moved, Stretched or re-scaled, the associated dimension is updated automatically.

To place a linear dimension:

1. Select *Draw|Dimension|Linear*. Edit the dialog as required (see Dimension Settings - Dimension, Section 5.6.11.1). Click [OK].
2. Place the starting point for the dimension. IRRICAD will locate each endpoint, and start the linear dimension. The first point should be placed precisely, since it will be the basis for the first distance measurement. The first point can be positioned via *Snaps*, especially if for "Partitioned" or "Cumulative" modes
3. Place the ending point for the first dimension. As the user moves the cursor, a dynamic preview of the dimension now appears, constrained to move perpendicular to the dimension direction. The user can place the dimension on either side of the line being measured. Depending on the settings for "Proximity Fixed" and "Extension Stretch", the user may or may not be able to freely drag the dimension preview (within its constraints). The extension lines may Stretch as required to maintain the specified extension offset, or they may remain constant in length, allowing the offset distance to vary.
4. Move the dimension line to the required location away from the dimensioned object, and place a point to set the dimension line. For single dimensions, this step completes the tool. For "Partitioned" dimensions, this point sets the first dimension line and establishes the starting point and offset for the next dimension line (so the user will not need to place the dimension line for subsequent dimensions). For "Cumulative" and "Partitioned" dimensions, place subsequent points to create each new dimension.
5. Select *Right-click|Done* or double-click to complete the tool.

See also:

Dimension Settings - Dimension	*Section 5.6.11.1*
Dimension Settings - Dimension Text	*Section 5.6.11.2*
Snaps	*Section 5.1.3*

5.6.11.5 Angular Dimension

Use the *Angular Dimension* tool to measure any angle in the drawing by first identifying a vertex and then a point on each ray. For every angle, a choice of dimensioning either the inside or the outside measurement is available. Once placed, angular dimensions are associative. This means that if the dimensioned angle changes, the associated angular dimension will be updated automatically.

To place an angular dimension:

1. Select *Draw|Dimension|Angular*. Edit the dialog as required (see Dimension Settings - Dimension, Section 5.6.11.1). Click [OK].
2. Place a vertex for the angle, snapping to a point on the object the user is dimensioning.
3. If the user is dimensioning the angle spanned by an arc, click the arc. IRRICAD will find the end-points and determine the angle (if this is the case, the user can skip to step 5).
4. Place a second point to identify the first ray of the angle.
5. Place a third point to identify the second ray of the angle.
6. Drag the mouse to choose the smaller or larger angle.
7. A dynamic preview of the angle dimension will now appear.
8. Drag the preview dimension to the required location and place a point to position the dimension.

Tip: *The text is always placed horizontally in angular dimensions.*

See also:

Dimension Settings - Dimension	*Section 5.6.11.1*
Dimension Settings - Dimension Text	*Section 5.6.11.2*
Snaps	*Section 5.1.3*

5.6.11.6 Radial Dimension

Use the *Radial Dimension* tool to measure the radius of a circle or arc. Once placed, a radial dimension is associative: if the dimensioned items are Stretched or re-scaled, the associated dimension will be updated automatically.

To place a radial dimension:

1. Select *Draw|Dimension|Radial*. Edit the dialog as required (see Dimension Settings - Dimension, Section 5.6.11.1). Click [OK].
2. Click the circle or arc the user are dimensioning.
3. A preview of the dimension appears along a path, which passes through the object's center point and the cursor. The dimension line rotates as necessary to stay aligned with the cursor and the dimension arrow points outward toward the circle perimeter

when the cursor is inside the circle and inward toward the circle when the cursor is outside the circle.

4. Drag the dimension to the required position then click to set the radial dimension.

See also:

Dimension Settings - Dimension	*Section 5.6.11.1*
Dimension Settings - Dimension Text	*Section 5.6.11.2*
Snaps	*Section 5.1.3*

5.6.11.7 Diameter Dimension

Use the *Diameter Dimension* tool to measure the diameter of a circle or arc. Once placed, a diameter dimension is associative; if the dimensioned items are Stretched or re-scaled, the associated dimension will be updated automatically.

To place a diameter dimension:

1. Select *Draw|Dimension|Diameter*. Edit the dialog as required (see Dimension Settings - Dimension, Section 5.6.11.1). Click [OK].
2. Click the circle or arc the user are measuring.
3. A preview of the dimension appears along a path, which passes through the object's center point and the cursor. The dimension line rotates as necessary to stay aligned with the cursor, and the dimension arrows point outward toward the circle perimeter when the cursor is inside the circle and inward toward the circle when the cursor is outside the circle.
4. Drag the dimension to the required position, and then click to set the diameter dimension.

See also:

Dimension Settings - Dimension	*Section 5.6.11.1*
Dimension Settings - Dimension Text	*Section 5.6.11.2*
Snaps	*Section 5.1.3*

5.6.11.8 Ordinate Dimension

Ordinate dimensions allow the user to place a series of dimensions based on a point the user specifies on the drawing.

1. Select *Draw|Dimension|Ordinate*. Edit the dialog as required (see Dimension Settings - Dimension, Section 5.6.11.1). Click [OK].
2. Click a base point from which to measure the dimensions.
3. Click a point that describes the positive axis of the measurements.
4. Click where the user want to locate the dimension lines.
5. Click the points that the user want to dimension. When done, select *Right-click|Done*.

See also:

Dimension Settings - Dimension	*Section 5.6.11.1*
Dimension Settings - Dimension Text	*Section 5.6.11.2*
Snaps	*Section 5.1.3*

5.6.11.9 Leader Dimension

Leaders (or call-outs) are notes that identify or call attention to objects or areas in the drawing. A multi-segmented, arrowhead-tipped line connects the object to a block of text.

To place a leader:

1. Select *Draw|Dimension|Leader*. Edit the dialog as required (see Leader / Datum Settings, Section 5.6.11.3). Type the leader text in the empty box in the dialog box screen. Click [OK].
2. Click to set the tip of the arrowhead. An arrowhead-tipped rubberband will appear between the first point and the cursor location.
3. Place additional points to set segments of the leader line. By placing multiple segments, the user can make the leader line bend around objects in the drawing. Remember that the final segment or shoulder will be drawn automatically to connect the leader lines to the text block
4. When finished drawing the leader line segments, select *Right-click|Done*. Do not press <Esc> as this will cancel the tool.
5. Click at a point to show which side of the leader line the user wants the text to appear, as prompted on the Status bar. A bounding box appears next to the leader shoulder in the drawing. This box indicates the position of the leader text, although the user will later be able to shift it to either side of the leader shoulder. The leader text will appear next to the leader

shoulder. As the user moves the cursor to the left or right, the leader text will flip to the opposite side of the shoulder.

6. Click to place the leader text.

See also:

Leader / Datum Settings	*Section 5.6.11.3*
Snaps	*Section 5.1.3*

5.6.11.10 Datum Dimension

Use Datum dimensioning to place a leader containing the absolute X, Y or XY value of a chosen point.

1. Select *Draw|Dimension|Datum*.
2. Edit the dialog as required (see Leader / Datum Settings, Section 5.6.11.3). Click [OK].
3. Click the point to dimension.
4. Click additional points to draw the leader. Select *Right-click|Done* to complete the leader line.
5. Click to position the datum text.

See also:

Leader / Datum Settings	*Section 5.6.11.3*
Snaps	*Section 5.1.3*

5.6.12 Symbol

Symbols are collections of objects that are grouped together, named, saved, and treated as a single object. The user can insert them repeatedly in the same drawing, or save them on disk for use in future designs. This saves the user the time that would be necessary to draw the same objects over and over.

To place symbols accurately in a design, the user should be familiar with IRRICAD's coordinate entry and point placement tools. In general, the user works with symbols in IRRICAD as described in the following list. For more information, see the descriptions of the specific tools.

To place a symbol in the design:

1. Select *Draw|Symbol*.
2. Edit the dialog as required. Click [OK].

3. Place the symbol in the design.
4. Repeat Step 3 as required.

5.6.12.1 Symbol Dialog

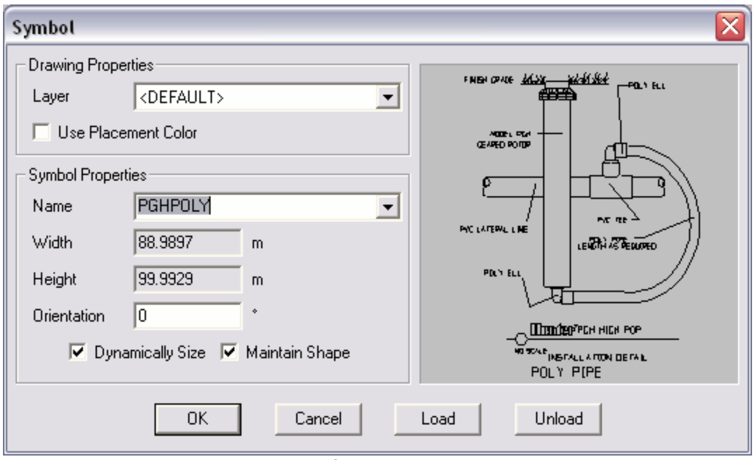


Figure 5-57

Layer: The layer the symbol will be stored in. The <DEFAULT> layer is DRAWING_SYMBOLS.

Use Placement Color: Check to draw the symbol in the current drawing color. Leave unchecked to draw the symbol in its definition color i.e., the color is was when created.

Name: The name of the currently selected symbol. Symbols available in the dropdown list have been previously loaded (see Load Symbol, Section 5.6.12.2).

Width: The width of the symbol in the defined units.

Height: The height of the symbol in the defined units.

Orientation: The orientation (rotation) of the symbol.

Dynamically Size: Check to drag the symbol to any size using a rubberband rectangle. Uncheck to enter a size.

Maintain Shape: Check to maintain a ratio of the width and height at which the symbol was created. Uncheck to Stretch or squash the symbol in one direction.

Tips: *The user can replace all instances of one symbol in the drawing with another by lassoing the items and choosing Modify|Change Type.*

The user can create a symbol in the drawing by highlighting (selecting) the existing entities to be included in the symbol and then selecting Tools|Create Symbol. This also saves the named symbol to a file for use in other designs.

The user can divide a symbol into its individual component entities by first selecting it, and then selecting Modify|Explode.

5.6.12.2 Load Symbol

Before a symbol can be used in a design its definition must first be loaded. The names of the loaded symbols appear in the dropdown list of Names in the symbol dialog.

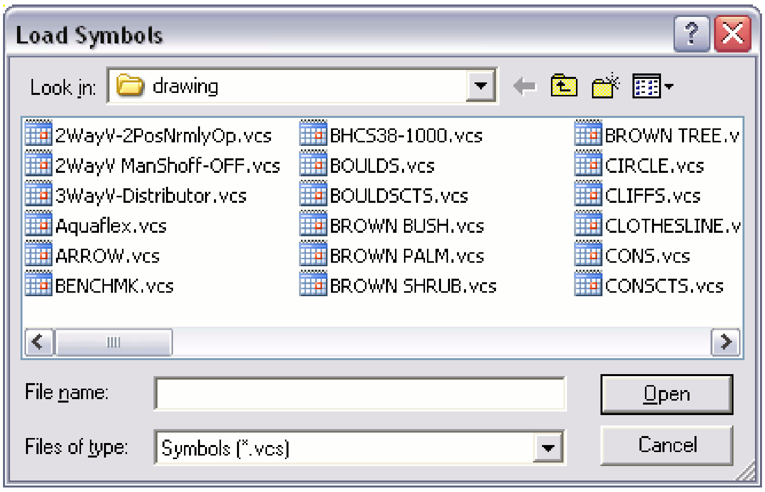


Figure 5-58

To load symbols:

1. Click [Load].
2. In the Open dialog box, select one or more symbol files to be loaded into the design. The user can browse for .vcs symbol files in other directories such as symbols\database, to load database symbols.
3. Click [Open].

The selected symbols will be loaded ready for use.

Tips: *The user may need to check the "Placement Color" check box in the dialog if the symbol has been created in white.*

The user can load more than one symbol at a time by holding down the <Shift> or <Ctrl> key on the keyboard.

5.6.12.3 Unload Symbol

Symbols which are unused i.e., which are loaded but not placed in the design, may be unloaded. This is useful when there are a large number of symbols in the dropdown list.

To unload symbols:

1. Click [Unload].
2. Select the symbols to unload.
3. Click [OK].

Note: *If the user tries to unload a symbol that is used in the design, IRRICAD will display a message and the symbol will not be unloaded.*

5.6.13 Text

This tool allows the user to place text on the screen.

To place text on the screen:

1. Select *Draw|Text*.
2. Type in the required text or label.
3. Edit the dialog as required. Click [OK].
4. Place the text where required on the design. The box displayed is approximately the size of the text entered.
5. Repeat Step 4 as required.

True type text is shown by the presence of a star to the right of the font name.

5.6.13.1 TEXT DIALOG

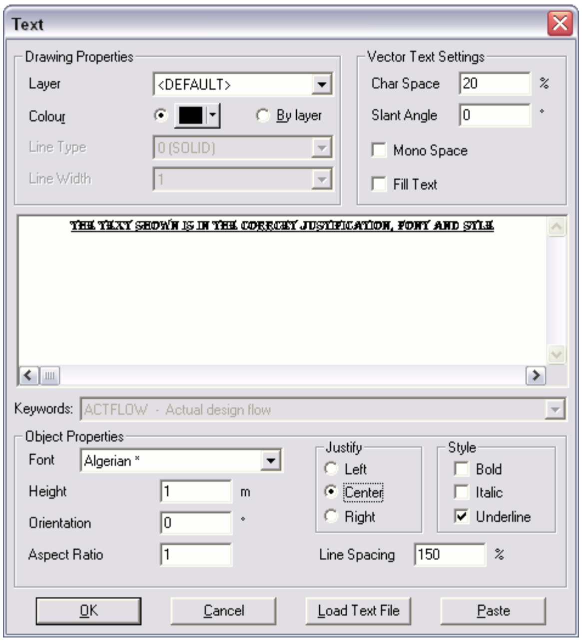


Figure 5-59

Layer: Specifies the layer in which the item will be placed. The <DEFAULT> layer for text items is TEXT. Select a different layer from the dropdown list if required.

Color: Specifies the color of the text. Select a new color from the color chart by clicking on the color edit box, or select the By Layer option to use the default layer color.

Line Width: Specifies the line width of the display element. Select a different line width from the dropdown list.

Line Type: Specifies the line type of the text. Select a different line type from the dropdown list.

Char Space: Specifies the spacing between characters of a text line as a percentage of the character size. The default is 20%. This option only applies to vector text.

Slant Angle: Specifies the angle at which vector text is slanted to emulate italics. The angle must be

	between -45° and 45°. This option only applies to vector text.
Mono Space:	When checked, all characters are the same width. When unchecked, wide characters (M and W) take up more space than narrow characters (I and L).
Fill Text:	When checked, characters are solid filled. When unchecked, characters are displayed in outline, making both redrawing and printing faster.
Font:	Sets the font used for attributes. Special font formatting, such as bold, italics and underline type styles, are not available for attributes. IRRICAD can use either Windows TrueType fonts or vector fonts. TrueType text tends to be more aesthetically pleasing and to redraw faster than vector fonts. TrueType fonts, however, are not as accurate as vector fonts and can present problems for some vector output devices such as HP-GL plotters.
Height:	Specifies the size (height) of text characters in the current drawing unit. The height of the text is measured in real-world scale.
Orientation:	Specifies the orientation of text from 0° to 360°. Orientation is counter-clockwise. This field is non-editable when placing text. The orientation of the text can be altered when the text is selected and using *Modify|Change*, typing in the required text orientation.
Aspect Ratio:	Adjusts the height-to-width ratio of characters in text blocks created using a vector font. For example, with a text height of 1 and an aspect of 2, the text character will be twice as wide as it is tall.
Justify:	Determines text justification. Text can be justified left, justified right, or centered horizontally relative to the placement point.
Bold:	Specifies bold type when checked. This option applies only to TrueType text.
Italic:	Specifies italic type when checked. This option applies only to TrueType text.
Underline:	Specifies underlined type when checked. This option applies only to TrueType text.

Line Spacing: Specifies the spacing between lines as a percentage of the font size. This is measured from the reference point of the first line to the reference point of the second line. For example, using a font height of 2 and line spacing of 200%, the distance between the lines would be 4.

Load ASCII: Loads text from a file into a text box.

Paste: Pastes text previously copied to the clipboard into the text box.

5.6.14 PLOT LAYOUT

A plot layout is usually placed on the completed design just prior to printing. The layout will place a border around the design, supply details such as designer, client, date, company logo etc., and supply a legend for the pipes and other hydraulic items present in the design.

To place a plot layout on the screen:

1. Zoom in or out as required so that the part of the design (or whole design) to be printed is visible on the screen.
2. Select *Draw|Plot Layout*.
3. Edit the dialog as required. Use the [Calculate] button to determine an appropriate scale if unknown (the scale is calculated on the current zoom). Click [OK].
4. The plot layout will be created at the specified scale and the zoom state will be altered so the complete plot layout and required part of the design can be seen on the screen.
5. Use *Modify|Move* to move the layout if required.
6. Now select *File|Print*.
7. Do not change anything in the print dialog, as IRRICAD has set the print page based on the options in the *Draw|Plot Layout* dialog. Simply click [Print].

Tips: *Scale Calculate: Clicking the [Calculate] button will automatically select a scale suitable for the current zoom state; this scale can be overridden by simply typing in a different scale.*

Keep Fills: Check this option if the generated plot layout should retain any fills in the template. The user will need to do this if printing only a portion of the plan where the plot layout overlaps the design so that the parts of the design underneath the plot *layout are not visible. Do NOT check this option if "All Colors to Black" option has been selected, or using File|Direct Plot to plot the plan, since the fills will be printed in black or whatever plotter pen color has been assigned to the color white. In the standard plotting templates for this version, fills have been added around the edges of the border and under title blocks.*

5.6.14.1 Plot Layout Dialog

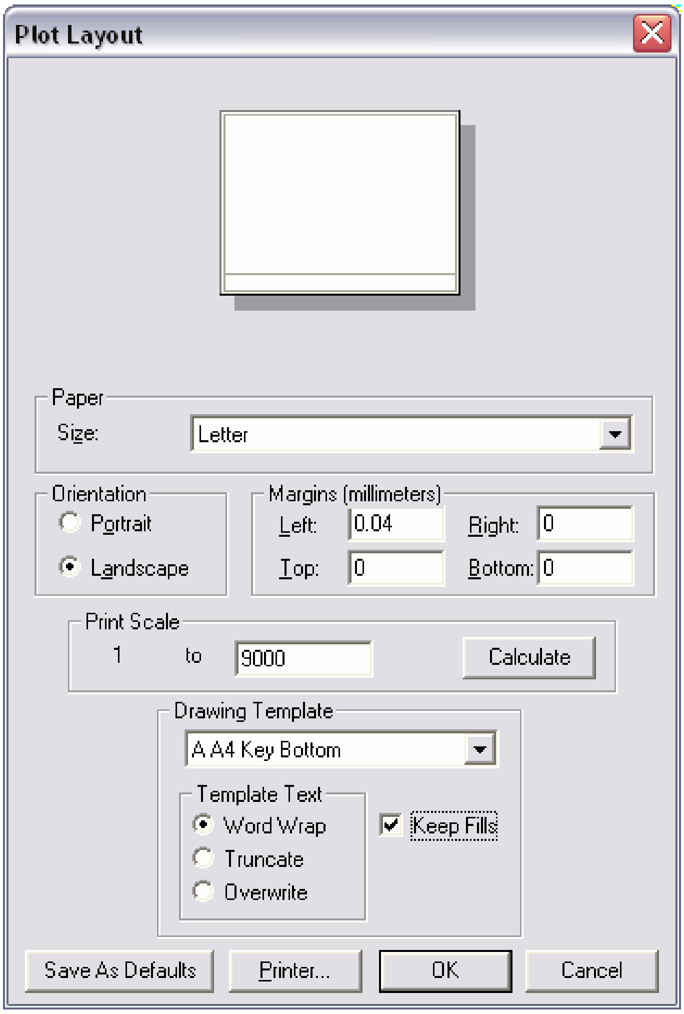


Figure 5-60

Paper Size:	Shows the dimensions of the currently selected paper. To change the page size, click the down arrow and select another paper size supported by the selected printer.
Orientation:	Select the paper orientation Portrait for vertical or Landscape for horizontal orientation.
Margins:	Shows the current margin values. Type 0 to get the minimum default margins for the printer selected.
Print Scale:	The required scale to print the drawing to.
Calculate:	IRRICAD will calculate a scale based on the current zoom.
Drawing Template:	The template file used to create the plot layout.
Template Text:	Specifies the option selected for the title block text. Word wrap will create subsequent lines if the text is longer than the title block. Truncate will cut off additional text once the border is reached. Overwrite will print the text beyond the border of the plot layout.
Keep Fills:	Creates the plot layout with white fills around the border and under the title block area. Used if printing a section of the design.
Save As Defaults:	Saves the currently selected printer, set margins and template as the default. The default will be loaded each time *Draw|Plot Layout* is selected.
Printer:	Select the printer and printer properties required.

See also:

Convert Plot Layouts *Section 5.3.14.4*
Print *Section 5.3.16*

5.6.15 MANAGEMENT SYMBOL

The graphical management process automatically creates a symbol, representing the current management arrangement, which can be subsequently drawn onto the plan.

A symbol dialog is displayed and contains the normal symbol placement and creation options.

The *Management Symbol* menu item is disabled when unavailable (before Management has been completed).

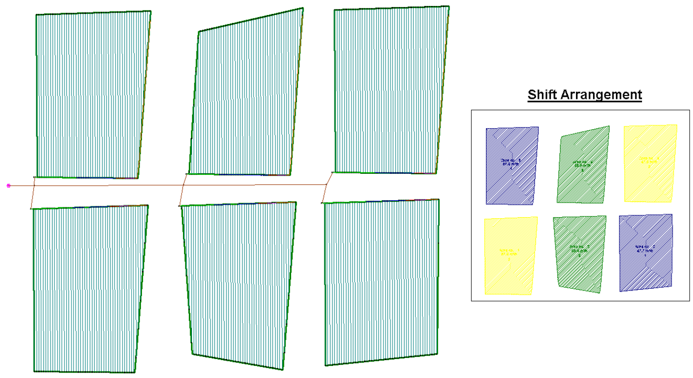


Figure 5-61

To place a Management Symbol:

1. Complete a Management option (e.g., *Design|Assign…*).
2. Select *Draw|Management Symbol*.
3. Select the required option and click [OK].
4. If "Dynamically Size" and "Maintain Shape" are checked, simply draw out the required size of the symbol by placing the top left corner (click on the screen) and the bottom right corner (click on the screen).

Note: If the Management has changed, the symbol will automatically be updated.

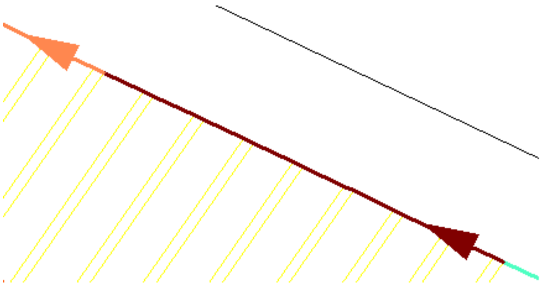
5.6.16 PIPE REDUCTIONS

Pipe reduction symbols can be automatically placed on the design to show the location, and direction, of changes in pipe size.

To place the symbols on the plan:

1. Select *Draw|Pipe Reductions*.
2. Select the type of item or items to be labelled with pipe reduction symbols.
3. Click the [OK] button.

The items which are labeled with pipe reduction symbols can also be controlled by using *Select* tools. Both pipe sizes need to be selected for the smaller pipe to be labelled with the pipe reduction symbol. If no items are selected, then all items of the types specified in the "Tool Options" will be labeled (i.e. this is equivalent to a *Select All*).



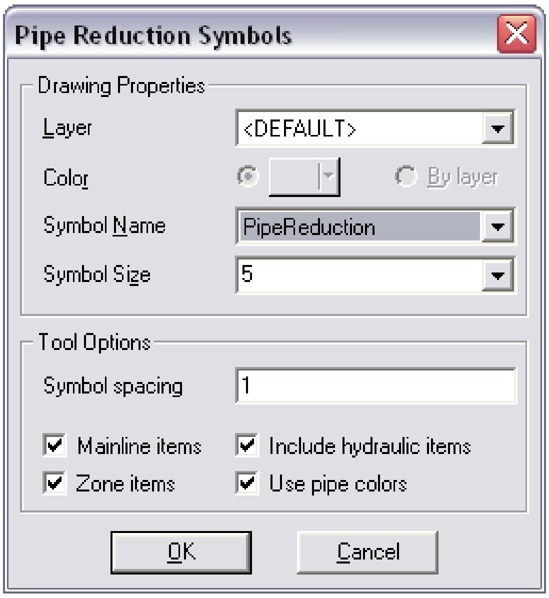


Figure 5-62

Drawing Properties

Layer: The default layer is IRRICAD.

Symbol Name: The default symbol is **PipeReduction** but can be replaced by any other symbol.

Symbol Size: The default symbol size is **5**.

Tool Options

Symbol Spacing: The spacing in 'symbol size' from the junction i.e **1** is the same length as the symbol itself at the current "Base Database Symbol Size": if the symbol measures 2m in length on the plan, then the symbol will be placed 2m from the junction at symbol size **1**.

Mainline items: Check this option to place reduction symbols on Mainline items.

Zone items: Check this option to place reduction symbols on Zone items.

Include hydraulic items: Any reduction occurring at a valve, pump or other hydraulic item will not produce a reduction symbol unless this option is checked.

Use pipe colours: When checked, the reduction symbols will be the same colour as the smaller pipe. When unchecked all reduction symbols will be black.

5.6.17 TREE BLOCK

Enables the creation of grids of tree symbols with specified tree and row spacings. The Tree properties can be modified after construction. The tree symbols can be moved independently, within the block, or all moved as a unit by selecting and moving the block boundary.

An existing closed polygon or curve can be converted to a Tree Block by highlighting and selecting *Draw|Tree Block*. Imported or an array of symbols can be specified as a Tree Block.

5.6.17.1 TO CREATE A TREE BLOCK

1. Select an existing boundary.
2. Select *Draw|Tree Block*.
3. Specify the Tree Properties and Block Properties in the dialog. Click [OK].
4. If **User Defined** "Tree Row Direction" was selected place the start and end point for a representative row of trees. Note if the **Automatic** "Tree Row Direction" is selected the first row of tree symbols will be aligned with the first block boundary drawn.

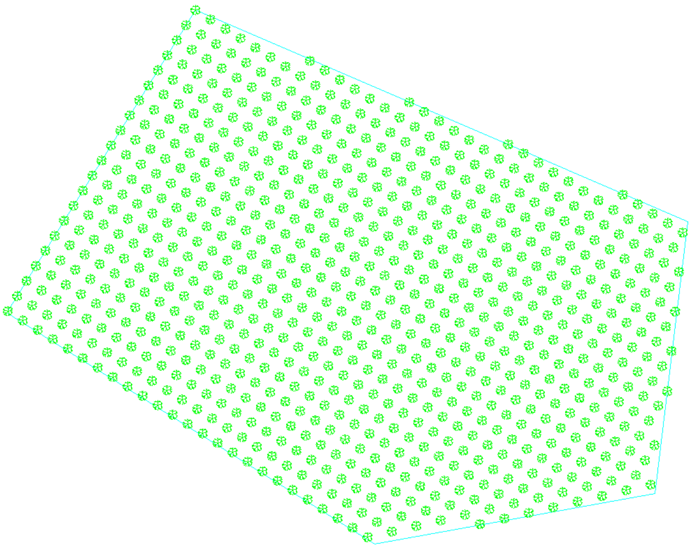


Figure 5-63

5.6.17.2 To Modify a Tree Block

1. Use *Change* on the tree block boundary.
2. In the dialog make changes as required.
3. Click [OK].

5.6.17.3 To Create a Tree Block from an Existing Array of Symbols/Items

1. Have an existing array of symbols or items on the screen.
2. Go to *Draw|Tree Block*.
3. In Tree Properties enable **Select** as the "Tree type". Click [OK].
4. Draw a lasso around the extents of the collection of symbols/items. Close the lasso by clicking on the start point or by selecting *Right-click|Close*.
5. Click on one of the symbols/items that represent the trees.
6. Specify the row direction by clicking two representative points that depict the alignment.

The tree block has now been specified.

7. Repeat steps 4 to 6 on a new set of symbols/items as required.

8. To finish the tool go to *Select Object* mode (or press the <Esc> key twice).

5.6.17.4 TREE BLOCK DIALOG

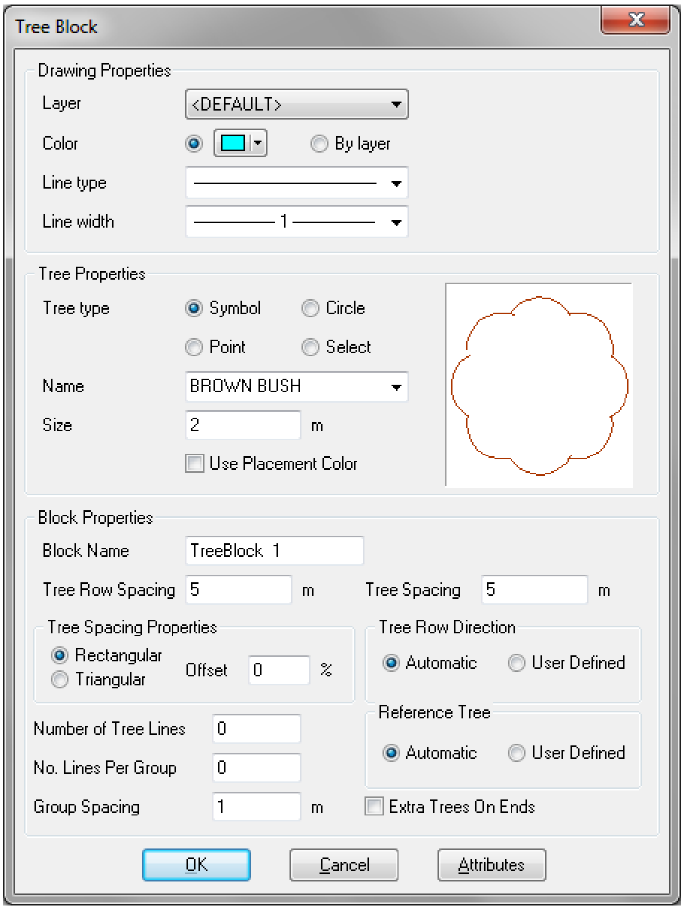


Figure 5-64

Drawing Properties

Layer: The layer field setting applies to the tree block boundary only. The <DEFAULT> is DRAWING.

Color: The color of the tree block boundary.

Line Type: The line type for the tree block boundary.

Line Width: The line width for the tree block boundary.

Tree Properties

Tree Type: The 'tree type' can be displayed as a **Symbol** of the user's choice: a **Circle**, a **Point**, or existing items can be specified with the **Select** option.
Symbol - a tree/shrub/bush symbol to be used for the 'trees'.
Circle - an open circle will be placed at the tree positions in the current drawing color.
Point - a point will be placed at the tree positions in the current drawing color.
Select - an option for use with imported or pre-drawn tree positions to be converted into *Tree Block*.

Name: The pre-loaded symbol name. Used with the **Symbol** "Tree Type" option.

Size: The required symbol size. Used with the **Symbol** "Tree Type" and "Circle" options.

Use Placement Color: The symbol placement color. When enabled the symbols will use the current drawing color rather than the symbol definition color. Used with the **Symbol** "Tree Type" option.

Notes:*The tree symbols are automatically placed on the DRAWING_SYMBOLS layer. This can subsequently be manually changed using the* Change Type *tool.*

Additional symbols can be loaded via Draw|Symbol [Load Symbol] *prior to starting the* Tree Block *tool.*

Block Properties

Block Name: The name of the block.

Tree Row Spacing: The spacing between tree rows within the block. If the **Select** "Tree Type" is used this spacing is nominal only.

Tree Spacing: The spacing between trees along a row. If the **Select** "Tree Type" is used this spacing is nominal only.

Tree Spacing Properties: The type of pattern that the trees are placed in.
Rectangular - Rectangular tree configuration in the block.
Triangular - Triangular tree configuration in the block.

Offset - The distance of the first tree from the start of the row.

Tree Row Direction: Determines the row direction. All other rows are placed relative to this, based on the row spacing. It can be **User Defined** where the user specifies the position and alignment of a row, or **Automatic** where the row direction is aligned with either the first boundary drawn or a selected block side.

Number of Tree Rows: The number of rows to be inserted in the block when a specific number of rows is required. If left at zero IRRICAD will fill the area defined by the block boundaries.

No. Rows per Group: If greater than zero, the number of rows in each group. If this field is set at zero then the "Group Spacing" field will be disabled and all rows will be spaced identically.

Group Spacing: The spacing between groups of rows (which will be spaced at the tree row spacing).

Reference Tree: Determines a precise tree position. All other trees are placed relative to this position based on the tree spacing. This can be **User Defined** where the user specifies the tree location or **Automatic** where the first tree is placed on the first row relative to the Offset.

Extra Trees on Ends: When enabled extra trees will be placed on the ends of the tree rows if the distance from the last tree to the end of the row is 45% of the tree spacing or greater.

User Attributes

The [Attributes] button allows the user to attach any extra information to these items and can subsequently be used in labels and reports.

> Note*: If making changes to the Tree Block after creation the "Tree Row Direction" and "Reference Tree" fields will be disabled. Enable the "Change" option to make any required changes.*

5.6.18 CONTOUR

Contours are used to enter topographic information.

To draw contours:

1. Select *Draw|Contour*.
2. Place the starting point.
3. Place the end point of the first segment. This is also the starting point for the second segment.
4. Place additional points to create the line segments at the contour line.
5. To finish select *Right-click|Done*.
6. Edit the dialog as required. Click [OK].
7. Repeat Steps 2 to 6 as required.

5.6.18.1 Contour Dialog

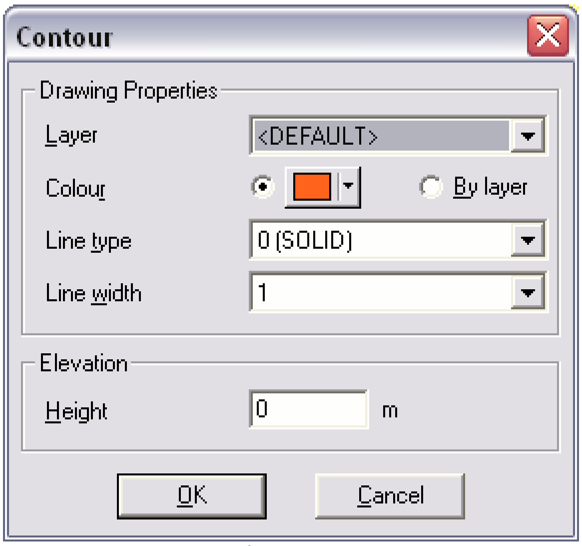


Figure 5-65

Layer: Specifies the layer contours will be stored in. The <DEFAULT> layer for the contour is the ELEVATIONS layer. Select a different layer if required.

Color: Specifies the default color of contour lines. Click on the color to change. Contours can also be specified as By Layer color – will display the color as specified in *Settings|Layers* for the layer the contours are in.

Line Type: Specifies the default line type for contours. To change click the down arrow and select a new line type.

Line Width:	Specifies the default line width for contours. To change click the down arrow and select a new line width.
Height:	Specifies the elevation of the contour. Type in the value. IRRICAD remembers the last elevation used.

The default settings can be edited in *Settings|Irrigation Items.*

Notes:

Contours may be closed in a similar manner to polylines.

Contours may be connected to other contours. The height of the new contour is automatically set to the height of the contour to which it is connected.

When drawing contours close together, the new contour may snap to an existing contour. In this case, continue drawing the contour, then use Move Point to move the points away from the existing contour.

See also:

Spot Height	*Section 5.6.19*
Convert to Elevations	*Section 5.12.8*
Import Contours	*Section 5.3.6*

5.6.19 SPOT HEIGHT

Spot heights are used to enter topographic information.

To put in spot heights:

1. Select Draw|Spot Height.
2. Place the points where required. Upon left clicking the mouse on the screen to place a spot height, a dialog box will appear.
3. Enter the height and edit the drawing properties as required.
4. Click [OK].

5.6.19.1 Spot Heights Dialog

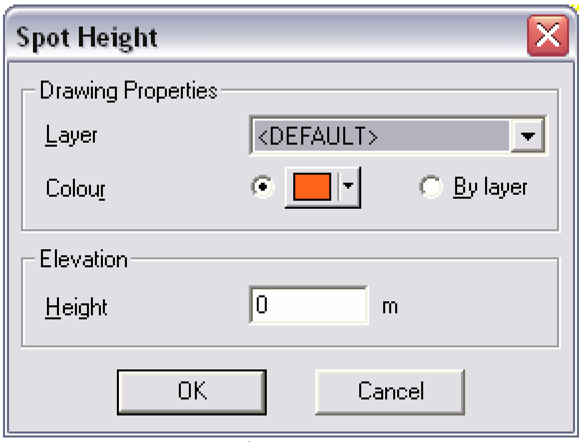


Figure 5-66

Layer: Specifies the layer spot heights will be stored in. The <DEFAULT> layer for the spot height is the ELEVATIONS layer. Select a different layer if required.

Color: Specifies the default color of spot heights. Click on the color to change. Spot heights can also be specified as By Layer color – will display the color as specified in *Settings|Layers* for the layer the spot heights are in.

Height: Specifies the elevation of the spot height. Type in the value. IRRICAD remembers the last elevation used.

The default settings can be edited in *Settings|Irrigation Items*.

See also:

Contour	Section *5.6.18*
Convert to Elevations	Section *5.12.8*
Calculate Contours	*Section 5.12.7*
Import Contours	Section *5.3.6*

5.7 ZONE

The *Zone* menu has the following commands:

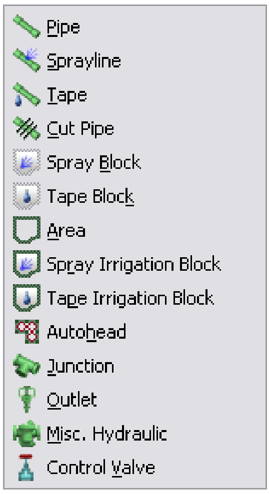


Figure 5-67

The *Zone* menu allows the user to place and connect zone items in the design. A Zone is defined as connected hydraulic items downstream from a control valve.

> Note: *When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.*

5.7.1 PIPE

Pipes are hydraulic items connecting outlets and valves to water supplies.

To place a pipe:

1. Select *Zone|Pipe*.
2. Edit the dialog as required. Click [OK].
3. Place the starting point.
4. Place the end point. This is also the starting point of the next pipe. Place additional points to create connected pipes.

5. To finish, select *Right-click|Restart*.

IRRICAD will automatically connect the pipe to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

5.7.1.1 Pipe Dialog

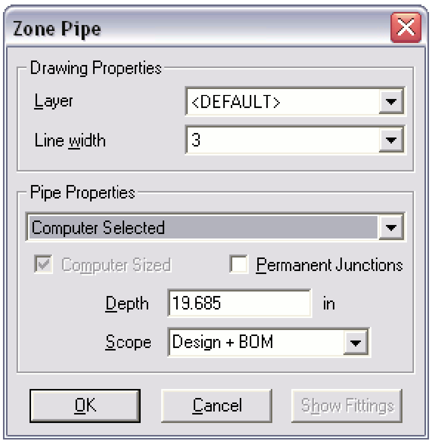


Figure 5-68

Drawing Properties

Layer: The <DEFAULT> layer is ZONE_PIPES or MAINLINE_PIPES respectively.

Line Width: The line width can be changed and saved as default in *Settings|Irrigation - Design Specific*. Color and symbol are edited in the Database Editor only (see Pipes, Section 3.8.1).

Pipe Properties

Item: The currently selected pipe. Pipes available in the dropdown list have been entered into and enabled in the pipe database.

Computer Sized: Check to get IRRICAD to select a suitable pipe size during Design. Uncheck if manually selecting a pipe or to keep the pipe size previously selected by IRRICAD during Design.

Permanent Junctions: Check to create permanent junctions at the start and end of pipe segments. Non-permanent

	junctions are removed during design if the pipe segments are considered to be close to a straight line.
Depth:	The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.
Scope:	This determines whether this item is to be designed only, in BOM reports only or both.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

See also:

Snaps - Right-click menu	*Section 5.1.3*

5.7.2 SPRAYLINE

A method of spacing outlets uniformly along a pipe.

To draw a Sprayline:

1. Select *Zone|Sprayline*.
2. Edit the dialog as required. Click [OK].
3. Place the starting point.
4. Place the end point of the first sprayline segment. This is also the starting point of the second segment. Place additional points to create the sprayline segments.
5. To finish select *Right-click|Restart*.

IRRICAD will automatically connect the sprayline to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

5.7.2.1 SPRAYLINE DIALOG

Pipe Properties

Pipe:	The currently selected pipe. The pipes available in the dropdown list have been entered into and enabled in the pipe database.

Computer Sized: Check to get IRRICAD to select a suitable pipe size during Design. Uncheck if manually selecting a pipe or to keep the pipe size previously selected by IRRICAD during Design.

Permanent Junctions: Check to create permanent junctions at the start and end of pipe segments. Non-permanent junctions are removed during design if the pipe segments are considered to be close to a straight line.

Depth: The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.

Scope: This determines whether this item is to be designed only, in BOM reports only or both.

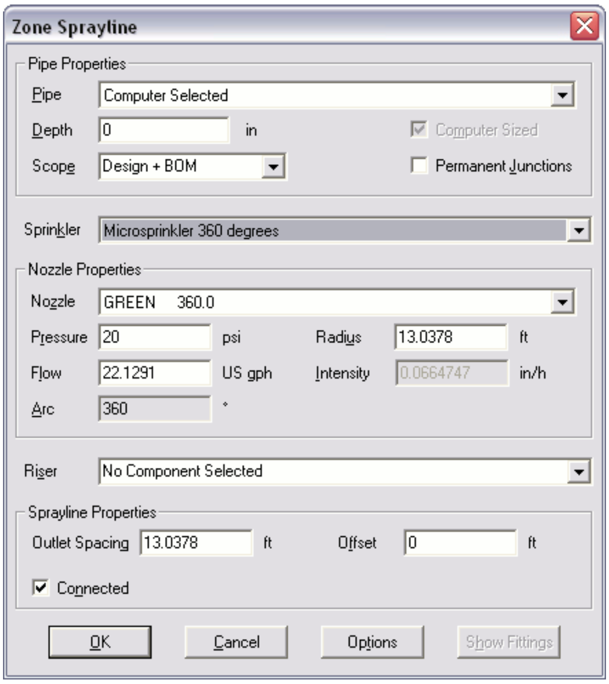


Figure 5-69

Sprinkler

Sprinkler: The currently selected outlet body. The outlets available in the dropdown list have been entered and enabled in the Database Editor.

Nozzle Properties

Nozzle: The currently selected nozzle. The sprinkler nozzle currently selected. Nozzles available in the dropdown list have been entered and enabled in the Database Editor.

Pressure: Operating pressure for the sprinkler; the default value is user-defined in the database.

Flow: Flow rate for the sprinkler at the pressure shown.

Arc: The plan angle over which the sprinkler operates (in degrees).

Radius: The wetted radius for the selected nozzle at the selected pressure.

Intensity: Flow rate divided by area of application for a single sprinkler; used as a simple measure of precipitation rate.

Riser

Riser: The currently selected riser. The risers available in the dropdown list have been entered and enabled in the Database Editor.

Sprayline Properties

Outlet Spacing: The spacing between the outlets on the sprayline.

Offset: The distance of the first sprinkler from the start of the sprayline.

Options: Click this button to edit other properties of spraylines

Scope: This determines whether the item is to be designed only, in BOM reports only or both.

Connected: If checked, IRRICAD is to treat the sprayline with outlets as one item. If unchecked, sprayline is Unconnected. Once placed the spraylines becomes individual entities of pipes and sprinklers.

Options – Drawing Properties

Layer: The <DEFAULT> layers are SPRAYLINES for the sprayline pipe, SPRAYLINE_OUTLETS for the outlet the user have selected, and SL_WETTED_RADII for the sprayline outlets

	wetted radii. These can be turned on or off in *Settings|Layers*. If a sprayline is unconnected, the default layers are ZONE_PIPES, OUTLETS and OUTLET_WETTED_RADII respectively. Wetted radii default settings can be changed in *Settings|Irrigation Items*.
Line Width:	Select a line width from the dropdown list. Outlet color and symbol, pipe color and symbol are edited in the Database Editor only (see Pipes, Section 3.8.1).

Options – Outlet properties

Orientation:	The orientation in degrees for the outlet symbol.

Options – Fixed Spacing

Fixed Spacing:	Indicates whether the outlet spacing is fixed or adjusted to fit between two points.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.3 TAPE

Tapes are laterals with built in emitters.

To draw a Tape:

1. Select *Zone|Tape*.
2. In the dialog, select the tape item that is required in the design.
3. Type in the required depth, if any, and edit the Inlet Pressure if required.
4. If the design requires a regulated submain pressure, check the Regulated box, and type in a minimum submain pressure in the box below. The nominal SDR is shown at the bottom of this dialog. This value has been entered in the tape database.
5. Click [OK].
6. Place the start of the tape by clicking the left mouse button. End the tape by a left click. Bent tapes can be drawn in much the same way as polylines. Select *Right-click|Done* to finish.
7. Repeat step 6 as required.

5.7.3.1 TAPE DIALOG

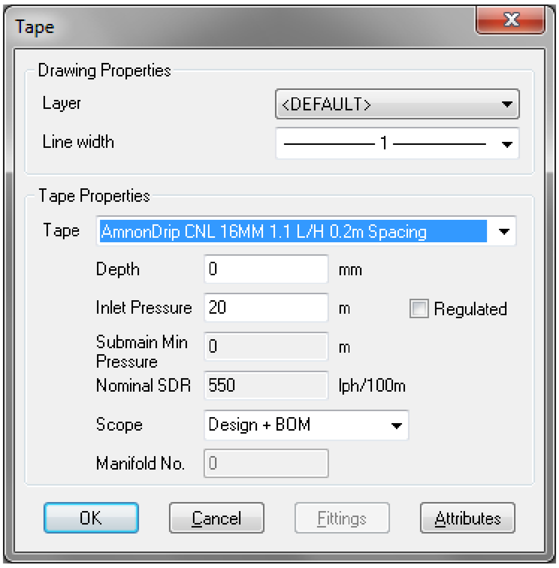


Figure 5-70

Drawing Properties

Layer: The <DEFAULT> layer is SPRAYLINES.

Line Width: The line width can be changed and saved as default in *Settings|Irrigation - Design Specific*. Color and symbol are edited in the Database Editor only (see Tapes, Section 3.8.2).

Tape Properties

Tape: The currently selected tape. Tapes available in the dropdown list have been entered into and enabled in the database.

Depth: The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.

Inlet Pressure: The pressure is required at the start of each tape.

Pressure Regulation: Indicates whether or not pressure regulation (e.g., PRVs, spaghetti tube) will be used to control the pressure at the tape inlet. During analysis it is assumed that the regulation device burns up the difference between the sub-main pressure and the nominal inlet pressure at the start of the tape.

Submain Min Pressure: The minimum pressure required in the submain. Required for pressure regulated tapes. The difference between the submain pressure and tape inlet pressure provides a differential pressure in which the pressure regulators must operate. If the Regulated option is unchecked, the submain minimum pressure is not used.

Nominal SDR: The nominal Specific Discharge Rate specified in the database and used for Show Flow and Management reports only. This can be changed in the Database Editor.

Scope: This determines whether the item is to be designed only, in BOM reports only or both.

IRRICAD will automatically connect the tape to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

> Note: *When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.*

5.7.4 Cut Pipe

Cut Pipe is a tool to connect a zone pipe to many existing zone pipes or laterals.

To use Cut Pipe:

1. Select *Zone|Cut Pipe*.
2. Choose a pipe, or leave as **Computer Selected**; edit drawing properties if required. Click [OK].
3. Place the pipe where required, crossing other pipes as needed.

4. Select *Right-click|Restart*. The new pipe will now join to all pipes it has crossed, or is placed close to the ends of.

5.7.4.1 Cut Pipe Dialog

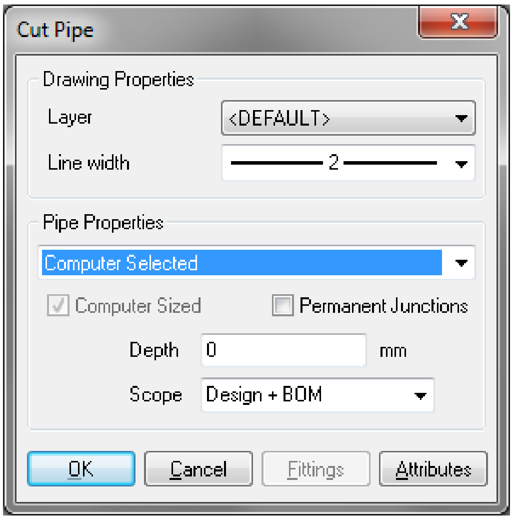


Figure 5-71

Drawing Properties

Layer: The <DEFAULT> layer is ZONE_PIPES.

Line Width: The line width can be changed and saved as default in *Settings|Irrigation - Design Specific*. Color and symbol are edited in the Database Editor only (see Pipes, Section 3.8.1).

Pipe Properties

Item: The currently selected pipe. Pipes available in the dropdown list have been entered into and enabled in the pipe database.

Computer Sized: Check to get IRRICAD to select a suitable pipe size during Design. Uncheck if manually selecting a pipe or to keep the pipe size previously selected by IRRICAD during Design.

Depth: The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.

Scope: This determines whether this item is to be designed only, in BOM reports only or both.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.5 SPRAY BLOCK

Spray Block is used to place spraylines at fixed intervals.

To use Spray Block:

1. Select *Zone|Spray Block*. A dialog will appear which will require the user to enter information about pipe properties, sprinkler selection, nozzle properties, riser selection, and block properties. Check the "Connected" check box if the user require connected spraylines.
2. In clicking [Options] the user can enter information about the lateral, including lateral direction if "User-Defined", the outlets, including a reference outlet if "User-Defined", and layer / line width properties.
3. Now Click [OK] on both dialogs. The dialog will disappear and the block boundaries can be drawn using the cursor. Upon closing the boundaries, the laterals are placed automatically.
4. If the "User-Defined" direction box has been checked, then another line must be drawn to show the direction and placement of a reference lateral. Also, if the Reference Outlet "User-Defined" box has been checked, a point must be entered to show the required position.

5.7.5.1 BLOCK DIALOG

Pipe Properties

Pipe: The currently selected pipe. The pipes available in the dropdown list have been entered into and enabled in the pipe database.

Computer Sized: Check to get IRRICAD to select a suitable pipe size during Design. Uncheck if manually selecting a pipe or to keep the pipe size previously selected by IRRICAD during Design.

Depth: The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.

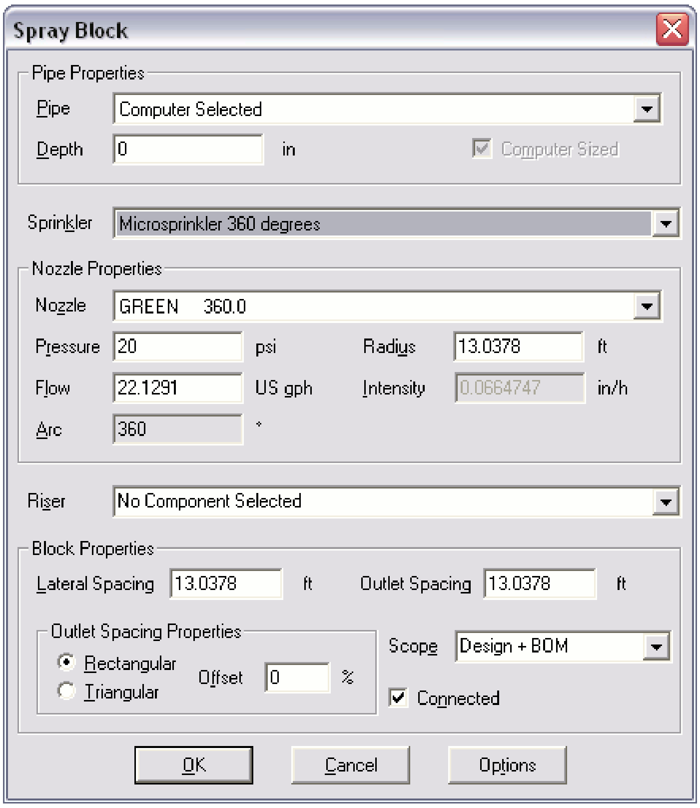


Figure 5-72

Sprinkler

Sprinkler: The currently selected outlet body. The outlets available in the dropdown list have been entered and enabled in the Database Editor.

Nozzle Properties

Nozzle: The currently selected nozzle. The sprinkler nozzle currently selected. Nozzles available in the dropdown list have been entered and enabled in the Database Editor.

Pressure: Operating pressure for the sprinkler; the default value is user-defined in the database.

Flow: Flow rate for the sprinkler at the pressure shown.

Arc: The plan angle over which the sprinkler operates (in degrees).

Radius: The wetted radius for the selected nozzle at the selected pressure.

Intensity: Flow rate divided by area of application for a single sprinkler; used as a simple measure of precipitation rate.

Riser

Riser: The currently selected riser. The risers available in the dropdown list have been entered and enabled in the Database Editor.

Block Properties

Lateral Spacing: The spacing between laterals within the block.

Outlet Spacing: The spacing between the emitters along the sprayline.

Headlands: The distance between the drawn block boundary and the start and end of the laterals.

Sidelands: The distance between the drawn block boundary and the edges of the first and last laterals. Note that if the angle between the boundary and an edge lateral is greater than 30 degrees then the Headland value is used.

Offset: The distance of the first sprinkler from the start of the sprayline.

Scope: This determines whether the item is to be designed only, in BOM reports only or both.

Connected: IRRICAD is to treat the sprayline with outlets as one item.

Options - Laterals

Number of Laterals: This is used when a specific number of laterals is required in the block. Otherwise IRRICAD will fill the area defined by the block boundaries.

No. Laterals/Group: If greater than zero the number of laterals in each group. If this field is set at zero then the "Group Spacing" field will be disabled and all laterals will be spaced identically.

Group Spacing: The spacing between groups of laterals (which will be spaced at the lateral spacing).

Lateral Direction: The direction in which the laterals are required to run. This can be user defined, or determined automatically by IRRICAD based upon the first block boundary that is drawn.

Extra Outlets on Ends: Check this box if an extra outlet is required on the sprayline ends.

Options – Outlet properties

Orientation: The orientation in degrees for the outlet symbol.

Reference Outlet: An indication where the first outlet is placed on the sprayline. This can be user defined (where the user can specify where the first outlet is to be placed), or determined automatically (where the first outlet is placed at the start of the first sprayline).

Options – Drawing Properties

Layer: The <DEFAULT> layers are SPRAYLINES for the sprayline pipe, SPRAYLINE_OUTLETS for the outlet the user have selected, and SL_WETTED_RADII for the sprayline outlets wetted radii. These can be turned on or off in *Settings|Layers*. If a sprayline is unconnected, the default layers are ZONE_PIPES, OUTLETS and OUTLET_WETTED_RADII respectively. Wetted radii default settings can be changed in *Settings|Irrigation Items*.

Line Width: Select a line width from the dropdown list. Outlet color and symbol, pipe color and symbol are edited in the Database Editor only (see Pipes, Section 3.8.1).

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

See also:

Sprayline *Section 5.7.2*

5.7.6 TAPE BLOCK

Tape Block is used to place tapes at fixed intervals.

To use Tape Block:

1. Select *Zone|Tape Block*.
2. In the dialog, select the tape item that is required in the design.
3. Type in the required depth, if any, and edit the inlet pressure if required.
4. If the design requires a regulated submain pressure, check / tick the Regulated box, and type in a minimum submain pressure in the box below. The nominal SDR is shown at the bottom of this dialog.
5. Type in the block properties, i.e. the lateral spacing and number of laterals.
6. Select either the "Determine Automatically" option or the "User Defined" option.
7. Click [OK]. The dialog will disappear and the block boundaries can be drawn using the cursor. Upon closing the boundaries, the tapes are placed automatically.
8. If the "User Defined" direction box has been checked, then another line must be drawn to show the direction and placement of a reference tape.

5.7.6.1 TAPE BLOCK DIALOG

Drawing Properties

Layer: The <DEFAULT> layer is SPRAYLINES. These can be turned on or off in *Settings|Layers*.

Line Width: Select a line width from the dropdown list. Outlet color and symbol, pipe color and symbol are edited in the Database Editor only (see Tapes, Section 3.8.2).

Tape Properties

Tape: The currently selected tape. Tapes available in the dropdown list have been entered into and enabled in the database.

Depth: The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.

Inlet Pressure: The pressure is required at the start of each tape.

Pressure Regulation: Indicates whether or not pressure regulation (e.g., PRVs, spaghetti tube) will be used to control the pressure at the tape inlet. During analysis it is assumed that the regulation device burns up the difference between the sub-main pressure and the nominal inlet pressure at the start of the tape.

Submain Min Pressure: The minimum pressure required in the submain.

Required for pressure regulated tapes. The difference between the submain pressure and tape inlet pressure provides a differential pressure in which the pressure regulators must operate. If the Regulated option is unchecked, the submain minimum pressure is not used.

Nominal SDR: The nominal "Specific Discharge Rate" specified in the database and used for *Show Flow* and Management reports only. This can be changed in the Database Editor.

Scope: This determines whether this item is to be designed only, in BOM reports only or both.

Lateral Properties

Spacing: The spacing between laterals within the block.

Number of Laterals: This is used when a specific number of laterals is required in the block. Otherwise IRRICAD will fill the area defined by the block boundaries.

Lateral Direction: The direction in which the laterals are required to run. This can be user defined, or determined automatically by IRRICAD upon the first block boundary that is drawn. If "User Defined" is selected, the user have has the option to draw bent tapes by checking the "Polyline" check box.

No. Laterals/Group: If greater than zero, the number of laterals in each group. If this field is set at zero then the "Group Spacing" field will be disabled and all laterals will be spaced identically.

Group Spacing: The spacing between groups of laterals (which will be spaced at the lateral spacing).

Headlands: The distance between the drawn block boundary and the start and end of the laterals.

Sidelands: The distance between the drawn block boundary and the edges of the first and last laterals. Note that if the angle between the boundary and an edge lateral is greater than 30 degrees then the Headland value is used.

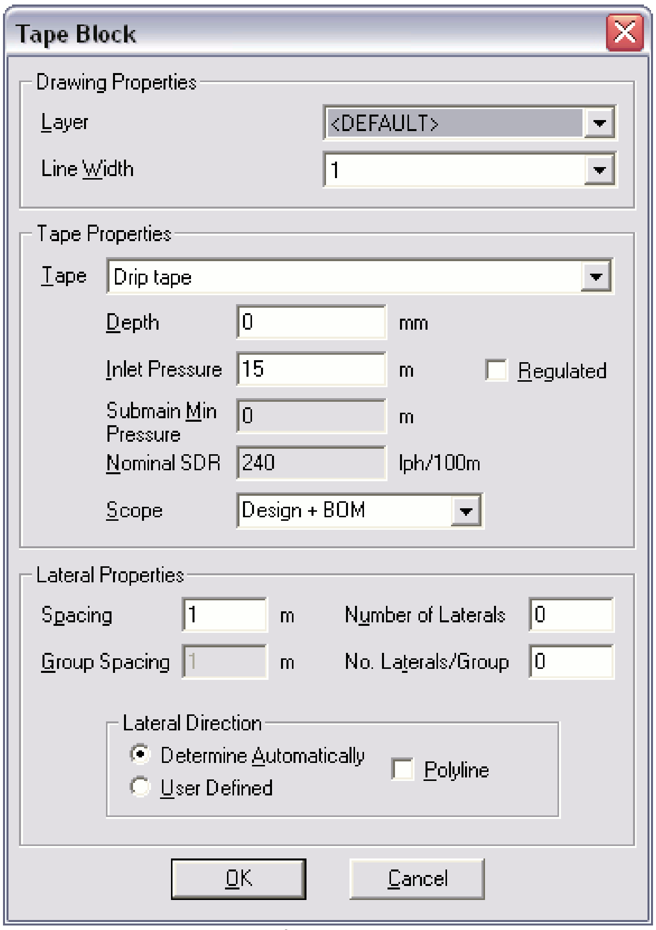


Figure 5-73

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.7 Area

An Area is a parcel of land that has the same specified water requirements.

To define an Area:

1. Select *Zone|Area*.
2. Place the starting point.
3. Place the end point of the first segment of the boundary.
4. Continue placing points to create the area boundary.
5. To finish select *Right-click|Close*.

Where an area cannot be completed in one sequence e.g., while digitizing, select *Done* instead of *Close*.

6. Edit the dialog as required. Click [OK].
7. Repeat Steps 2 to 6 as required.

Note: *An Area boundary may be completed later using the Area tool by connecting a new boundary segment to one end of the existing boundary and continuing to place points.*

5.7.7.1 Area Dialog

Drawing Properties

Layer: The <DEFAULT> layer is IRRIGATION_ AREAS.

Color: Change the color of the Area line by selecting a different color from the color chart when clicking on the current color edit field. The user can change the default color of the layer in *Settings|Layers*.

Line Type: The line type can be selected from a dropdown list. The default line type for the layer may be changed in *Settings|Layers* for IRRIGATION_ AREAS if required.

Line Width: The line width can also be selected from the dropdown list in the dialog. The default line width for the layer may be changed in *Settings|Layers* for IRRIGATION_AREAS if required.

The default settings can be edited in *Settings|Irrigation Items*.

Area Properties

Name: The name of the area.

Set Arc Orientation Using Area: Check this box if all sprinklers that will be encompassed by the area, require toshould have their arcs rotated to water within the area only. Sprinklers added after the area has been drawn will automatically have their arcs orientated to water within the area regardless of this setting.

Max. Intensity: The maximum allowable mean precipitation rate for the area. Actual precipitation rates are checked against this value. Can be left as 0 if the area is used only to orientate sprinkler arcs.

Required Quantity of Water: The amount of water to be applied to the Irrigation Area on a daily basis expressed as a depth or as a volume. Can be left as 0 if the area is used only to orientate sprinkler arcs.

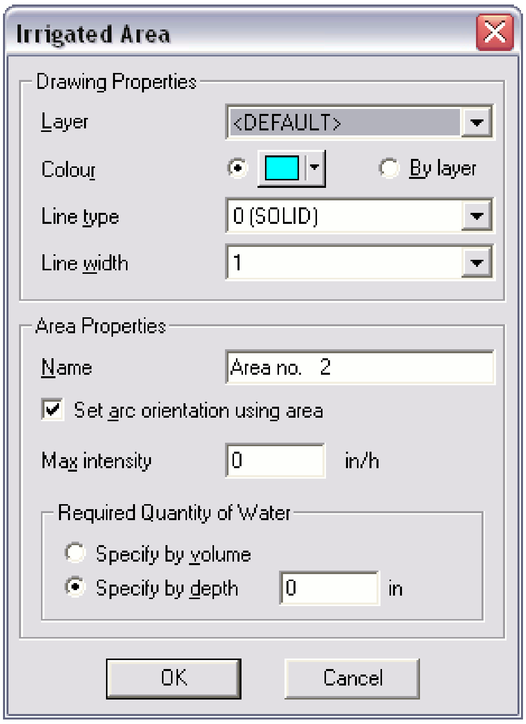


Figure 5-74

Note: *Areas work in the opposite way to most other hydraulic tools, i.e. most tools: Select tool, dialog to set properties, draw or place. Areas: Select tool, draw area, dialog to set properties.*

See also:

Names	*Section 5.10.15*
Aligning Arcs with Boundaries	*Section 2.5.3*
System Flow Report	*Section* **5.14.12.2**
Water Requirements	*Section 5.14.12.1*

5.7.8 Spray Irrigation Block

Block Entities retain the drawn boundary of the block tools as an Irrigation Area and 'group' the laterals contained by them. They also facilitate the automatic placement of submains and manifolds, the creation of block labels, and simplify the process of changing the type, spacing etc., of laterals.

At present blocks of Spraylines can be treated in this way. Spray Irrigation Blocks can be created by selecting *Spray Irrigation Blocks* from the *Zone* menu or by clicking the button on the Toolbar respectively. Note that the user may need to add these to the Toolbar by selecting the *View|Toolbars* menu item (on the Commands tab select "Hydraulic Tools" and then dragging the button onto the desired toolbar).

Most of the items on this dialogs are self-explanatory. The fields on the Lateral tab have exactly the same function as those on the *Sprayline Block* tool dialogs. Similarly those on the Area tab are identical to those on the *Irrigation Area tool* dialog.

5.7.8.1 Drawing Properties

Layer: The <DEFAULT> layer is IRRIGATION_AREAS. These can be turned on or off in *Settings|Layers*.

Color: The default for Irrigation Areas as per *Settings|Irrigation Items* will be displayed.

Line Type: The default for Irrigation Areas as per *Settings|Irrigation Items* will be displayed.

Line Width: The default for Irrigation Areas as per *Settings|Irrigation Items* will be displayed.

5.7.8.2 LATERALS TAB

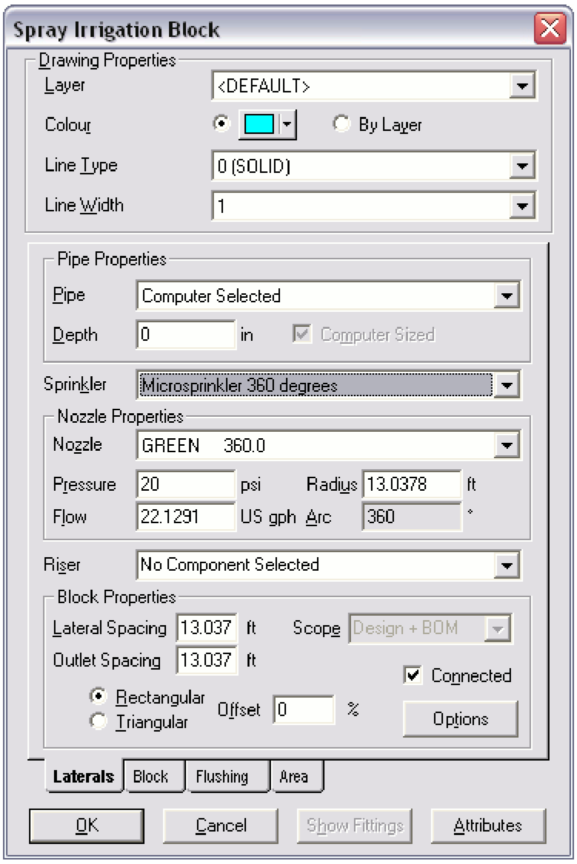


Figure 5-75

Pipe Properties

Pipe: Computer sized or manually selected pipe.

Depth: The depth of the pipe below ground level.

Sprinkler

The currently selected outlet body. The outlets available in the dropdown list have been entered and enabled in the Database Editor.

Nozzle Properties

Nozzle: The currently selected nozzle. The sprinkler nozzle currently selected. Nozzles available in the dropdown list have been entered and enabled in the Database Editor.

Pressure: Operating pressure for the sprinkler; the default value is user-defined in the database.

Radius: The wetted radius for the selected nozzle at the selected pressure.

Flow: Flow rate for the sprinkler at the pressure shown.

Arc: The plan angle over which the sprinkler operates (in degrees).

Riser

The currently selected riser. The risers available in the dropdown list have been entered and enabled in the Database Editor.

Block Properties

Lateral Spacing: The spacing between laterals within the block.

Scope: This setting is read only in this dialog and cannot be changed.

Outlet Spacing: The spacing between the emitters along the sprayline.

Rectangular: Rectangular outlet configuration in the block.

Triangular: Triangular outlet configuration in the block.

Offset: The distance of the first sprinkler from the start of the sprayline.

Connected: IRRICAD is to treat the sprayline with outlets as one item.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.8.3 Options

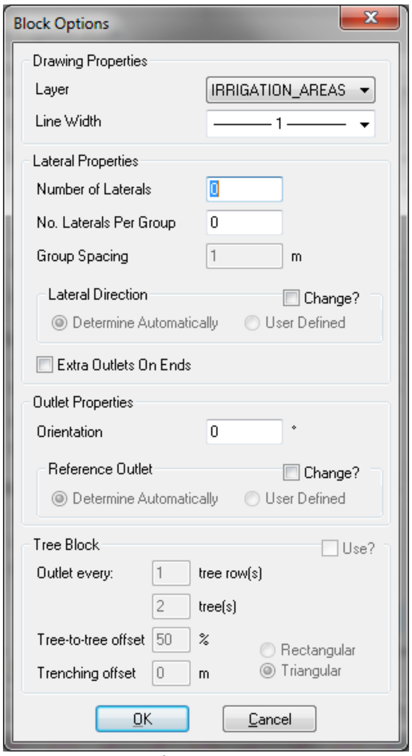


Figure 5-76

Lateral Properties

Number of Laterals: This is used when a specific number of laterals is required in the block. Otherwise IRRICAD will fill the area defined by the block boundaries.

No. Laterals/Group: If greater than zero, the number of laterals in each group. If this field is set at zero then the "Group Spacing" field will be disabled and all laterals will be spaced identically.

Group Spacing: The spacing between groups of laterals (which will be spaced at the lateral spacing).

Lateral Direction: The direction in which the laterals are required to run. This can be user defined, or determined automatically by IRRICAD when the user selects the block boundary.

Change: The existing lateral direction can be changed by checking the "Change" check box and specifying the new lateral direction on the plan.

Extra Outlets on End: When checked, extra outlets will be placed on the ends of the laterals.

Outlet Properties

Orientation: The orientation in degrees for the outlet symbol.

Reference Outlet: An indication where the first outlet is placed on the sprayline. This can be user defined where (the user can specify where the first outlet is to be placed), or determined automatically (where the first outlet is placed at the start of the first sprayline).

Tree Block

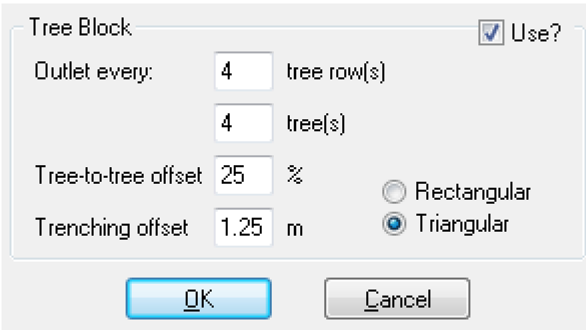


Figure 5-77

Use: This option is automatically enabled when converting a Tree Block entity to a Spray Irrigation Block. Uncheck if the tree block parameters are not to drive the placement of the sprinklers.

Outlet every x tree row(s): Specifies the regularity of the outlets in the tree rows.

Outlet every x tree(s): Specifies the regularity of the outlets within a row.

Tree-to-tree offset: The distance of the outlets between two trees. A 50% offset places the outlet half way between the trees.

Trenching Offset: The lateral position distance from the tree row.

Rectangular: Rectangular outlet configuration in the block relative to the trees and tree rows.

Triangular: Triangular outlet configuration in the block relative to the trees and tree rows.

5.7.8.4 BLOCK TAB

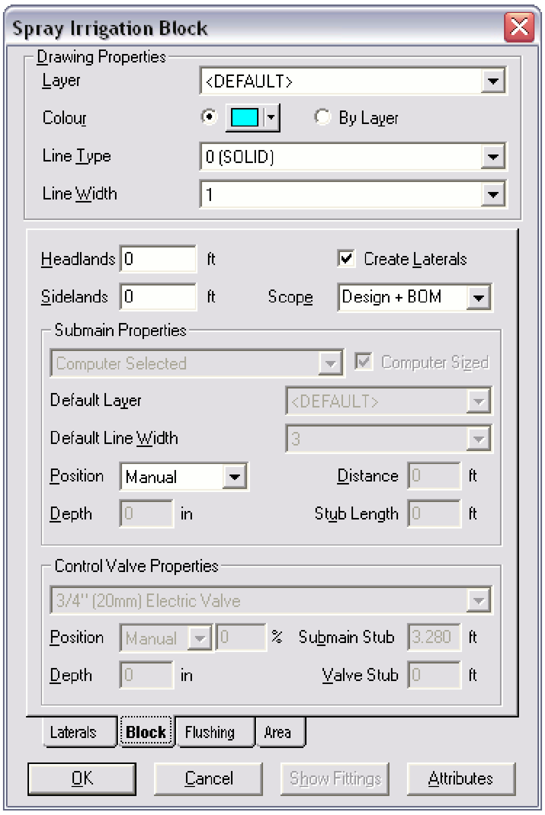


Figure 5-78

Headlands

The distance between the drawn block boundary and the start and end of the laterals.

Sidelands

The distance between the drawn block boundary and the edges of the first and last laterals. Note that if the angle between the boundary and an edge lateral is greater than 30 degrees then the Headland value is used.

Create Laterals

If checked then laterals are created for the block.

Scope

This determines whether the item is to be designed only, in BOM reports only or both. This setting is read only during the initial block creation.

Submain Properties

Submains may be automatically placed and connected when the block is created. The options for the submain position are:-

Pipe:	Computer sized or manually selected pipe.
Computer Sized:	Check box to enable or disable Computer Sizing.
Default Layer:	Defaults to the default layer for zone pipes.
Default Line Width:	Defaults the pipe line width for zone pipes as set in *Settings|Irrigation – Design Specific*.
Position:	**Manual** – The submain will not be automatically positioned. Use the *Cut-pipe* tool to do this after the block has been created. **Start** – The submain will be positioned on the starting point of the laterals. Note this point is the one that corresponds to the point on the first lateral that is closest to the first point of the lateral direction line (the first point of the block boundary in the case of the automatic lateral direction option) **End** – The submain will be positioned on the end point of the laterals. **Center** - The submain will be positioned at the mid-point of all laterals. **Set Distance** – The submain will be positioned at the distance, specified in the "Distance" field, down the laterals. When the block is created a direction for submains is specified by selecting a side of the block polygon. The closest end of the lateral closest to this direction line determines where the distance is measured from. IRRICAD can also allow any line to be

	used when specifying the submain direction (i.e. not just block boundaries).
Distance:	If using **Set Distance,** then select the distance the user wants the submain to be from the reference (the line the user specifies as a parallel guide).If using **Set Distance** then select the distance the user want the submain from the line the user are using as a parallel guide.
Depth:	Depth of the Submain.
Stub Length:	Length of pipe after the first and last lateral.

Control Valve Properties

Control Valves may be automatically connected when a block is created, similarly to submains. Note that this option is not available if the submain is manually placed. The options for the valve position are as follows:-

Control Valve:	The appropriate valve can be selected from the drop-down list.
Position:	**Manual** – The valve is not automatically placed. **Start** – The valve is connected to the start of the submain. The start of the submain is on the first lateral which is defined as the lateral closest to the line that defines the lateral direction. **End** – The valve is connected to the end of the submain. **Center** – The valve is connected in-line halfway between the middle two laterals. When there are an odd number of laterals then the valve will be connected between the middle and preceding lateral. **Percentage** - The valve will be positioned between the two laterals closest to the given fraction along the submain (i.e., the more laterals, the more accurate the positioning). **Even Flow** - The valve will be positioned where the flow is as close to equal on either side of the valve as can be attained.
Submain Stub:	If the valve is positioned at the start or end of the submain, this stub is the length of pipe outside of the lateral at the 'valve' end of the submain.
Depth:	Depth of the Valve.

Valve Stub: This stub is the length of pipe between the submain and the valve. The pipe is placed in a direction parallel to the block laterals and toward the shortest lateral nearest the valve (this is generally toward the nearest block boundary in the lateral direction).

When a block entity is created with the control valve automatically placed the Zone Name assigned to the valve will be defined by the "Name" field on the Area tab. The valve will be placed in the CONTROL_VALVES layer.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.8.5 Flushing Tab

This feature allows for flushing manifolds to be created for bill of materials and manifold numbering purposes only.

Create Manifolds

If checked then flushing manifolds are created for the block.

Scope

This determines whether the item is to be designed only, in BOM reports only or both. For flushing manifolds, the Scope is **BOM only** during the initial block creation and can be edited at a later stage by using the *Change Type* tool. The flushing manifolds can then be analyzed if required.

Note: If more than one type of item is selected to change the Scope, use the Change tool instead of Change Type.

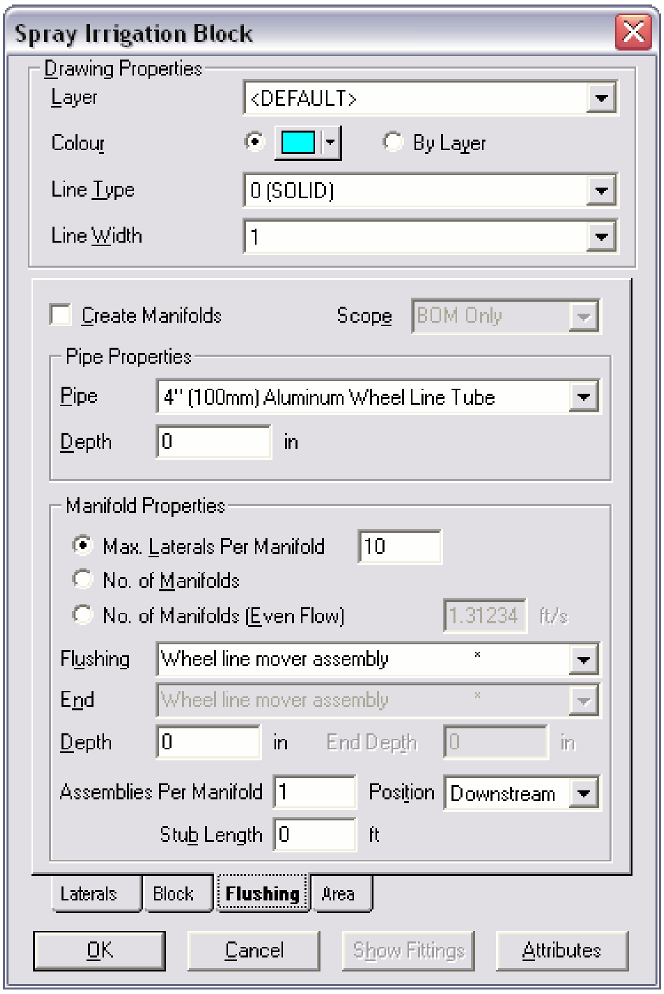


Figure 5-79

Pipe Properties

Pipe: Select the size of pipe the user wishes to use for the flushing manifold.

Depth: Depth of the flushing manifold.

Manifold Properties

Max Laterals Per Manifold: The manifold(s) are connected in even groups of up to the specified number of laterals.

No of Manifolds: The laterals are connected in even numbers to the specified number of manifolds (the number of laterals is evenly divided by the number of manifolds).

No of Manifolds (Even Flow): In this mode the user must specify both a number of manifolds and a target outlet velocity. This velocity is used to calculate the outlet flow per lateral and this is combined with the nominal irrigation (emitter) flow. Laterals are connected to the manifolds such that the flow is evenly distributed to each manifold. Please note that this velocity is used purely to balance the manifold flows, is **does not** guarantee that the specified outlet flow will be achieved and it **is not** a design parameter.

Flushing: If two assemblies per manifold are required, the 'flushing' assembly is placed at one end of the manifold and the 'end' assembly is placed at the other. If more than two assemblies per manifold are specified then the assemblies are placed on the ends as above, and the required number of 'flushing' assemblies are placed at even intervals along the manifold.

End: If two assemblies per manifold are required, the 'flushing' assembly is placed at one end of the manifold and the 'end' assembly is placed at the other. If more than two assemblies per manifold are specified then the assemblies are placed on the ends as above, and the required number of 'flushing' assemblies are placed at even intervals along the manifold.

Depth: Depth of the flushing assemblies.

Assemblies Per Manifold: The user may also specify up to twonumber of assemblies that will be automatically attached to the manifold.

Position: If only one assembly per manifold is required, the user must specify its location - upstream, downstream or center.

Stub Length: A stub length may also be specified and it is applied to the ends of each manifold, prior to the assembly.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.8.6 AREA TAB

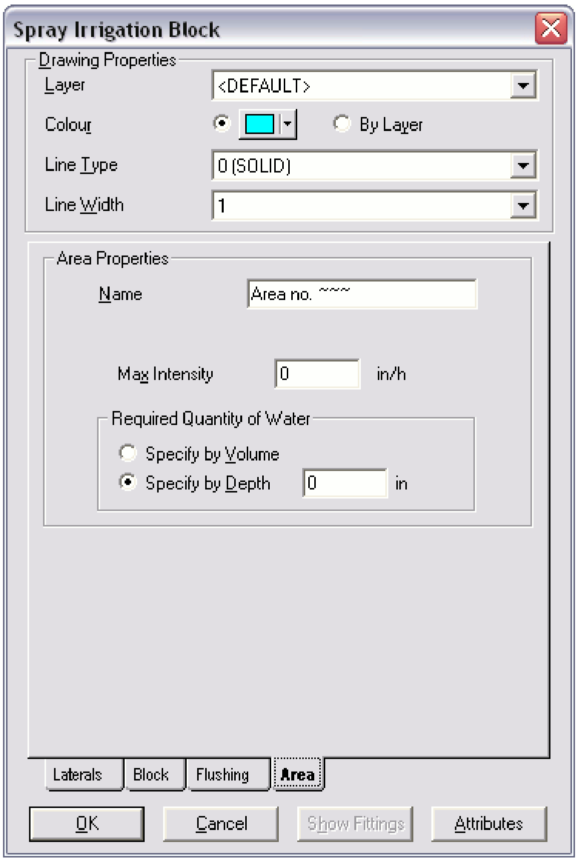


Figure 5-80

Area Properties

Name: The name of the area.

Max. Intensity: The maximum allowable mean precipitation rate for the area. Actual precipitation rates are checked against this value. Can be left as 0 if the area is used only to orientate sprinkler arcs.

Required Quantity of Water: The amount of water to be applied to the Irrigation Area on a daily basis expressed as a depth or as a volume. Can be left as 0 if the area is used only to orientate sprinkler arcs.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.9 Tape Irrigation Block

Block Entities retain the drawn boundary of the block tools as an Irrigation Area and 'group' the laterals contained by them. They also facilitate the automatic placement of submains and manifolds, the creation of block labels, and simplify the process of changing the type, spacing etc., of laterals.

At present for blocks of tapes to be treated in this way theyTape Irrigation Blocks can be created by selecting *Tape Irrigation Blocks* from the *Zone* menu or by clicking the button on the Toolbar respectively. Note that the user may need to add these to the Toolbar by selecting the *View|Toolbars* menu item (on the Commands tab select "Hydraulic Tools" and then dragging the button onto the desired toolbar).

5.7.9.1 Drawing Properties

Layer: The <DEFAULT> layer is IRRIGATION_AREAS. These can be turned on or off in *Settings|Layers*.

Color: The default for Irrigation Areas as per *Settings|Irrigation Items* will be displayed.

Line Type: The default for Irrigation Areas as per *Settings|Irrigation Items* will be displayed.

Line Width: The default for Irrigation Areas as per *Settings|Irrigation Items* will be displayed.

5.7.9.2 Laterals Tab

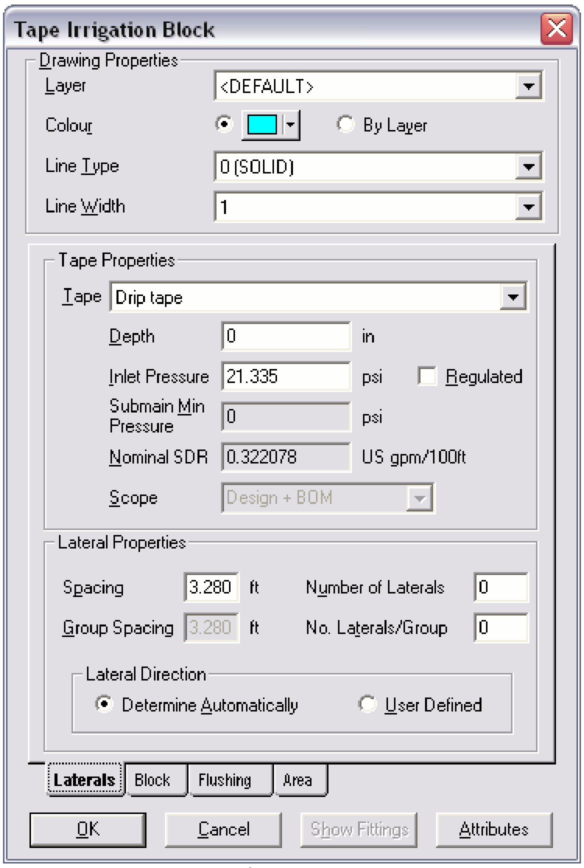


Figure 5-81

Tape Properties

Tape: The currently selected tape. Tapes available in the dropdown list have been entered into and enabled in the database.

Depth: The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.

Inlet Pressure: The pressure is required at the start of each tape.

Regulated: Indicates whether or not pressure regulation (e.g., PRVs, spaghetti tube) will be used to control the pressure at the tape inlet. During analysis it is assumed that the regulation device burns up the difference between the sub-main pressure and the nominal inlet pressure at the start of the tape.

Submain Min Pressure: The minimum pressure required in the submain. Required for pressure regulated tapes. The difference between the submain pressure and tape inlet pressure provides a differential pressure in which the pressure regulators must operate. If the Regulated option is unchecked, the submain minimum pressure is not used.

Nominal SDR: The nominal Specific Discharge Rate specified in the database and used for Show Flow and Management reports only. This can be changed in the Database Editor.

Scope: This setting is read only in this dialog and cannot be changed.

Lateral Properties

Spacing: The spacing between laterals within the block.

Number of Laterals: This is used when a specific number of laterals is required in the block. Otherwise IRRICAD will fill the area defined by the block boundaries.

Group Spacing: The spacing between groups of laterals (which will be spaced at the lateral spacing).

No. Laterals/Group: If greater than zero, the number of laterals in each group. If this field is set at zero then the "Group Spacing" field will be disabled and all laterals will be spaced identically.

Lateral Direction: The direction in which the laterals are required to run. This can be user defined, or determined automatically by IRRICAD when the user selects the block boundary.

Change: The existing lateral direction can be changed by checking the "Change" check box and specifying the new lateral direction on the plan.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.9.3 BLOCK TAB

The Block tab contains a number of fields the use of these is described below.

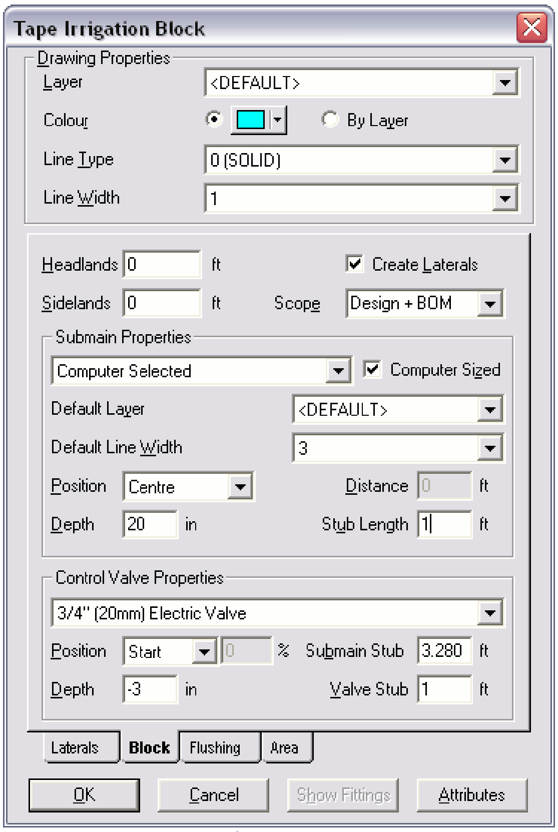


Figure 5-82

Headlands

The distance between the drawn block boundary and the start and end of the laterals.

Sidelands

The distance between the drawn block boundary and the edges of the first and last laterals. Note that if the angle between the boundary and an edge lateral is greater than 30 degrees then the Headland value is used.

Create Laterals

If checked then laterals are created for the block.

Scope

This determines whether the item is to be designed only, in BOM reports only or both. This setting is read only during the initial block creation.

Submain Properties

Submains may be automatically placed and connected when the block is created. The options for the submain position are:-

Pipe:	Computer sized or manually selected.
Computer Sized:	Check box to enable or disable Computer Sizing.
Default Layer:	Defaults to the default layer for zone pipes.
Default Line Width:	Defaults for the pipe line width for zone pipes as set in *Settings|Irrigation – Design Specific*.
Position:	**Manual** – The submain will not be automatically positioned. Use the *Cut-pipe* tool to do this after the block has been created. **Start** – The submain will be positioned on the starting point of the laterals. Note this point is the one that corresponds to the point on the first lateral that is closest to the first point of the lateral direction line (the first point of the block boundary in the case of the automatic lateral direction option) **End** – The submain will be positioned on the end point of the laterals. **Center** - The submain will be positioned at the mid-point of all laterals. **Set Distance** – The submain will be positioned at the distance, specified in the "Distance" field, down the laterals. When the block is created a direction for submains is specified by selecting a side of the block polygon. The closest end of the lateral closest to this direction line determines where the distance is measured from. IRRICAD can also allow any line to be used when specifying the submain direction (i.e. not just block boundaries).
Distance:	If using **Set Distance,** then select the distance the user wants the submain to be from the

	reference line the user are using as a parallel guide (the line the user specifies as a parallel guide).
Depth:	Depth of the Submain.
Stub Length:	Length of pipe after the first and last lateral.

Control Valve Properties

Control Valves may be automatically connected when a block is created, similarly to submains. Note that this option is not available if the submain is manually placed. The options for the valve position are as follows:-

Control Valve:	The appropriate valve can be selected from the drop-down list.
Position:	**Manual** – The valve is not automatically placed. **Start** – The valve is connected to the start of the submain. The start of the submain is on the first lateral which is defined as the lateral closest to the line that defines the lateral direction. **End** – The valve is connected to the end of the submain. **Center** – The valve is connected in-line halfway between the middle two laterals. When there are an odd number of laterals then the valve will be connected between the middle and preceding lateral. **Percentage** - The valve will be positioned between the two laterals closest to the given fraction along the submain (i.e., the more laterals, the more accurate the positioning). **Even Flow** - The valve will be positioned where the flow is as close to equal on either side of the valve as can be attained.
Submain Stub:	If the valve is positioned at the start or end of the submain, this stub is the length of pipe outside of the lateral at the ‘valve’ end of the submain.
Depth:	Depth of the Valve.
Valve Stub:	This stub is the length of pipe between the submain and the valve. The pipe is placed in a direction parallel to the block laterals and toward the shortest lateral nearest the valve

(this is generally toward the nearest block boundary in the lateral direction).

When a block entity is created with the control valve automatically placed the Zone Name assigned to the valve will be defined by the "Name" field on the "Area" tab. The valve will be placed in the CONTROL_VALVES layer.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.9.4 Flushing Tab

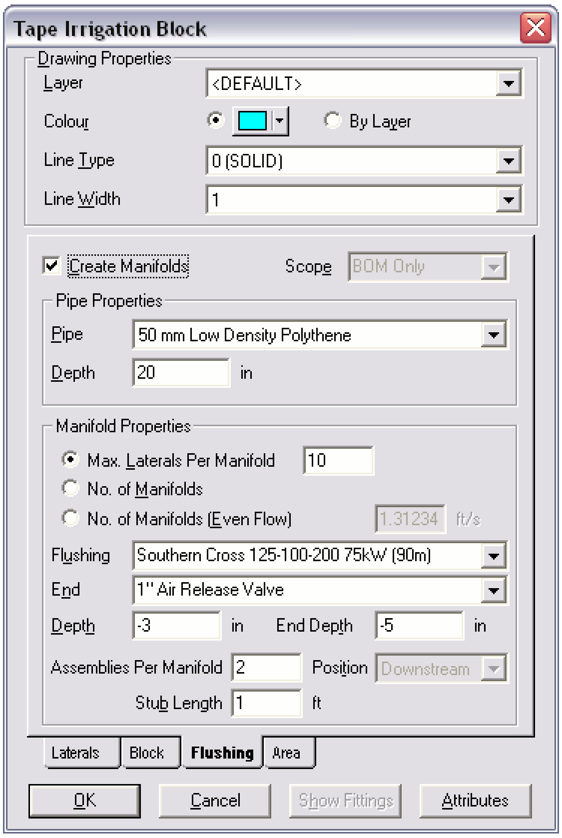


Figure 5-83

This feature allows for flushing manifolds to be created for bill of materials and manifold numbering purposes only.

Create Manifolds

If checked then flushing manifolds are created for the block.

Scope

This determines whether the item is to be designed only, in BOM reports only or both. For flushing manifolds, the Scope is **BOM only** during the initial block creation and should NOT be changed.

Pipe Properties

Pipe: Select the size of pipe the user wishes to use for the flushing manifold.

Depth: Depth of the flushing manifold.

Manifold Properties

Max Laterals Per Manifold: The manifold(s) are connected in even groups of up to the specified number of laterals.

No of Manifolds: The laterals are connected in even numbers to the specified number of manifolds (the number of laterals is evenly divided by the number of manifolds).

No of Manifolds (Even Flow): In this mode the user must specify both a number of manifolds and a target outlet velocity. This velocity is used to calculate the outlet flow per lateral and this is combined with the nominal irrigation (emitter) flow. Laterals are connected to the manifolds such that the flow is evenly distributed to each manifold. Please note that this velocity is used purely to balance the manifold flows, is **does not** guarantee that the specified outlet flow will be achieved and it **is not** a design parameter.

Flushing: If two assemblies per manifold are required, the 'flushing' assembly is placed at one end of the manifold and the 'end' assembly is placed at the other. If more than two assemblies per manifold are specified then the assemblies are placed on the ends as above, and the required number of 'flushing' assemblies are placed at even intervals along the manifold.

End: If two assemblies per manifold are required, the 'flushing' assembly is placed at one end of the manifold and the 'end' assembly is placed at the other. If more than two assemblies per manifold are specified then the assemblies are placed on the ends as above, and the required number of 'flushing' assemblies are placed at even intervals along the manifold.

Depth: Depth of the flushing assemblies.

Assemblies Per Manifold: The user may also specify up to twonumber of assemblies that will be automatically attached to the manifold.

Position: If only one assembly per manifold is required, the user must specify its location - upstream, downstream or center.

Stub Length: A stub length may also be specified and it is applied to the ends of each manifold, prior to the assembly.

<u>**User Attributes**</u>

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.9.5 AREA TAB

<u>**Area Properties**</u>

Name: The name of the area.

Max. Intensity: The maximum allowable mean precipitation rate for the area. Actual precipitation rates are checked against this value. Can be left as 0 if the area is used only to orientate sprinkler arcs.

Required Quantity of Water: The amount of water to be applied to the Irrigation Area on a daily basis expressed as a depth or as a volume. Can be left as 0 if the area is used only to orientate sprinkler arcs.

<u>**User Attributes**</u>

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

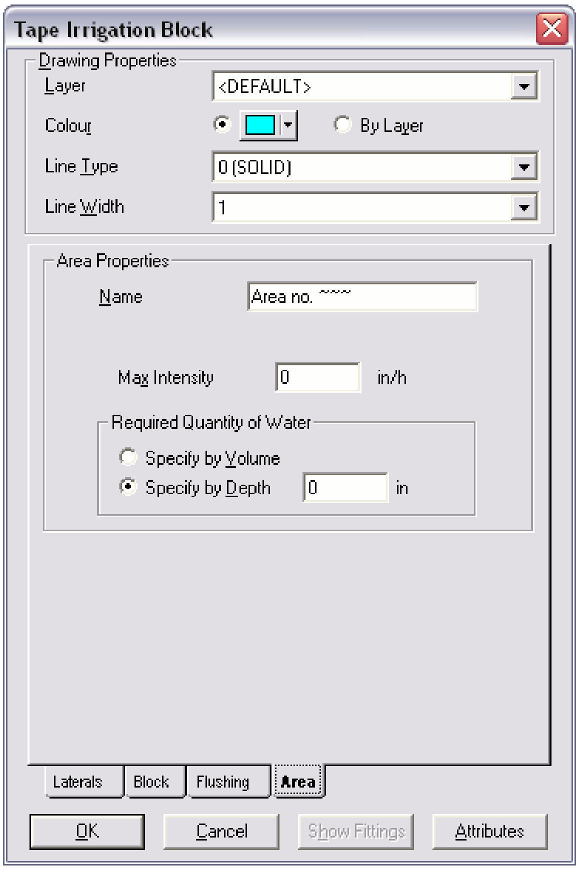


Figure 5-84

5.7.10 AUTOHEAD

The Autohead tool automatically places sprinklers in a given area.

To use Autohead:

1. Place an Irrigation Area (*Zone|Area*) if the arcs of part circle sprinklers need to be orientated.
2. Select *Zone|Autohead*.
4. Select a representative sprinkler body and nozzle and edit other dialog fields as required. Click [OK].
5. Place the starting point of the boundary.

6. Place additional points to create the boundary of the area to be filled.
7. To finish select *Right-click|Close*.
8. Repeat Steps 4 to 7 as required.

See also:

Outlet Dialog	*Section 5.7.12.1*
Automatically Placing Sprinklers	*Section 2.5.1*
Aligning Arcs with Boundaries	*Section 2.5.3*

5.7.11 JUNCTION (HYDRAULIC)

A junction denotes where two or more pipes are connected if no other hydraulic item (e.g., outlet, valve or water supply) is present.

To place a junction:

1. Select *Zone|Junction*.
2. Edit the dialog as required. Click [OK].
3. Click to connect the junction where required.
4. Repeat Step 3 as required.

IRRICAD will automatically connect the junction to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

5.7.11.1 JUNCTION DIALOG

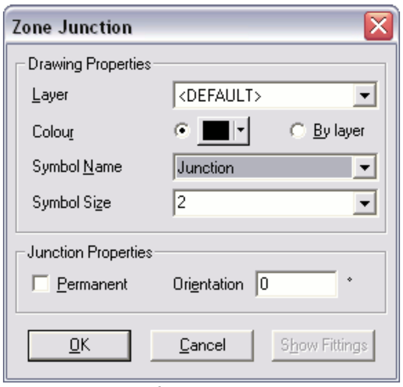


Figure 5-85

Drawing Properties

Layer:	The <DEFAULT> layer for junctions is ZONE_JUNCTIONS.
Color:	The color for junctions can be edited by selecting a color from the color chart by clicking on the color edit field, or by changing the default layer color in *Settings|Layers* and selecting the By Layer option in the junction dialog.
Symbol Name:	The default symbol for junctions is the Junction symbol. Select from the dropdown list in the dialog if the user wishes to use another symbol for this junction. Be aware that some symbols may have their default color as white not black, and will not be seen unless another color is selected for the new symbol.
Symbol Size:	The symbol size ranges from 0 to 9 and is relative to the size of the design. For more details on symbol sizes, see *Settings|Miscellaneous* – "Design Size", Section 5.10.12.3.

The default settings can be edited in *Settings|Irrigation Items*.

Junction Properties

Permanent:	Check if the junction is required to be permanent – i.e., will not be deleted during design if it is on a straight piece of pipe.
Orientation:	The orientation in degrees of the junction symbol. The orientation of the symbol is purely visual, e.g., an orientated square is a diamond shape.

See also:

Irrigation Items - Symbols	*Section 5.10.9.8*

5.7.12 Outlet

Outlets are devices that discharge water from an irrigation system.

To place outlets on the design:

1. Select *Zone|Outlet*. Select a sprinkler, nozzle and riser from the dropdown lists in the dialog.

<u>Note</u>: *If the user knows the first letter of a database entry, N for a Nelson product for example, pressing N on the keyboard will take the user to the first N entry in the database.*

2. Edit the dialog as required. Click [OK].

<u>Note:</u> *Changing one of the pressure, flow and radius fields for the nozzle will cause a change in one or both of the other two. Press the <Enter> key to update the fields.*

3. Click to connect this outlet where required.
4. Repeat Step 3 as required.
5. To change to another sprinkler, simply follow steps 1 to 5 again.

IRRICAD will automatically connect the outlet to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

5.7.12.1 OUTLET DIALOG

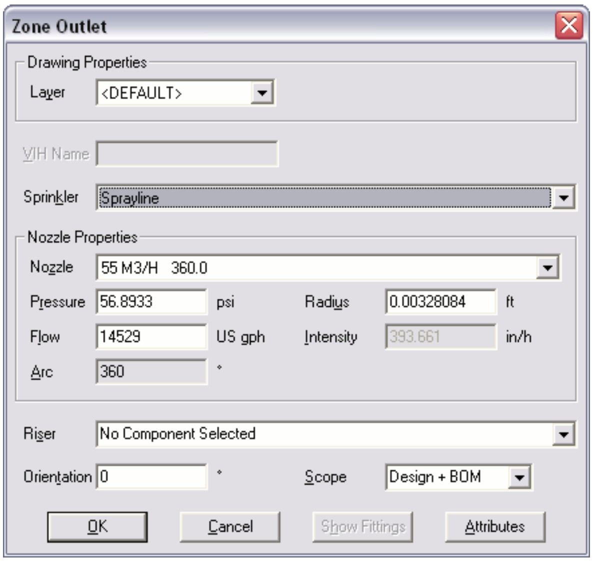


Figure 5-86

Drawing Properties

Layer: The <DEFAULT> layer for outlets is the OUTLETS layer. Colors and symbols for outlets can only be edited in the Database Editor (see Outlets, Section 3.8.11). Wetted radii default settings can be changed in *Settings|Irrigation Items*.

Sprinkler

Sprinkler: The outlet body currently selected. Sprinklers available in the dropdown list have been entered and enabled in the Database Editor.

Nozzle Properties

Nozzle: The sprinkler nozzle currently selected. Nozzles available in the dropdown list have been entered and enabled in the Database Editor.

Pressure: Operating pressure for the sprinkler; the default value is user-defined in the database.

Flow: Flow rate for the sprinkler at the pressure shown.

Arc: The plan angle over which the sprinkler operates (in degrees).

Radius: The wetted radius for the selected nozzle at the defined pressure.

Intensity: Flow rate divided by area of application for a single sprinkler; used as a simple measure of precipitation rate.

Riser

Riser: The riser currently selected. The risers (outlet connectors) available in the dropdown list have been entered and enabled in the Database Editor.

Orientation

Orientation: The orientation in degrees for the nozzle symbol.

Scope

Scope: This determines whether this item is to be designed only, in BOM reports only or both.

Demand Point Properties

If the outlet selected is a demand point, then instead of nozzle properties, demand point properties will appear.

Pressure: The required pressure for the demand point; the default value is user-defined in the database.

Flow: Flow rate for the demand point.

Symbol: A single character that will be drawn inside the demand point symbol so the user can identify it.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.13 Misc. Hydraulic

Misc. Hydraulic items are items such as pressure reducing valves, isolating valves, etc.

To place Miscellaneous Hydraulic items:

1. Select *Zone|Misc. Hydraulic*.
2. Edit the dialog as required click [OK].
3. Place the item at the required position or connect it to a pipe.
4. Repeat Step 3 as required.

IRRICAD will automatically connect the Misc. Hydraulic item to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

5.7.13.1 Misc. Hydraulic Dialog

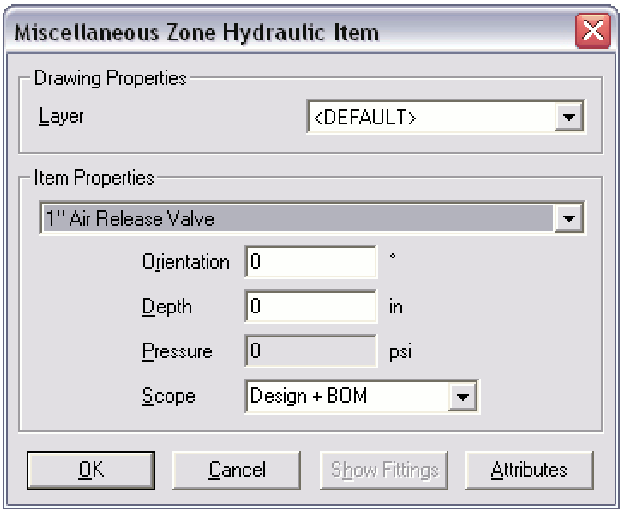


Figure 5-87

<u>Drawing Properties</u>

Layer: The <DEFAULT> layer will place Misc. Hydraulic items on the MISC_HYDRAULIC layer. Color and symbol are edited in the Database Editor only (see Other Hydraulics, Section 3.8.4).

<u>Item Properties</u>

Item: The Misc. Hydraulic item currently selected. The miscellaneous hydraulic items available in the dropdown list have been entered and enabled in the Database Editor.

<u>Orientation</u>

Orientation: The Orientation in degrees for the misc. hydraulic item symbol.

<u>Depth</u>

Depth: The depth of the hydraulic item <u>below</u> ground level. If the hydraulic item is <u>above</u> ground level enter this height as a <u>negative</u> number.

Pressure

Pressure: If the miscellaneous hydraulic item is a pressure-reducing valve (PRV), enter a pressure. This field cannot be edited if the item is not a PRV.

Scope

Scope: This determines whether this item is to be designed only, in BOM reports only or both.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.7.14 CONTROL VALVE

Control Valves are used to control flow to zones (groups of outlets).

To place a Control Valve:

1. Select *Zone|Control Valve*.
2. Edit the dialog as required. Click [OK].
3. Place the Control valve at the required location or connect it to a pipe. A dialog will then appear allowing the user to enter a zone name (or accept the default name). Click [OK].
4. Repeat Step 3 as required.

Note: *If the user knows the first letter of a database entry, N for a Nelson product for example, pressing N on the keyboard will take the user to the first N entry in the database.*

Tip: *Holding the <Shift> key when placing the control valve will bypass the name dialog, accepting the default name.*

The default zone names can be changed in *Settings|Names*, or can be temporarily changed by selecting *Right-click|Default Name* before placing / connecting the control valves on the screen. The temporary name change will remain in effect until another tool is selected.

IRRICAD will automatically connect the control valve to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pipe.

5.7.14.1 Control Valve Dialog

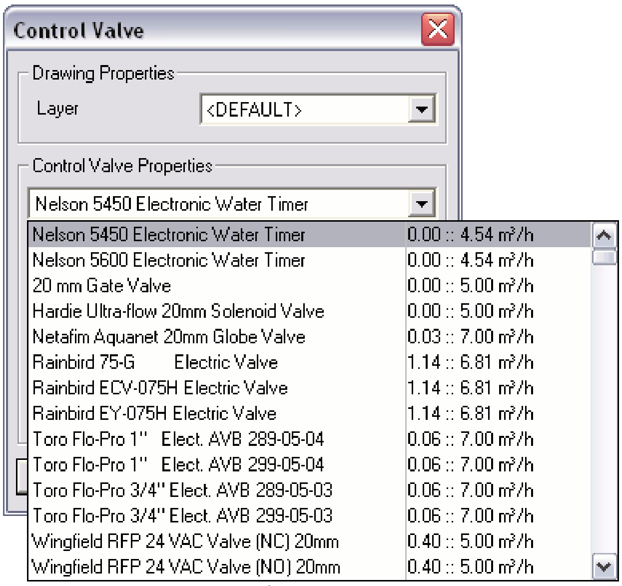


Figure 5-88

Drawing Properties

Layer: The <DEFAULT> layer is the CONTROL_VALVES layer. Color and symbol are edited in the Database Editor only (see Control Valves, Section 3.8.3).

Control Valve Properties

Item: The control valve currently selected. Control valves in the selection list have been entered and enabled in the Database Editor.

Orientation: The Orientation in degrees for the control valve symbol.

Pipe Type: Not used in this version of IRRICAD.

Depth:	The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.
Scope:	This determines whether this item is to be designed only, in BOM reports only or both.

Show Fittings

This button allows the fittings to be viewed, added or removed.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

See also:

Names *Section 5.10.15*

5.8 MAINLINE

The *Mainline* menu has the following commands:

Figure 5-89

The Mainline menu allows the user to place and connect mainline items in the design.

> Note: *When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.*

5.8.1 WATER SUPPLY

A water supply is a point of supply for the irrigation system.

To place Water Supplies on the screen:

1. Select *Mainline|Water Supply* and click on the screen at the required location.
2. Edit the dialog as required. Click [OK].

If there are multiple water supplies supplying the same system enter the "Head" and "Flow" data in the edit boxes provided.

5.8.1.1 Water Supply Dialog

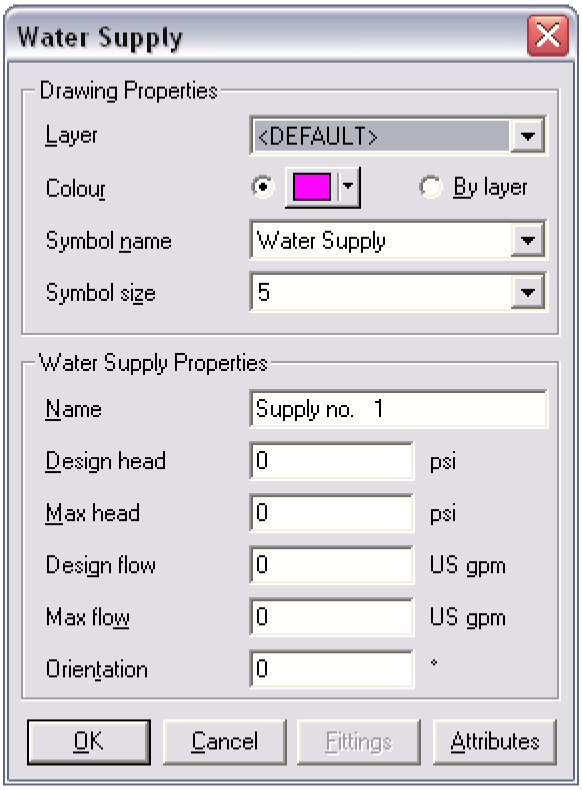


Figure 5-90

Drawing Properties

Layer: The <DEFAULT> layer for the water supply is MISC_HYDRAULIC.

Color: To change the color of the water supply symbol by clicking on the color edit field and selecting a color from the chart, or by changing the default layer color in *Settings|Layers*, and selecting the By Layer option in the dialog.

Symbol Name: The default symbol is the Water Supply symbol. Select from the dropdown list in the dialog if the user wish to changethe user wishes to change the symbol used. Be aware that some symbols may have a default color of white, not black. Change the color as required.

Symbol Size: Select a symbol size for the water supply. The symbol size ranges from 0-9. This symbol size, along with the design size will dictate the size of the symbol on the design. For more information on symbol size, see *Settings|Miscellaneous* – "Design Size", Section 5.10.12.3.

The default settings can be edited in *Settings|Irrigation Items*.

Water Supply Properties

Water Supply Name: Specifies the name of the water supply. The default can be changed in *Settings|Names*, or from *Right-click|Default Names*.

Calculate pressure?: When enabled the "Design" and "Maximum" head fields will be disabled and cause the supply pressure to be calculated during the design process.

Design Head: The pressure available from the water supply that ideally should not be exceeded for the design. This pressure, if specified, is used in the calculation of mainline pressures. If a pressure is not specified, IRRICAD will calculate the Design Pressure requirement for the system.

Maximum Head: The maximum pressure available from the water supply that cannot be exceeded under any circumstances.

Design Flow: The flow available from the water supply that ideally should not be exceeded for the design. If the valve operating sequence results in a water supply that exceeds this value, the user will be warned but allowed to proceed. If the Design Flow is left as zero, IRRICAD will calculate the Design Flow requirement for the system.

Maximum Flow: The maximum flow available from the water supply that should not be exceeded under any circumstances.

Calculate running costs for water supply?: Controls whether the cost of producing the duty for this supply is included in the calculations. When there is no running cost directly associated with a supply (for example when a pump is included downstream,

	as part of a water supply scheme, or a gravity system) then the field should normally be unchecked. For water supplies where the automatic calculation of pressure has been specified this option would usually be enabled. Tip: To include a pump in the capital costs without placing a pump in the hydraulic design add a pump (or item of similar value) via *Design|Miscellaneous Costs*.
Orientation:	The Orientation in degrees for the water supply symbol.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

See also:

Irrigation Items - Symbols	*Section 5.10.9.8*
Names	*Section 5.10.15*

5.8.2 Pipe (Mainline)

Refer to *Zone|Pipe* (see Section 5.7.1).

The default layer for mainline pipes is MAINLINE_PIPES. No zone items can be connected to mainline items.

5.8.3 Cut Pipe (Mainline)

Mainline Cut Pipe is a tool to connect a mainline pipe to many existing mainline pipes, mainline outlets or valves.

To use Cut Pipe:

1. Select *Mainline|Cut Pipe*.
2. Choose a pipe, or leave as **Computer Selected**; edit drawing properties if required. Click [OK].
3. Place the pipe where required, crossing other pipes as needed.
4. To finish press <Esc> on the keyboard or *Right-click|Restart*. The new pipe will now join to all pipes it has crossed, or is placed close to the ends of.

5.8.3.1 MAINLINE CUT PIPE DIALOG

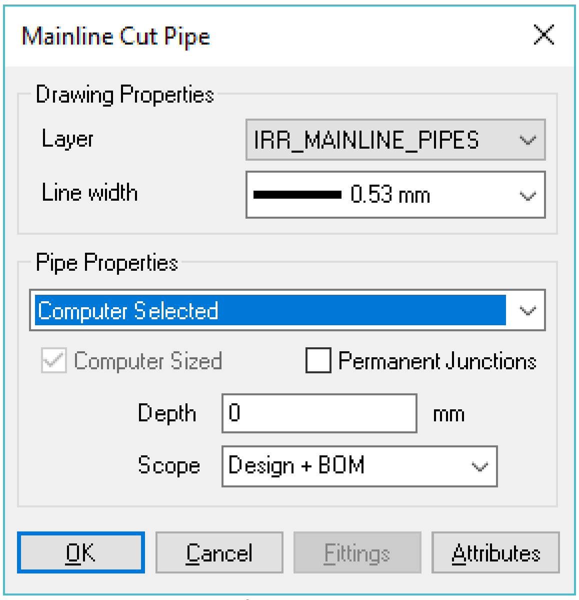


Figure 5-91

<u>Drawing Properties</u>

Layer: The default layer is MAINLINE_PIPES.

Line Width: The line width can be changed and saved as default in *Settings|Irrigation - Design Specific*. Color and symbol are edited in the Database Editor only (see Pipes, Section 3.8.1).

<u>Pipe Properties</u>

Item: The currently selected pipe. Pipes available in the dropdown list have been entered into and enabled in the pipe database.

Computer Sized: Check to get IRRICAD to select a suitable pipe size during Design. Uncheck if manually selecting a pipe or to keep the pipe size previously selected by IRRICAD during Design.

Depth: The depth of the hydraulic item <u>below</u> ground level. If the hydraulic item is <u>above</u> ground level enter this height as a <u>negative</u> number.

Scope:	This determines whether this item is to be designed only, in BOM reports only or both.

User Attributes

This button enables any extra information to be attached to these items and subsequently used in labels and reports.

5.8.4 SPRAYLINE (MAINLINE)

A mainline sprayline is a tool for placing equally spaced Valve-In-Head outlets connected by mainline pipes.

Refer to *Zone|Sprayline* (see Section 5.7.2). No zone items can be connected to mainline items. All mainline spraylines are unconnected. Therefore the *Mainline|Sprayline* tool is a means for placing outlets at a fixed spacing along a pipe in one action; once placed the pipe and outlets are separate entities.

Because mainline sprayline outlets are valve-in-head sprinklers each outlet is a zone. When entering mainline outlets the user will be asked to name the sprayline and individual outlets, or to accept the default name. The default name can be edited in *Settings|Names*, or prior to placing the sprayline in *Right-click|Default Names*. The default name can also be edited when the first point of the sprayline has been placed, and after the second point has been placed the user are still able to edit the outlet names, though the sprayline name is now fixed.

> Tip: *Holding the <Shift> key when placing the sprayline will bypass the name dialog, accepting the default name.*

The default layers for mainline spraylines are MAINLINE_PIPES for the sprayline pipe, OUTLETS for the outlet the user have selected, and OUTLET_WETTED_RADII for the outlets wetted radii. These can be turned on or off in *Settings|Layers*. Wetted radii default settings can be changed in *Settings|Irrigation Items*.

See also:

Sprayline	*Section 5.7.2*
Names	*Section 5.10.15*

5.8.5 PUMP

A pump is a device that supplies water with a known pressure discharge relationship.

To place a pump on the design:

1. Select *Mainline|Pump*.
2. Edit the dialog as required. Click [OK].
3. Click to connect the pump. If the pump is a main supply pump connect it slightly downstream of the water supply. If it is a booster pump connect it within a pipeline not at a tee junction.
4. Repeat Step 3 as required.

IRRICAD will automatically connect the pump to a pipe if the “Default Snap Mode” is “Connect” (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the pump.

5.8.5.1 PUMP DIALOG

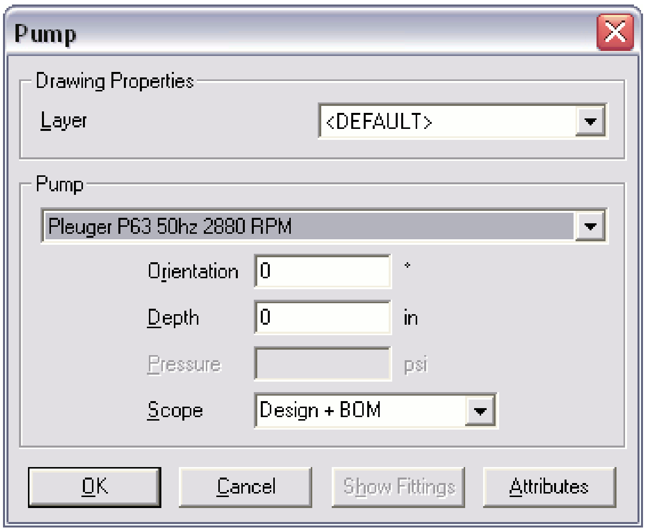


Figure 5-92

Drawing Properties

Layer: The <DEFAULT> layer for pumps is MISC_HYDRAULIC. The symbol and color

	properties can only be edited in the Database Editor (see Pumps, Section 3.8.10).

Pump

Item:	The pump currently selected. All pumps available in the dropdown list have been entered and enabled in the Database Editor.
Orientation:	The orientation in degrees for the pump symbol.
Depth:	The depth of the hydraulic item below ground level. If the hydraulic item is above ground level enter this height as a negative number.
Scope:	This determines whether this item is to be designed only, in BOM reports only or both.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.8.6 JUNCTION (MAINLINE)

Refer to *Zone|Junction (Hydraulic)* (see Section 5.7.11). No zone items can be connected to mainline items

5.8.7 OUTLET (MAINLINE)

Outlets are devices that discharge water from an irrigation system. Mainline outlets connect to mainline pipes and do not require a control valve.

To place on outlets on the design:

1. Select *Mainline|Outlet*. Select a sprinkler, nozzle and riser from the dropdown lists in the dialog.

Note: If the user knows the first letter of a database entry, N for a Nelson product for example, pressing N on the keyboard will take the user to the first N entry in the database.

2. Edit the dialog as required. Click [OK].

Note: Changing one of the pressure, flow and radius fields for the nozzle will cause a change in one or both of the other two. Press the <Enter> key to update the fields.

3. Click to connect this outlet where required.
4. Repeat Step 3 as required.
5. To change to another sprinkler, simply follow steps 1 to 5 again.

IRRICAD will automatically connect the outlet to a pipe if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the wire.

Because mainline outlets are valve-in-head sprinklers, they require a Zone name. The user can edit the default zone name by typing in a new name in the edit dialog when the outlet is first placed. The default name can also be changed for the outlets prior to placing them on the screen by selecting the *Right-click|Default Name* option. Type in a new name in the edit box. Zone names can be changed individually after the outlets have been placed, by using *Modify|Select Object* and *Modify|Change*.

Tip: Holding the <Shift> key when placing the outlet will bypass the name dialog, accepting the default name.

5.8.7.1 Outlet Dialog

Drawing Properties

Layer: The <DEFAULT> layer for outlets is the OUTLETS layer. Colors and symbols for outlets can only be edited in the Database Editor (See Outlets, Section 3.8.11). Wetted radii default settings can be changed in *Settings|Irrigation Items*.

Sprinkler

Sprinkler: The outlet body currently selected. Sprinklers available in the dropdown list have been entered and enabled in the Database Editor.

Nozzle Properties

Nozzle: The sprinkler nozzle currently selected. Nozzles available in the dropdown list have been entered and enabled in the Database Editor.

Pressure: Operating pressure for the sprinkler; the default value is user-defined in the database.

Flow: Flow rate for the sprinkler at the pressure shown.

Arc: The plan angle over which the sprinkler operates (in degrees).

Radius: The wetted radius for the selected nozzle at the defined pressure.

Intensity: Flow rate divided by area of application for a single sprinkler; used as a simple measure of precipitation rate.

Riser

Riser: The riser currently selected. The risers (outlet connectors) available in the dropdown list have been entered and enabled in the Database Editor.

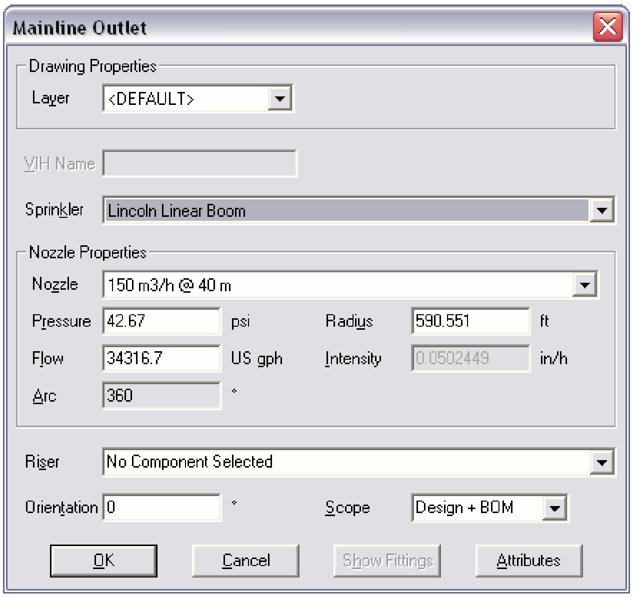


Figure 5-93

Orientation

Orientation: The orientation in degrees for the nozzle symbol.

Scope

Scope:	This determines whether this item is to be designed only, in BOM reports only or both.

Demand Point Properties

If the outlet selected is a demand point, then instead of nozzle properties, demand point properties will appear.

Pressure:	The required pressure for the demand point; the default value is user-defined in the database.
Flow:	Flow rate for the demand point.
Symbol:	A single character that will be drawn inside the demand point symbol so the user can identify it.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

See also:

Names	*Section 5.10.15*
Outlet component database	*Section 3.8.11*
Zone Junction (Hydraulic)	*Section 5.7.11*

5.8.8 Misc. Hydraulic (Mainline)

Refer to *Zone|Misc. Hydraulic* (see Section 5.7.13). For placing *Misc. Hydraulic* items on a mainline, select from the *Mainline* menu. No zone items can be connected to mainline items.

> Note: *When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.*

5.8.9 Control Valve

Refer to *Zone|Control Valve* (see Section 5.7.14). The user can select a *Control Valve* from the *Zone* or *Mainline* menu.

5.8.10 MAINLINE SPRAYLINE BLOCK

A mainline spray block is a precise method to layout mainline outlets in a block formation or spraylines a specified distance apart. This tool is useful for solid set systems where each sprinkler is controlled individually.

Refer to *Zone|Spray Block* (see Section 5.7.5). No zone items can be connected to mainline items. All mainline spraylines are unconnected. Therefore the *Mainline Sprayline Block* tool is a means for placing outlets and pipe at a fixed spacing in one action; once placed the pipe and outlets are separate entities and each outlet is a zone.

To draw a Mainline Sprayline Block:

1. Select *Mainline|SprayBlock*.
2. Edit the dialog as required. Click [OK].
3. Place the starting point.
4. Place the end point of the first sprayline segment. This is also the starting point of the second segment. Place additional points to create the sprayline segments.
5. To finish press <Esc> on the keyboard.

Because mainline sprayline outlets are valve-in-head sprinklers each outlet is a zone. When entering mainline outlets enter a name for the sprayline and individual outlets, or accept the default name. The default name can be edited in *Settings|Names*. The default name can also be edited when the first point of the sprayline has been placed. After the second point has been placed the the outlet names can still be edited, though the sprayline name is now fixed.

Tips: *Holding the <Shift> key when placing the sprayline will bypass the name dialog, accepting the default name.*

The default layers for mainline spraylines are MAINLINE_PIPES for the sprayline pipe, OUTLETS for the outlets, and OUTLET_WETTED_RADII for the outlets wetted radii. Wetted radii default settings can be changed in Settings|Irrigation Items.

5.9 ELECTRICAL

The *Electrical* menu has the following commands:

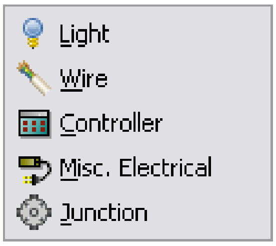


Figure 5-94

The *Electrical* menu allows the user to place electrical items in the design for costing purposes only.

5.9.1 LIGHT

Used to place electrical lighting in the design.

To place a light in the design:

1. Select *Electrical|Light*.
2. Edit the dialog as required. Click [OK].
3. Click the place the light where required.
4. Repeat Step 3 as required.

IRRICAD will automatically connect the light to a wire if the “Default Snap Mode” is “Connect” (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the wire.

5.9.1.1 LIGHT DIALOG

Drawing Properties

Layer: The <DEFAULT> layer for lights is ELECTRICAL. Color and symbol are edited in the Database Editor only (see Lights, Section 3.8.16).

Item Properties

Item: The light currently selected. The lights in the dropdown list have been entered and enabled in the Database Editor.

Orientation: The orientation in degrees for the light symbol.

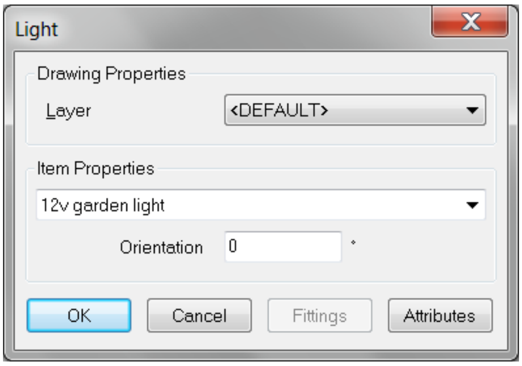


Figure 5-95

<u>Note</u>: *When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.*

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.9.2 WIRE

Used to place electrical wiring and to connect other electrical items in this design.

To place a wire:

1. Select *Electrical|Wire*.
2. Edit the dialog as required. Click [OK].
3. Place the starting point.
4. Place the end point of the first wire segment. This is also the starting point of the next segment.
5. Continue placing points to create wire segments.
6. To finish select *Right-click|Restart*.

7. Repeat Steps 3 to 6 as required.

IRRICAD will automatically connect the wire to another wire if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the wire.

5.9.2.1 WIRE DIALOG

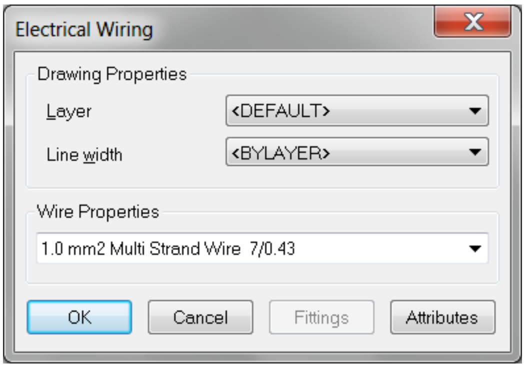


Figure 5-96

Drawing Properties

Layer: The <DEFAULT> layer for Wire is ELECTRICAL.

Line Width: The line widths range from 1 to 15. Color and line types are edited in the Database Editor only (see Wires, Section 3.8.14).

Wire Properties

Item: The wire currently selected. All wires in the dropdown list have been entered and enabled in the Database Editor.

Note: *When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.*

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.9.3 CONTROLLER

A controller is an electrical device which is able to turn valves on and off as required.

To place a Controller:

1. Select *Electrical|Controller*.
2. Edit the dialog as required. Click [OK].
3. Click to place the item where required.
4. Repeat Step 3 as required.

IRRICAD will automatically connect the controller to a wire if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the wire.

5.9.3.1 CONTROLLER DIALOG

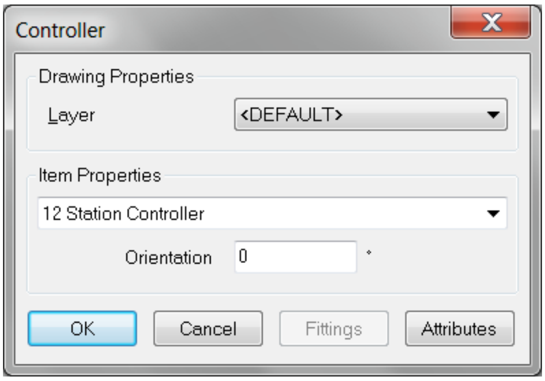


Figure 5-97

Drawing Properties

Layer: The <DEFAULT> layer for the controller is ELECTRICAL. Edit the layer if necessary. Color and symbol are edited in the Database Editor only (see Controllers, Section 3.8.15).

Item Properties

Item: The controller currently selected. All items in the dropdown list have previously been entered and enabled in the Database editor.

Orientation: The orientation in degrees for the controller symbol.

Note: When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.

User Attributes

This button allows the user to attach any extra information to these items and subsequently use it in labels and reports.

5.9.4 MISC. ELECTRICAL

Miscellaneous Electrical items are any electrical items that are not Controllers, Wires or Lights.

To place Misc. Electrical items:

1. Select *Electrical|Misc. Electrical*.
2. Edit the dialog as required. Click [OK].
3. Click to place the item where required.
4. Repeat Step 3 as required.

IRRICAD will automatically connect the Misc. Electrical items to a wire if the "Default Snap Mode" is "Connect" (see *Settings|Snap*, Section 5.10.16.1) and the cursor is close to the wire.

5.9.4.1 MISC. ELECTRICAL DIALOG

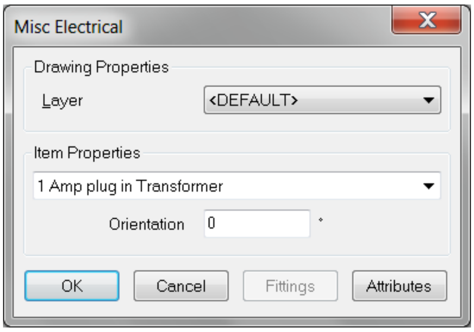


Figure 5-98

Drawing Properties

Layer:	The <DEFAULT> layer for Misc. Electrical items is ELECTRICAL. Color and symbol are edited in the Database Editor only (see Other Electrics, Section 3.8.17).

Item Properties

Item:	The misc. electrical item currently selected. The misc. electrical items in the dropdown list have been entered and enabled in the Database Editor.
Orientation:	The orientation in degrees of the misc. electrical item symbol.

Note: When changing or viewing an item in the design through the Change dialog, the item name will appear bold black if found and turned on in the database, bold green if found but turned off in the database or bold red if not found in the database.

5.9.5 Junction (Electrical)

A junction is the joining of two to four electrical items, e.g., wires, lights, controllers etc.

To place a Junction:

1. Select *Electrical|Junction*.
2. Edit the dialog as required. Click [OK].
3. Click to place the junction where required.
4. Repeat Step 3 as required.

5.9.5.1 Junction Dialog

Drawing Properties

Layer:	The <DEFAULT> layer for the electrical junction is ELECTRICAL.
Color:	The color for junctions can be edited by selecting a color from the color chart by clicking on the color edit field, or by changing the default layer color in *Settings|Layers* and selecting the By Layer option in the junction dialog.

Symbol name: The default symbol for junctions is the Junction symbol. Select from the dropdown list if the user wishes to use another symbol for this junction. Be aware that some symbols may have their default color as white not black, and will not be seen unless another color is selected for the new symbol.

Symbol Size: The symbol size ranges from 0 to 9 and is relative to the size of the design. For more details on symbol sizes, *Settings|Miscellaneous* – “Design Size”, Section 5.10.12.3.

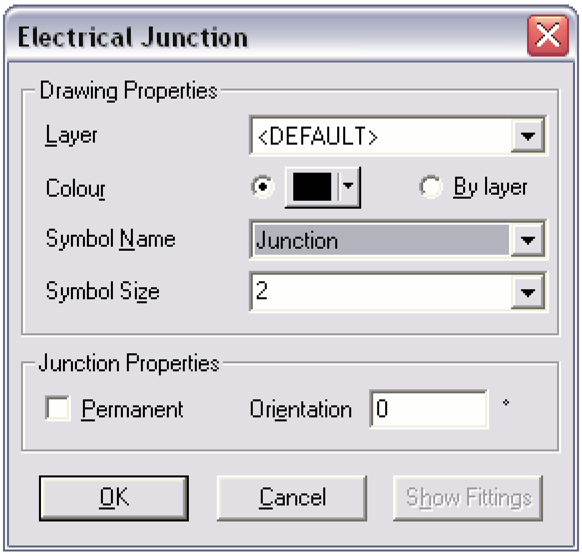


Figure 5-99

The default settings can be edited in *Settings|Irrigation Items*.

Junction Properties

Permanent: Has no effect for Electrical Junctions.

Orientation: The orientation in degrees of the junction symbol. The orientation of the symbol is purely visual, e.g., an orientated square is a diamond shape.

See also:

Irrigation Items - Symbols Section *5.10.9.8*

5.10 Settings

The *Settings* menu has the following commands:

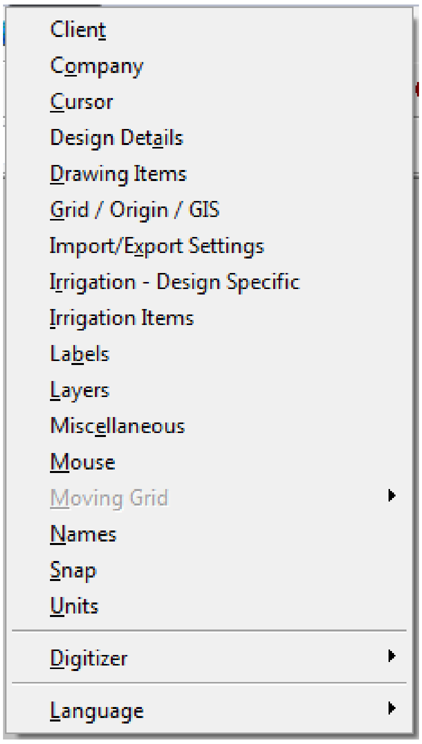


Figure 5-100

Settings are the default values, modes or limits that IRRICAD will use. System settings are those settings which, once set, will remain in force from design to design until the user changes them. They will not be reset when the user starts a new design. Examples of system settings are the cursor color and IRRICAD units.

Design settings are those settings which are set for each design and which will be reset to defaults when a new design is started. Examples of design settings are the selected database and lateral line width. Design settings are stored with the design and are therefore restored when the user opens an existing design.

The information entered into the dialogs about the design, company or client can appear in Reports and Layouts. For Layouts see Appendix I: Plot Template Keywords, Section 6.10.2.

Save As Defaults: Applies to design settings only. Saves the current values to the registry so they will be used as the defaults for a new design.

Restore Defaults: For design settings, restores the default values from the registry. For system settings, restores the hardwired default values.

The items in the *Settings* menu are displayed as tabs on a dialog.

5.10.1 CLIENT

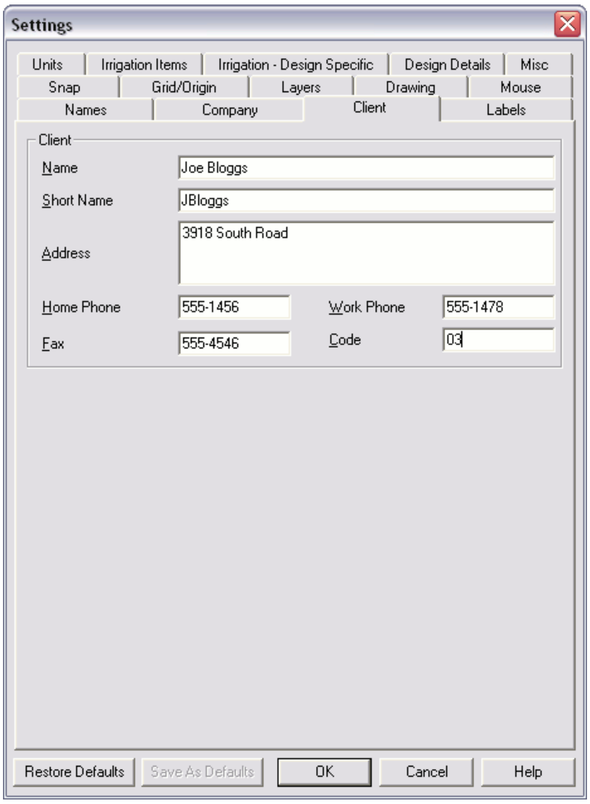


Figure 5-101

5.10.1.1 CLIENT

Name: Full name of client.
Short Name: First name or diminutive form for use in letters etc.
Client Address: Full address of client.
Client Home Phone: Home phone number of client.
Client Work Phone: Work phone number of client.
Client Fax: Fax number of client (if applicable).
Client Code: A three-character code for the client.

See also:

Plot Template Keywords *Section 6.10.2*

5.10.2 COMPANY

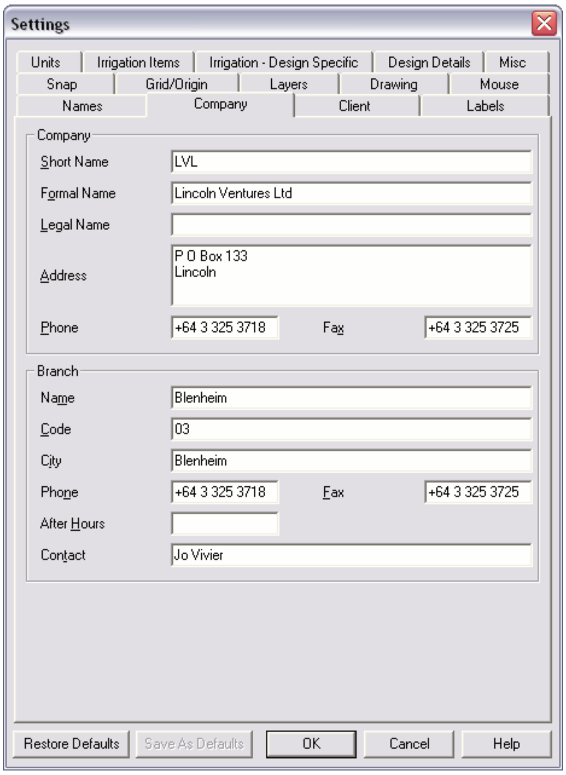


Figure 5-102

These settings contain information about the company that can be printed on reports and designs.

To enter company information:

1. Select *Settings|Company*.
2. Enter the required information.
3. Click [OK].

5.10.2.1 Company

Short Company Name: Abbreviated or popular company name, e.g., Acme for use as an adjective in letters etc., e.g., The Acme sprinklers ...

Formal Company Name: Normal form of name, e.g., Acme Irrigation, this may appear on a plot.

Legal Company Name: Full legal company name to be used in documents such as contracts, e.g., Acme Irrigation Services Pty. Ltd.

Company Address: Address of company head office (in full).

Company Phone: Phone number of company head office.

Company Fax: Fax number of company head office.

5.10.2.2 Branch

Branch Name: Name of local branch of company.

Branch Code: Code of local branch (if company has codes for branches).

Branch City: City local branch is located in.

Branch Phone: Phone number of local branch.

Branch AH Phone: After hours phone number of local branch (if applicable).

Branch Fax: Fax number of local branch.

Branch Contact: Name of person for clients to contact.

See also:

Plot Template Keywords *Section 6.10.2*

5.10.3 Cursor

The cursor settings control the appearance of the cursor.

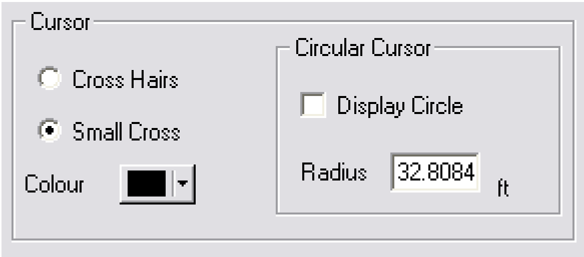


Figure 5-103

To change the Cursor:

1. Select *Settings|Cursor*. This option will take the user to the *Drawing* tab.
2. Change settings as required.
3. Click [OK].

5.10.3.1 CURSOR SETTINGS:

Small cross:	The cursor is drawn as a small cross.
Cross hairs:	The cursor is drawn as crosshairs.
Color:	Select the color of the cursor by clicking on the color.

5.10.3.2 CIRCULAR CURSOR

When "Display Circle" is checked, a circle of the given "Radius" centered around the main cursor is displayed. Circular cursor may be used to place sprinklers at a given spacing (the radius of the circle) or draw spraylines parallel to curved boundaries.

To use Circular Cursor:

1. Select *Settings|Cursor*. This option will take the user to the *Drawing* tab.
2. Check the "Display Circle" check box.
3. Type in the size of radius required (e.g., the distance required from the existing object)

<u>Note:</u> *Circular cursor is automatically turned off if "Snap to Grid" is turned on.*

5.10.4 DESIGN DETAILS

These settings allow the user to enter specifics for the project. The details will be printed on reports and on the plotted design.

To enter design headings:

1. Select *Settings|Design Details*.
2. Enter all necessary data.
3. Click [OK].

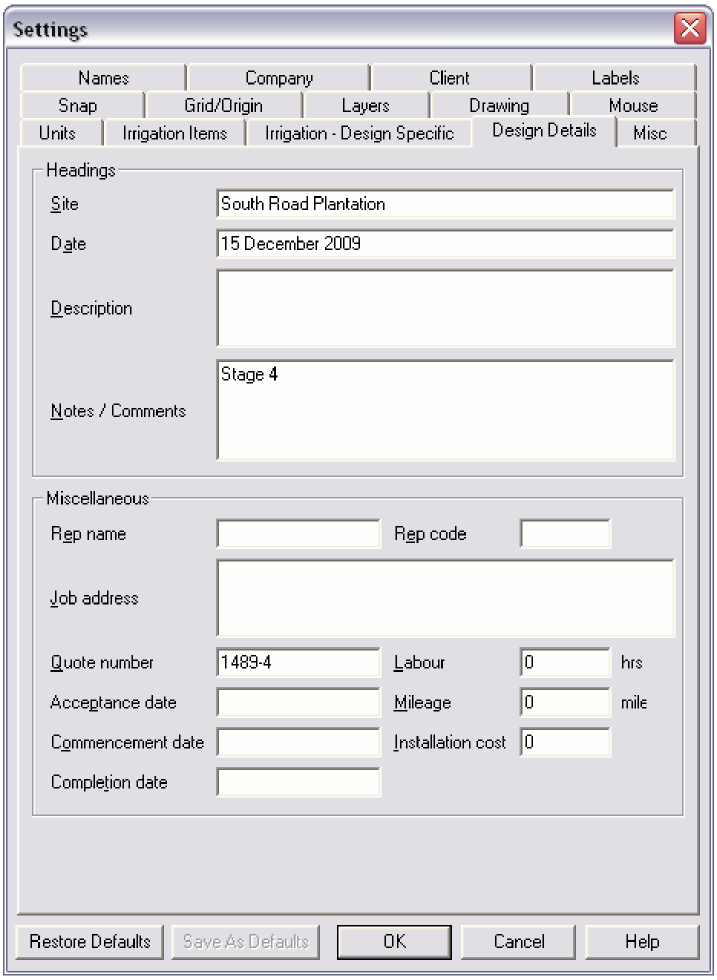


Figure 5-104

5.10.4.1 Headings

Site:	The site of the design or a title for it to be used for printing and reports.
Date:	The date the design is started.
Description:	A brief description of the design to be used in document output.
Notes / Comments:	Any comments the user wishes to make about the design such as which databases the user used, any other designs the user wishes to refer to etc.

Note: Use this field to enter additional notes, especially if re-doing the design in a different way. These will be printed at the start of each report.

5.10.4.2 Miscellaneous

Rep Name:	Name of local branch representative or salesman.
Rep Code:	Code for local branch rep (if company uses them).
Job Address:	Full address of site for the design.
Quote Number:	Unique reference for use in documents.
Acceptance Date:	Date quote is accepted.
Commencement Date:	Date installation is commenced.
Completion Date:	Date installation is completed.
Labor:	Total number of labor for installation (hours).
Mileage:	Total distance traveled (miles or km) for the job.
Installation Cost:	Total cost of installation excluding tax.

See also:

Plot Template Keywords — *Section 6.10.2*

5.10.5 Drawing Items

These settings are system settings for geometric items and drawing tools. Once set they remain in force until the user changes them, i.e., they do not reset when the user starts a new design.

To change the default settings for drawing items:

1. Select *Settings|Drawing Items*.
2. Change any settings as required.
3. Click [OK].

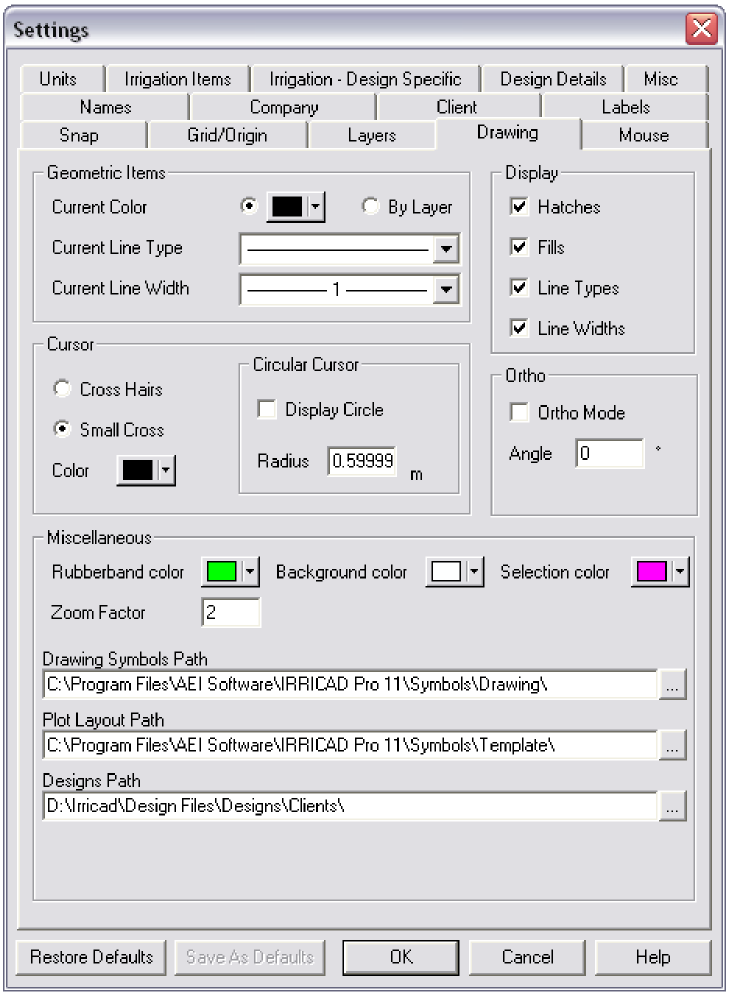


Figure 5-105

5.10.5.1 Geometric Properties

Geometric items are all items from the *Draw* menu excluding contours and spot heights.

Current Color:	Either select a specific color by clicking on the color or select By Layer to use the color property of the current layer for geometric items.
Current Line Type:	Select a specific line type from the dropdown list or <BYLAYER> to use the line type property of the current layer for geometric items.
Current Line Width:	Select a specific line width from the dropdown list or <BYLAYER> to use the line width property of the current layer for geometric items.

5.10.5.2 COLORS

The number of colors available in IRRICAD has been increased to 256.

Using AutoCAD Colors

IRRICAD loads the colors from the file vga.pal (located in the IRRICAD folder) or, if no file is found, sets up a default palette of colors. If an AutoCAD palette is required instead of the default palette the user needs to do the following:

Find the file vga.pal in the IRRICAD folder using Windows Explorer. Rename it to Vcadd.pal, for example. In the same folder, find either acadwindows.pal or acaddos.pal, depending on whether t Windows or DOS AutoCAD colors are required, and rename it to vga.pal.

Note that changing the palette will affect all designs; even those created with the old palette will have their colors changed.

Mapping AutoCAD Colors

When importing files IRRICAD maps the color from the DWG/DXF file to IRRICAD screen colors based upon the mapping selected in the *Import/Export Settings* under the Settings menu. If the user are using an AutoCAD palette and want the color numbers to be preserved then 'Custom' mappings should be setup as follows. In the *Color Import* tab of *Import/Export Settings* select the "Use Custom Map" radio button. Now select **One to One** from the "Map" dropdown box. Repeat this process on the Color Export tab. Note this method replaces the use of the 'KeepColorNumbers' registry setting which is no longer used.

For more information on *Import/Export Settings* see the section below.

5.10.5.3 Cursor Settings

See Cursor, Section 5.10.3 and Mouse, Section 5.10.13.

5.10.5.4 Miscellaneous Settings

Rubberband color:	The color used for the rubberband line (a temporary line that provides a dynamic preview of where the next point would be placed in the current drawing or editing operation, in relation to the last point entered and the current cursor position).
Selection color:	The color used for highlighting selected objects.
Background color:	The background color of the design. Choosing a background color changes only how the drawing appears on the screen. Because IRRICAD does not print or plot the background, the output is unaffected.
Zoom factor:	Sets the multiplier used to change the drawing magnification when the Zoom In command is used. The factor for the Zoom Out command is the reciprocal of this number.
Drawing Symbols Path:	The default path (folder) where IRRICAD looks for drawing symbols i.e., symbols such as trees etc. used in the *Draw|Symbol* tool.
Plot Layout Path:	The default path (folder) where IRRICAD looks for plot templates, i.e., templates containing pipe legends etc. used in *Draw|Plot Layout*.
Designs Path:	Specifies the default folder for designs for *File|Open* and *File|Save*.
Reports Path:	When this setting is changed the reports menu is automatically rebuilt to reflect the templates available in the selected folder. This feature allows for changing between different sets of reports without moving the reports to the default folder. This could be useful if different sets (for different design types) are created to keep report menus short or to change between language versions.

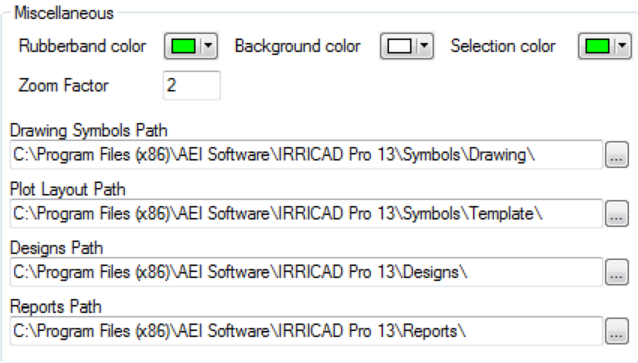


Figure 5-106

5.10.5.5 Display Settings

Hatches, Fills, Line Types, and Line Widths can be turned off in this dialog. Unchecking will hide hatches and fills, and draw line types as solid, and line widths as 1 regardless of the actual values. This can speed up redraws or hide these properties for printing.

5.10.5.6 Ortho Settings

"Ortho Mode" aligns each new point horizontally or vertically with the previous point placed. The angle of alignment can be changed from horizontal and vertical to any specified angle with the Ortho Angle setting.

Angle: Specifies the Ortho "Angle".
Ortho Mode: Specifies if "Ortho Mode" is on or off.

Note: *Holding the <Ctrl> key down when on "Ortho Mode" with disengage "Ortho Mode". Holding the <Ctrl> key down when not in "Ortho Mode" will engage "Ortho Mode" and at the angle set in this dialog field.*

5.10.6 Grid / Origin / GIS

5.10.6.1 Grid

Grid is a tool that places a grid of points on the screen to aid in drawing.

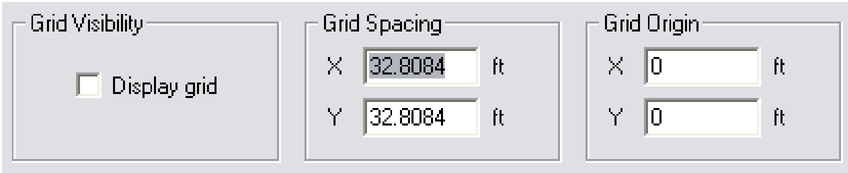


Figure 5-107

To set grid properties:

1. Select *Settings|Grid*.
2. Edit the grid properties as required.
3. Click [OK].

Grid Visibility

Display Grid Points: toggles on or off the display of the grid.

Grid Spacing

Spacing: Sets the spacing of grid points to any convenient spacing in the X and Y directions.

Grid Origin

Origin: Moves the grid so that a specified point of the drawing falls exactly on a grid point.

Tips: *Turning the grid display on or off does not affect the status of Snap to Grid. This can still be on (constraining cursor movement to grid points only) even if the grid points themselves are not visible.*

If there are two numbers on the Windows clipboard, they can be copied to any pair of X,Y boxes using the <Ctrl>+V shortcut key combination when the focus is in any edit box.

See also:

Snap Panel — *Section 5.5.13.2*

5.10.6.2 ORIGIN

Typically when data from GPS or GIS software is imported into IRRICAD (usually via a DXF or DWG file) the resulting coordinates are very large. This can make it very awkward when viewing reports and entering coordinates via the keyboard. IRRICAD Pro includes a facility to set a user defined origin which has the effect of reducing the magnitude of the coordinates displayed on screen and in IRRICAD reports. The original origin is retained internally so that if any data is exported it will use the original coordinate system.

These origins are defined in the "User Origin" section under *Settings|Grid*.

Figure 5-108

User Origin

X,Y: The X and Y Coordinates of the user origin, all coordinates displayed will be relative to this point.

Enable User Origin: When checked the origin defined in X,Y will be used.

To use "User Origin":

1. A DXF file is imported with coordinates ranging from 2431236.0 to 2432257.0 in the X direction and 5733465.0 to 5734532.0 in the Y direction.
2. Set the "User Origin" to 2431200 in the "X" box and 573300 in the "Y" box.
3. The resulting coordinates would be approximately between 0 and 1000.0

Notes:

The original world coordinates are still retained internally in IRRICAD. This means that when importing another drawing (with the same coordinate system) into the same design, or exporting the design, the world coordinates will be used.

Toggle between the world coordinates and set user coordinates by using the "Enable User Origin" check box.

The coordinates may be copied from the Object Info dialog (do not copy "P1" and pasted directly into the "X" box, where the corrdinates will be pasted correctly across both boxes.

The exact position of the user origin can be set to a specific item on the plan e.g., end or corner of a fence line. In this way the coordinates on the design will reflect the distance from this item on the plan.

5.10.6.3 GIS OPTIONS

The current UTM zone is displayed in *Settings|Grid/Origin/GIS*.

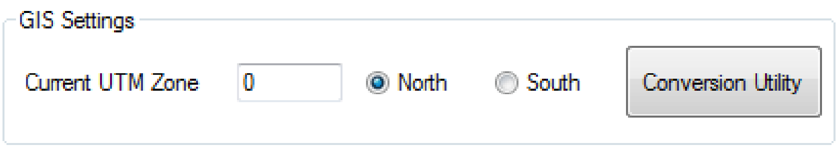


Figure 5-109

GIS Settings

Current UTM Zone: Displays the current UTM (imported) zone.
Zone - The zone number e.g., UTM 59
North - If the UTM zone is North, this radio button will be checked.
South - If the UTM zone is South, this radio button will be checked.

When importing a GeoTIFF image or KML/KMZ file the current UTM zone will be set using the geographic information in the imported file. Conflicting zones, when another geo-referenced file is imported, will cause a warning message to be displayed.

Conversion Utility:

Converts UTM to WGS84 coordinates and WGS84 coordinates to UTM.

UTM: Set the UTM zone.
Zone - The UTM zone
N - The hemisphere if North.
S - The hemisphere if South.

Convert Buttons: Convert from UTM to WGS84 or from WGS84 to UTM.

WGS84: Set the WGS84 coordinates.

Latitude - The latitude in decimal degrees.
Longitude - The longitude in decimal degrees.

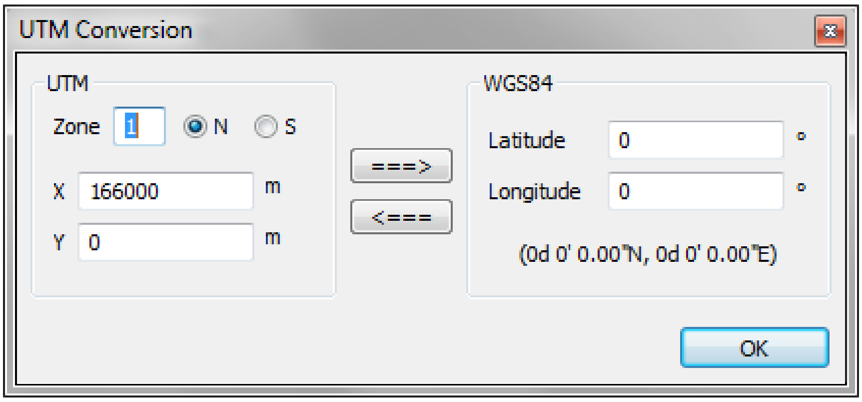


Figure 5-110

For an explanation of UTM see Importing a DXF, VCD DWG, GCD, SHP, MIF, CSV or KML File, Section 2.4.1.1.

Internal Offset /Scale

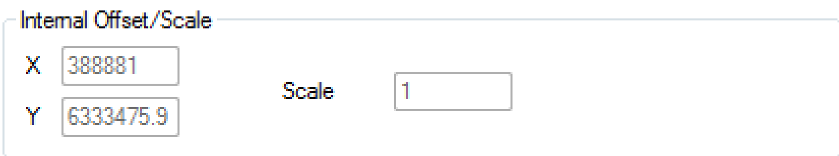


Figure 5-111

X:	The "X" coordinate of the internal origin based on the location of the imported plan.
Y:	The "Y" coordinate of the internal origin based on the location of the imported plan.
Scale:	The resolution based on the span of items on the plan.

5.10.7 IMPORT/EXPORT SETTINGS

IRRICAD is based on Visual CADD which uses a different set of colors than AutoCAD, so colors must be mapped when importing and exporting. Similarly for Fonts, the user can use font mapping to translate AutoCAD font names into names of fonts available to IRRICAD (and vice versa), or the user can choose to translate all fonts to a specific font the user select.

This section describes the various parameters that can be set that control the importing and exporting of Autocad DXF and DWG files.

5.10.7.1 DWG SETTINGS TAB

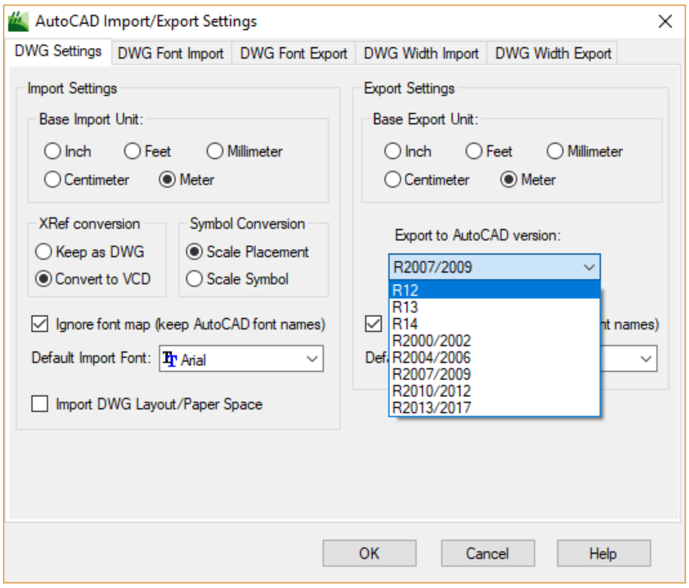


Figure 5-112

Export to AutoCad

Select the required export format.

Xref Conversion

Leave this as **Keep as DWG**.

Base AutoCAD Unit

Selects the unit of measurement in which the AutoCAD drawing was created. This is the same setting as the "Imported" unit in *Settings|Units*.

Font Name Import/Export

Ignore Font Map: When checked, current font mapping in DWG Font tabs is overridden. All fonts are mapped to the existing fonts of the same name. If the font of the same name does not exist, IRRICAD will map the font to the default font.

Default Export Font: During export, specifies the font name to be used when no mapping exists for a font.

Default Import Font: During import, specifies the font name to be used when no mapping exists for a font.

5.10.7.2 DWG Font Import Tab

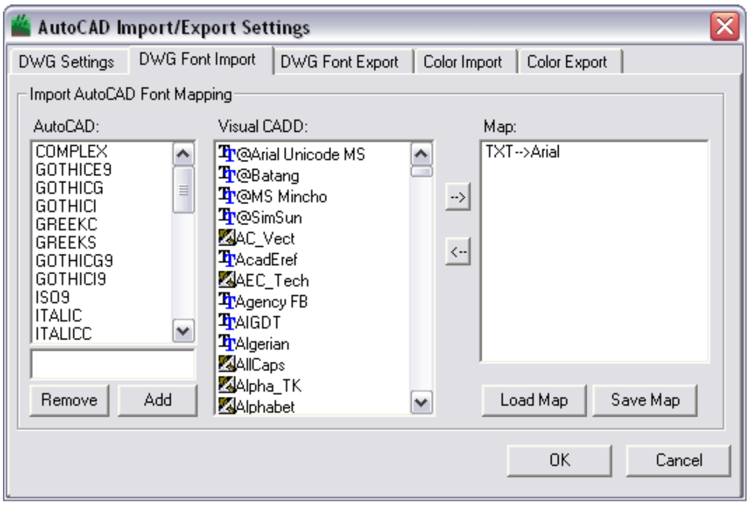


Figure 5-113

This tab allows the user to control how fonts in translated AutoCAD drawings are imported into IRRICAD. The Import AutoCAD Font Mapping options display list boxes of AutoCAD font names, IRRICAD font names, and a list box showing which AutoCAD fonts have been mapped to which IRRICAD fonts.

To map AutoCAD fonts to IRRICAD fonts

1. Click the name of an AutoCAD font the user wishes to translate to a specific IRRICAD font.
2. Click the name of the IRRICAD font the user wishes to substitute for the specified AutoCAD font.
3. Click the right arrow button.

The pair of font names will appear in the map table list box.

To delete a mapped pair of fonts from the map list

1. Click and highlight the pair of mapped font names the user wishes to delete from the map list.
2. Click the left arrow button.

The font pair will be deleted from the map list.

5.10.7.3 DWG FONT EXPORT TAB

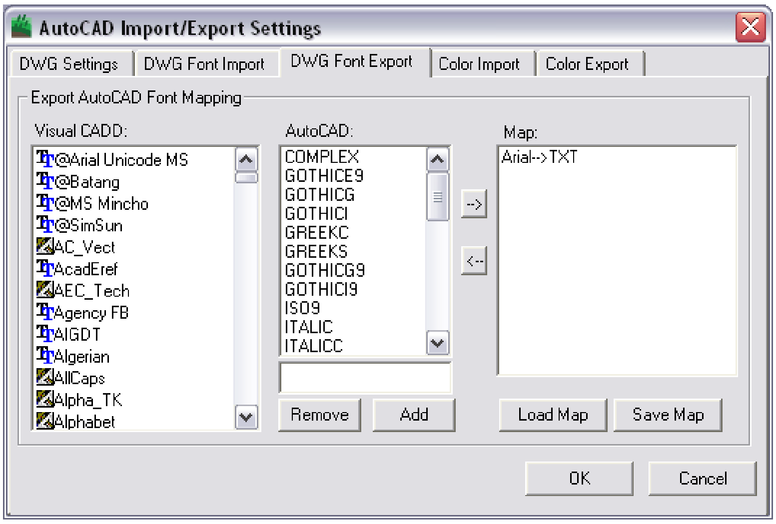


Figure 5-114

This tab allows the user to control how fonts will be translated when IRRICAD drawings are exported into AutoCAD .dwg format. The “Export AutoCAD Font Mapping” options display list boxes of IRRICAD/Visual CADD font names, AutoCAD font names, and a list box showing which IRRICAD fonts have been mapped to which AutoCAD fonts.

To map IRRICAD fonts to AutoCAD fonts

1. Click the name of an IRRICAD font the user wishes to translate to a specific AutoCAD font.
2. Click the name of the AutoCAD font the user wishes to substitute for the specified IRRICAD font.
3. Click the right arrow button.

The pair of font names will appear in the map table list box.

To delete a mapped pair of fonts from the map list

1. Click and highlight the pair of mapped font names the user wishes to delete from the map list.
2. Click the left arrow button.

The font pair will be deleted from the map list.

Tips: *IRRICAD will not map one source font to more than one destination font.*

The user can save font maps and then load them for later conversions

The user can add new fonts and delete fonts from the AutoCAD font list in both Import and Export to be used in mapping.

5.10.7.4 Color Mapping

IRRICAD/Visual CADD and AutoCAD have very different color indexes. Because AutoCAD maps colors to pen width for printed output, it is often important to retain these colors on drawings that the user import and then must export back to consultants or others the user share drawing files with. Color mapping provides the ability to match to other color indexes.

Default maps are provided for both AutoCAD Windows's colors and a default of 1-to-1 (DWG color 0 to VCD color 0, DWG color 1 to VCD color 1, etc.). It is however possible to create maps, for AutoCAD DOS or any other combination of colors. Line widths can also be mapped to colors, color mapping ignored on import and all colors forced to a designated color.

To Create a New Color Import Map:

1. Select the "Use Custom Map" radio button.
2. Press the [New Map] button.
3. Enter a name for the new color map and press [OK].

The new name is shown as current in the dialog dropdown list.

4. In the edit boxes, make changes to IRRICAD colors to correspond with each DWG color. If the user wants to include line width mapping, uncheck the "Ignore" box and type a line width to correspond with each DWG color.

5. Press [OK] to save the new map.

Alternatively, check the "All Colors to:" checkbox and type a color number in the right hand edit box to force all DWG colors to the one IRRICAD color.

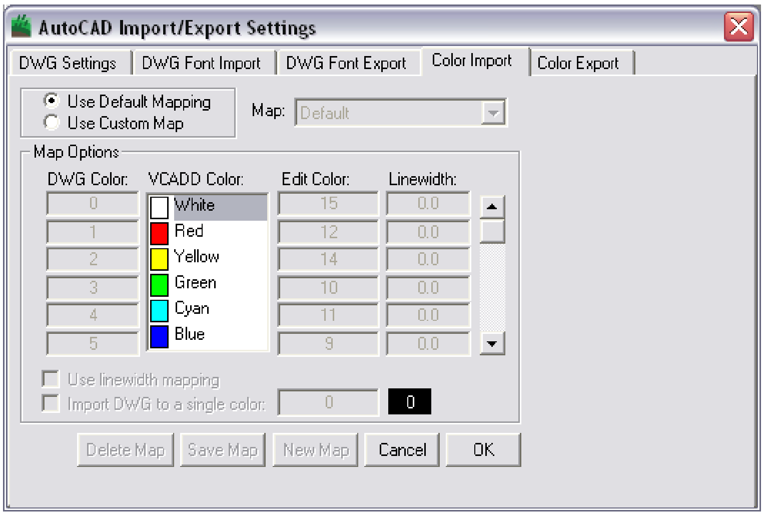


Figure 5-115

To Create New Color Export Map

1. Select the "Use Custom Map" radio button.
2. Press the [New] button.
3. Enter a name for the new color map and press [OK].
4. The new name is shown as current in the dialog dropdown list.
5. Decide whether to convert color to color or IRRICAD line width to DWG color.
6. In the edit boxes, make changes to IRRICAD line width and/or DWG colors.
7. Press [OK] to save the new map.

Warning

Pressing the [Reset] button returns all settings in the current map to the Default: DWG color 0 is VCD color 0, DWG color 1 is VCD color 1, etc. The user should never reset the AutoCAD Windows map.

Tip: *Prior to AutoCAD 2000, line width in a DWG was not an option. When importing from an earlier version, the user can map DWG* *color to an IRRICAD line width, to approximate VCADD's line width feature.*

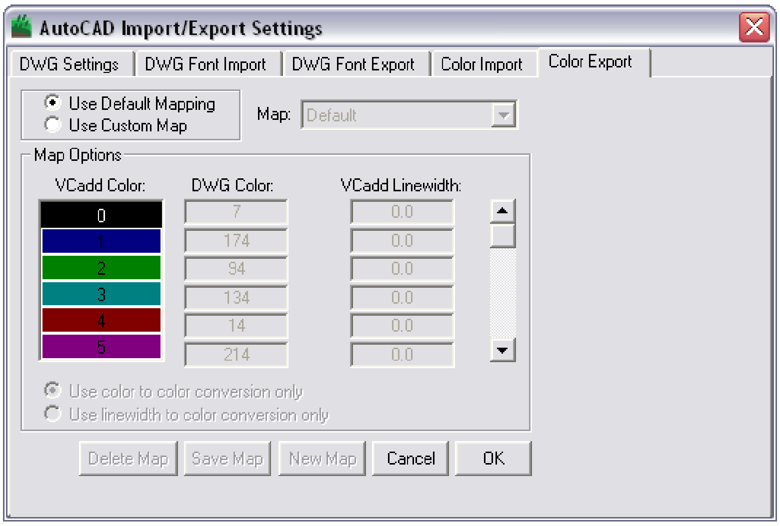


Figure 5-116

Database Symbol Color Export

Visual CADD (the CAD engine we use) handles placement color for symbols differently from AutoCAD. Consequently the color of database symbols may be lost when exporting to DXF or DWG files (this doesn't apply to outlet and nozzle symbols). When exporting use the **AutoCAD Windows** Color Export map for the symbol colors to be properly displayed in AutoCAD.

To export a design to DXF or DWG and maintain the symbol colors:

1. Draw the design plan.
2. When ready to export go to *Settings|Import/Export Settings*.
3. Click on the Color Export tab.
4. Select the "Use Custom Map" option.
5. Change the map to **AutoCAD Windows**.
6. Click [OK] to close the dialog.
7. The plan is now ready to export to DXF or DWG.

5.10.8 IRRIGATION – DESIGN SPECIFIC

These settings are design settings for hydraulic items and tools.

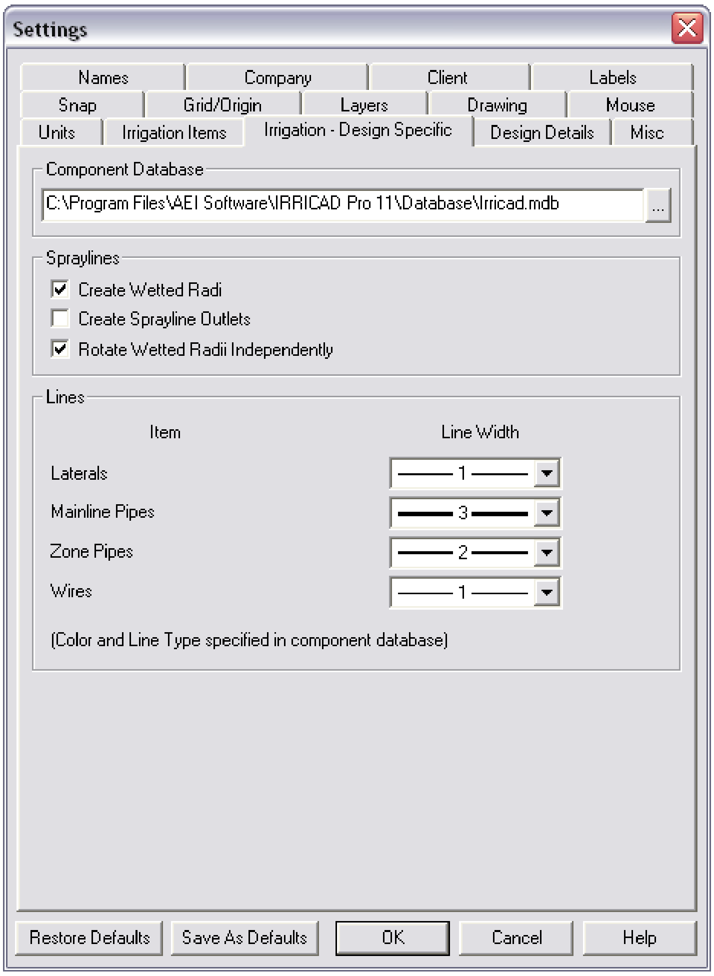


Figure 5-117

To change the default settings for *Irrigation - Design Specific*:

1. Select *Settings|Irrigation – Design Specific*.
2. Change any settings as required.
3. Click [OK].

5.10.8.1 Component Database

Database: The database where all hydraulic information is stored and from which hydraulic items in the design are selected. Either type in the path and name of the database or click [Browse] to select it.

5.10.8.2 SPRAYLINES

Create Wetted Radii Setting: If checked, a wetted radius arc will be created for each outlet drawn. If "Create Sprayline Outlets" is also checked then a wetted radius arc will also be created for each sprayline outlet drawn. If this option is left unchecked when the user places outlets, wetted radii will not be created. See *Tools|Create Wetted Radii*, Section 5.12.4.

Create Sprayline Outlets Setting: If checked, sprinkler symbols will be created for each connected sprayline drawn. If this option is left unchecked when the user places spraylines, sprayline outlet symbols will not be created. *Note:* Wetted radii and sprayline outlets may be created later using *Tools|Create Wetted Radii* and *Tools|Create Sprayline Outlets*. It is a good idea not to create sprayline outlets as there tend to be many sprayline outlets in a sprayline design. The presence of these sprayline outlets can slow down redrawing and other tools markedly. See *View|Sprayline Outlets,* Section 5.5.16 and *Tools|Create Sprayline Outlets,* Section 5.12.5

Rotate Wetted Radii Independently: If checked then a wetted radius arc may be selected and rotated independently of its sprinkler symbol. Usually a sprinkler symbol and its wetted radius arc are rotated together as a single unit.

5.10.8.3 LINES

Item: The name of the hydraulic item type (pipes or wires) to which the drawing property applies.

Line Width: Select a specific line width from the dropdown list or <BY LAYER> to use the line width property of the current layer for this type of item.

5.10.9 IRRIGATION ITEMS

These settings are system settings for hydraulic items and tools. Once set they remain in force until the user change them, i.e. they do not get reset when the user start a new design.

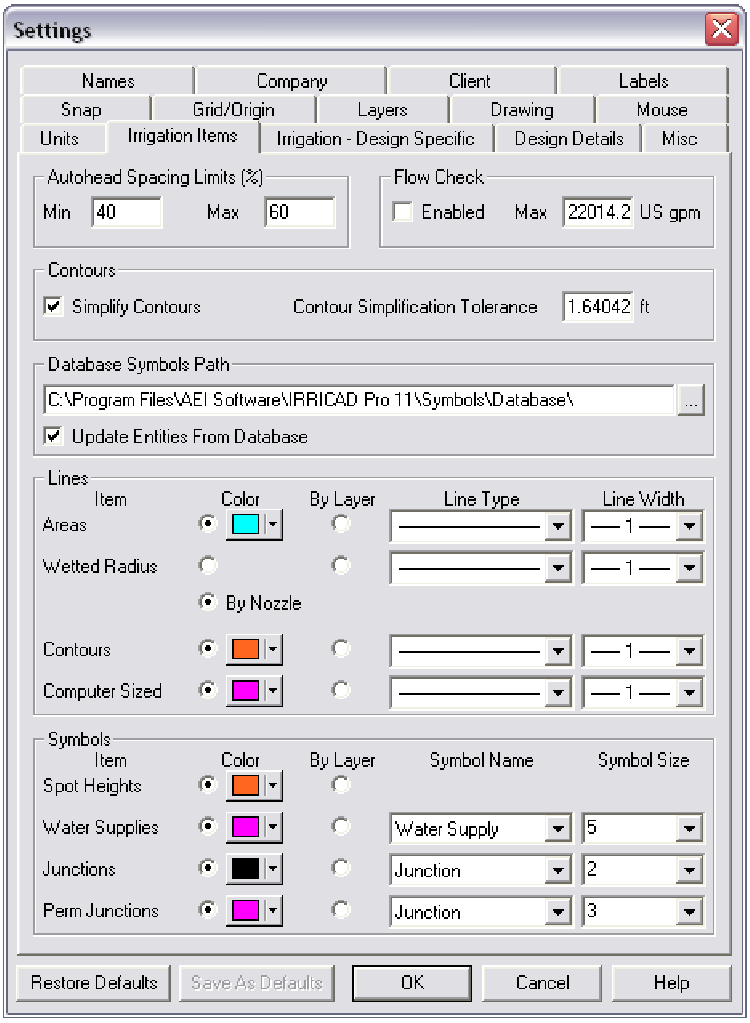


Figure 5-118

To change the default settings for irrigation items:

1. Select *Settings|Irrigation Items*.

2. Change any settings as required.
3. Click [OK].

5.10.9.1 Autohead Spacing Limits (%)

The overlap ranges that Autohead uses to space sprinklers can be restricted to the limits specified.

Autohead, where possible, will space sprinklers so that the overlap lies between the minimum and maximum values. The default values are 40% minimum to 60% maximum. (A 50% value corresponds to head-to-head spacing). Reduce these values for closer spacing (e.g., in windy areas), or increase them for wider spacing.

5.10.9.2 Flow Check

Where limits are placed on the available flow for a system, this setting aids in keeping a tally of connected zone flows during design input. If the water supply has a limitation, this would be entered as the maximum flow allowed in this field.

Check the enabled box and enter the maximum flow required for a zone into the max field.

As the user connects pipes to outlets or to groups of connected outlets, the flow required for the group is displayed (f=) on the status line. The maximum flow (m=) for a zone is also displayed. When the user connects other outlets to the group, the connected flow is automatically updated. If the currently connected flow exceeds maximum flow, a warning is displayed which allows the user to continue or to terminate the last connection.

5.10.9.3 Simplify Contours

If this item is checked then all polylines and curves that are converted into contours either via *Import Contours* or *Convert to Elevations* will be simplified. By default this option is checked.

IRRICAD has an internal limit for the number of contour segments that can be used during the elevation interpolation process. If contours are imported from a DXF file it is occasionally possible for this limit to be exceeded due to a combination of the ‘smoothness’ (i.e. the number of small line segments making up the line) and the number of contours lines that are imported. It is also possible for a similar situation to arise when using the *Convert to Elevations* tool.

In this version a facility has been added to 'simplify' any curves and polylines, that are imported as contours (or selected by the *Convert to Elevations* tool), to avoid exceeding the allowable number of contour segments. Two new items have been added to the *Irrigation Items* tab of the *Settings* menu (see Figure 5-118) to control the behavior of this option.

5.10.9.4 Contour Simplification Tolerance

A tolerance for the Douglas-Peucker algorithm which is used to simplify the polylines or curves. Making this value larger will make the resulting contours coarser. The default value of 0.5 meters should be applicable to most situations.

<u>*Notes*</u>*:*

The number of individual segments is now counted during the contour importing process. A warning message (UTIL 1606) will be generated if this number exceeds the internal limit. If this occurs then there are a number of possible solutions including: - Turn on contour simplification and re-import the contours.
- Increase the contour simplification tolerance and re-import the contours.
- Delete some contour lines.

5.10.9.5 Database Symbols Path

The default path (folder) where IRRICAD looks for database symbols, i.e. the symbols used for hydraulic items such as sprinklers, valves, etc.

5.10.9.6 Update Entities from Database

When the user place hydraulic items in a design IRRICAD copies the hydraulic information from the current database to a local database it keeps with the design. When the user open a design file IRRICAD runs through all the local database items and updates them from the current database. If this setting is checked IRRICAD will also run through all the hydraulic objects in the design and update them using the updated local database. If the user has changed any drawing properties in the database such as pipe colors or symbol names then check this setting so that the hydraulic objects in the design will be updated with the new colors etc. when the user re-loads the design.

5.10.9.7 Lines

Item:	The name of the hydraulic item type to which the drawing properties apply
Color:	Either select a specific color by clicking on the color or select By Layer to use the color property of the current layer for this type of item. Note that wetted radii have a third alternative By Nozzle that uses the same color as the sprinkler nozzle to which the wetted radius belongs.
Line Type:	Select a specific line type from the dropdown list or <BYLAYER> to use the line type property of the current layer for this type of item.
Line Width:	Select a specific line width from the dropdown list or <BYLAYER> to use the line width property of the current layer for this type of item.

5.10.9.8 Symbols

Item:	The name of the hydraulic item type to which the drawing properties apply
Color:	Either select a specific color by clicking on the color or select By Layer to use the color property of the current layer for this type of item.
Symbol Name:	The name of the database symbol for this type of item.
Symbol Size:	The size of the database symbol for this type of item. Select from the dropdown list or enter a specific value. Normally the user would use a value between 1 and 10. The base size is 5 with other values proportional to this, e.g., a symbol with size 3 would be $^3/_5$ the base size.

See also:

Design Size — *Section 5.10.12.3*

5.10.10 LABELS

To label hydraulic items on the design:

1. Select *Settings|Labels* to open the Labels dialog box
2. Check the item type(s) the user wishes to label e.g., Zone Pipes and Mainline Pipes
3. Add any keyword required by clicking the button in the Label Text column and edit the text properties. Note a suitable text height will depend on the design extents.
4. Edit the [Background] properties as needed.
5. Select INLINE, BELOW or ABOVE for the label placement
6. Select the items the user wishes to label (*Modify|Select All* can also be used.)
7. Select *Tools|Create Labels*.

5.10.10.1 PROPERTIES

Label Set 1 / Label Set 2: Selects the label set to edit.

Load Label Set: Load an existing Label Set, from one previously saved, into the current label set.

Save Label Set: Save the current label set to an .lbl file.

Checkbox: The checkbox beside the description of each type controls whether labels are constructed for this type of hydraulic item. If not checked then labels for this type of item will not be created, with the label tool, regardless of whether they are selected/clicked or not.

Label Text: Keywords can be found in Technical Reference Appendix I: Keywords for Use In Labels, Section 6.10.1. The other fields in the Text dialog set the properties of the label text in the same way as the *Draw|Text* dialog. One thing to note is that the size of a label will be determined solely by the text height selected and the length of the resulting label string. The text color for labels can be specified using the color button in the text dialog.

Background Settings: Sets the properties of the label background. A background 'fill' can be selected and enabled for display. Note that for items that have **in-line** labels specified it is desirable to select a

	background fill since this will stop the item showing through the label.
Border Settings:	Sets the color and line thickness properties of the border surrounding the label text.
Layer:	This dropdown allows the layer for the label to be selected. Note that if <DEFAULT> is specified then labels will be placed on the IRRICAD layer, although this behaviour may change in later versions.
Position:	The position of the label relative to the item is specified using this dropdown box. For line items (pipes, tapes, spraylines, wires and contours) there are three possible options, IN LINE, ABOVE and BELOW. All other items have two additional options, LEFT and RIGHT.
Combine Pipe Labels:	If checked then when labeling Zone or Mainline pipes any that are connected, and are of the same type, will be combined and a single label produced. Zone and Mainline pipes are considered independently.
Angle Tolerance:	For pipes to be combined the total angle between them must be less than the value set in the "Angle Tolerance" field
Use Crop Width:	If unchecked the irrigation entity area is calculated by Total Lateral Length * Lateral Spacing. If checked the irrigation entity area is calculated based on the total lateral length divided by the number of laterals in the group * Crop Width when the keyword IRRAREA is used.
Crop Width:	A value depicting the actual width of the crop
Check Label Length:	When checked the label will not be created if the length of the label symbol exceeds 90% this fraction of the length of the longest line segment in the item.
Length Allowance:	This value multiplied by multiplied by the length of the longest segment, gives the maximum allowable label length for a particular item. Not used if "Check Label Length" is unchecked.
Move Tolerance:	If the distance a label is moved is greater than this value, the label will remain in its new position during the *Update Labels* action. However, if the label has been moved less than

	the current “Move Tolerance”, the label will snap back to the original position based on the current label settings during *Update Labels*.
Use Label Set 1:	When checked the settings from Label Set 1 are used to construct labels for the selected items. May be used in conjunction with Label Set 2.
Use Label Set 2:	When checked the settings from Label Set 2 are used to construct labels for the selected items. Can be used in conjunction with Label Set 1.

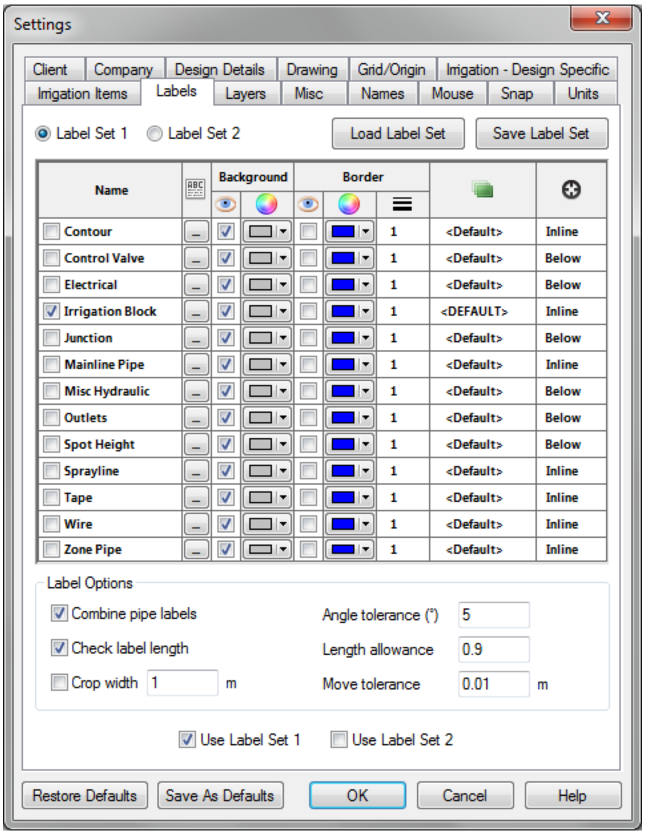


Figure 5-119

<u>Note</u>: Label sets saved to a file for a later use may be copied and shared with other Irricad users. The default location for storing .lbl files is the Irricad “config” folder.

5.10.10.2 Labels Text Dialog Properties

Color:	Specifies the color of the text. Select a new color from the color chart by clicking on the color edit box, or select the By Layer option to use the default layer color.
Char Space:	Specifies the spacing between characters of a text line as a percentage of the character size. The default is 20%. This option only applies to vector text.
Slant Angle:	Specifies the angle at which vector text is slanted to emulate italics. The angle must be between -45° and 45°. This option only applies to vector text.
Mono Space:	When checked, all characters are the same width. When unchecked, wide characters (M and W) take up more space than narrow characters (I and L).
Fill Text:	When checked, characters are solid filled. When unchecked, characters are displayed in outline, making both redrawing and printing faster.
Keywords:	A drop down box containing the complete set of keywords for use in Labels.
Font:	Sets the font used for attributes. Special font formatting, such as bold, italics and underline type styles, are not available for attributes. IRRICAD can use either Windows TrueType fonts or vector fonts. TrueType text tends to be more aesthetically pleasing and to redraw faster than vector fonts. TrueType fonts, however, are not as accurate as vector fonts and can present problems for some vector output devices such as HP-GL plotters.
Height:	Specifies the size (height) of text characters in the current drawing unit. The height of the text is measured in real-world scale.
Orientation:	Specifies the orientation of text from 0° to 360°. Orientation is counter-clockwise. This field is non-editable when placing text. The orientation of the text can be altered when the text is selected and using *Modify|Change*, typing in the required text orientation.

Aspect Ratio:	Adjusts the height-to-width ratio of characters in text blocks created using a vector font. For example, with a text height of 1 and an aspect of 2, the text character will be twice as wide as it is tall.
Justify:	Determines text justification. Text can be justified left, justified right, or centered horizontally relative to the placement point.
Bold:	Specifies bold type when checked. This option applies only to TrueType text.
Italic:	Specifies italic type when checked. This option applies only to TrueType text.
Underline:	Specifies underlined type when checked. This option applies only to TrueType text.
Line Spacing:	Specifies the spacing between lines as a percentage of the font size. This is measured from the reference point of the first line to the reference point of the second line. For example, using a font height of 2 and line spacing of 200%, the distance between the lines would be 4.
Load Text File:	Loads text from a file into a text box.
Paste:	Pastes text previously copied to the clipboard into the text box.

5.10.11 LAYERS

Everything the user draws in IRRICAD is placed on a layer of the drawing.

5.10.11.1 CURRENT LAYERS

There is one current default layer for each group of items - drawing, zone, mainline, electrical, and elevation. The user can change the current layer for any one group.

To select the current layer for a group:

1. Select *Settings|Layers*.
2. Select a layer from the dropdown list. The value <DEFAULT> means an object will be placed on the default layer for that type of object as specified above, e.g., control valves will be placed

on the CONTROL_VALVES layer. If the user select CONTROL_VALVES to be the current layer for Zone items, all Zone items will now be placed on the CONTROL_VALVES layer.

<u>Tip:</u> *For hydraulic objects, the current layer acts as a default layer. The user can change the current layer for a particular of object in the dialog for that tool when selected from the Zone or Mainline or Electrical menu.*

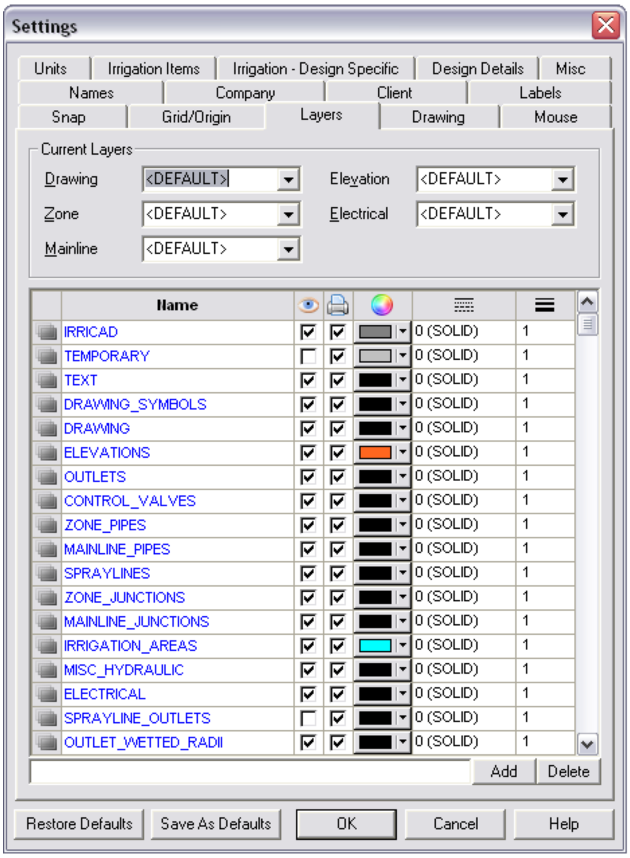


Figure 5-120

5.10.11.2 LAYER MANAGER

In IRRICAD there are a number of hardwired layers on which objects will be placed by default. The names of these layers cannot be changed nor can the layers be deleted but the user can edit the other layer properties. The <DEFAULT> layers are as follows:

IRRICAD:	All other objects
TEMPORARY:	Temporary drawing items created by the program.(Unused at present)
TEXT:	Text
DRAWING_SYMBOLS:	Symbols
DRAWING:	Points, lines, polylines, rectangles, polygons, circles, curves, arcs, hatches, fills, dimensions, images
ELEVATIONS:	Contours, spot heights
OUTLETS:	Outlets
CONTROL_VALVES:	Control valves
ZONE_PIPES:	Zone pipes
MAINLINE_PIPES:	Mainline pipes
SPRAYLINES:	Spraylines (connected), tapes
ZONE_JUNCTIONS:	Zone junctions
MAINLINE_JUNCTIONS:	Mainline junctions
IRRIGATION_AREAS:	Areas
MISC_HYDRAULIC:	Water supplies, miscellaneous hydraulic items, pumps
ELECTRICAL:	Electrical junctions, lights, controllers, miscellaneous electrical items, wires
SPRAYLINE_OUTLETS:	Spraylines outlets
OUTLET_WETTED_RADII:	Outlet wetted radii
SL_WETTED_RADII:	Sprayline outlet wetted radii
PLOT_TEMPLATE:	Plot layout

If the user does not wish to view a layer, select *Settings|Layers*, and uncheck the "Show" column in the *Layer Manager* corresponding to the layer the user wishes to turn off. SPRAYLINE_OUTLETS and OUTLET_WETTED_ RADII can also be turned off and on by checking / unchecking these two items in the *View* menu.

Add new layers by clicking on the [New] button. Remove layers (except hardwired ones) by selecting a layer and clicking on the Remove button.

Layer Properties:

Name:	The name of the layer.
Show:	Checked means all objects drawn on the layer are visible, unchecked means they are hidden.

Print: Checked means all objects on this layer will be printed. Unchecked means all items on this layer will not be printed. Note that the layer must have **Show** ticked for the layer items to be printed.

Color: The color that objects on this layer are drawn in if their color property is BYLAYER.

Line Type: The line type that objects on this layer are drawn with if their line type property is BYLAYER.

Line Width: The line width that objects on this layer are drawn with if their line width property is BYLAYER.

5.10.12 MISCELLANEOUS

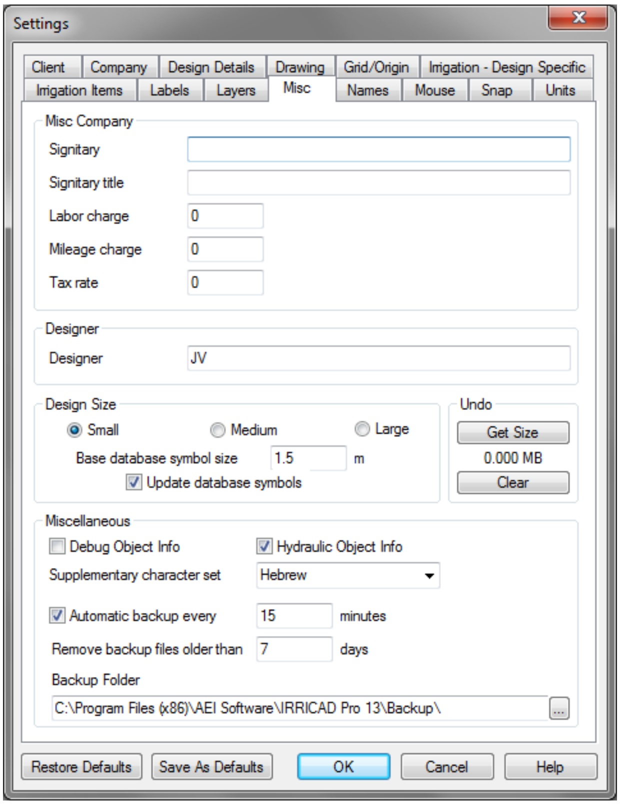


Figure 5-121

These settings are those which do not fit into any other category. Note the Backup folder can be specified.

To edit miscellaneous settings:

1. Select *Settings|Miscellaneous*.
2. Edit the settings as required.
3. Click [Save As Defaults] if the user wishes to retain these settings between designs. Click [OK].

5.10.12.1 Misc. Company

Signatory:	Name of person signing documents.
Signatory Title:	Official title of above person.
Labor Charge:	Hourly cost of labor.
Mileage Charge:	Travel charge per mile or km.
Tax Rate:	% GST, VAT etc. to be added to prices (e.g., total price, materials price) in documents.

5.10.12.2 Designer

Designer: Name of person completing the designs.

5.10.12.3 Design Size

Rough guidelines for selecting a design size calculated are:

- Small: up to 330 x 330ft (100 x 100m).
- Medium: up to 1640 x 1640ft (500 x 500m).
- Large: larger than 1640ft (>500m).

Selecting a design size will alter the suggested base database symbol size. The user can type in a base database symbol size instead of selecting a design size.

Base Database Symbol Size: The world size of a hydraulic item on the screen corresponding to symbol size 5 in the database. Other sizes are proportional to this.

Update Database Symbols: Check this box if the user has changed the "Base Database Symbols Size" so that all the database symbols already present in the design will be updated to reflect the new size. If this box is unchecked, then all existing symbols in the design will remain unchanged, but all new symbols inserted into the design will be in the new world size.

5.10.12.4 UNDO

The number of Undo actions retained is limited only by the available PC memory. The amount of memory currently used may be displayed by clicking the [Get Size] button. If a large amount of memory is consumed by stored actions it can be freed by selecting [Clear].

5.10.12.5 MISCELLANEOUS

Cad Error Checking: If this box is checked, error messages from the CAD engine will be displayed. Under normal circumstances leave this option unchecked.

Debug Object Info: When this check box is checked, the *Right-click|Object Info* option will include much more information to help the IRRICAD technician find the source of a problem. Under normal circumstances leave this option unchecked.

Hydraulic Object Info: Check this box if the user wishes to view hydraulic information when viewing *Right-click|Object Info* on a selected hydraulic object. Depending on the type of object selected, hydraulic information displayed can be pressure, flow, headloss and / or velocity. The last values entered or database items selected in all the dialogs for Hydraulic Item are now retained with each individual design. Previously they would revert to the default values.

Supplementary Character Set: A setting for the supplementary character set (*Settings|Miscellaneous*). This, in conjunction with the Windows "Language for Non-Unicode Programs" setting (Control Panel | Regional and Language Options), allows non-western character sets to be displayed correctly. In addition this setting also controls the "Codepage" used when exporting DWG and DXF files (R2004/2006 and older formats). For more information on using this feature refer to the V11 release notes.

Automatic Backup: If the "Automatic Backup" check box is selected a copy of the current design is saved at the interval specified in the "Minutes" edit box. The name of the backup design is the name of the current design with '~~backup' appended.
Backup designs are saved by default to a \Backup sub-folder of the main IRRICAD installation folder.
During start-up backup files older than the value specified in the "Remove Backup Files Older Than" field are purged. This value may be between 1 and 365 days.

Backup Folder: The default location of the backup folder can be changed. Either type in the path or click the [Browse] button. If the IRRICAD installation is on a network drive, backup performace may be improved by specifying a local folder for the backups.

5.10.13 MOUSE

This section under the *Settings* menu allows the configuration of the wheel mouse and scroll functions. IRRICAD Pro supports the use of 'wheel mouse' devices to both zoom and pan.

Three specific functions are allowed, zoom, pan vertically and pan horizontally. Each of these functions can be applied to one of three mouse wheel actions which are: mouse wheel only; mouse wheel with the shift key pressed; mouse wheel with the control key pressed. In addition dragging with the mouse wheel depressed allows 'dynamic' panning.

Zoom

The required mouse wheel action may be selected from the dropdown *Right-click* menu on the right. If the "Reverse" checkbox is checked then the effect of rotating the mouse wheel is reversed relative to the default effect. The amount of zoom that each mouse wheel 'click' represents is controlled by the "Zoom Factor". This number is the ratio of the new to the old zoom state and must greater than 1 and less than 10. For example 1.5 will give an increase of 50% when zooming out for each wheel click and a decrease of $^2/_3$ when zooming in.

By default this function is attached to the **mouse wheel only** action. Rotating the mouse wheel forwards will zoom out while rotating it backwards will zoom in.

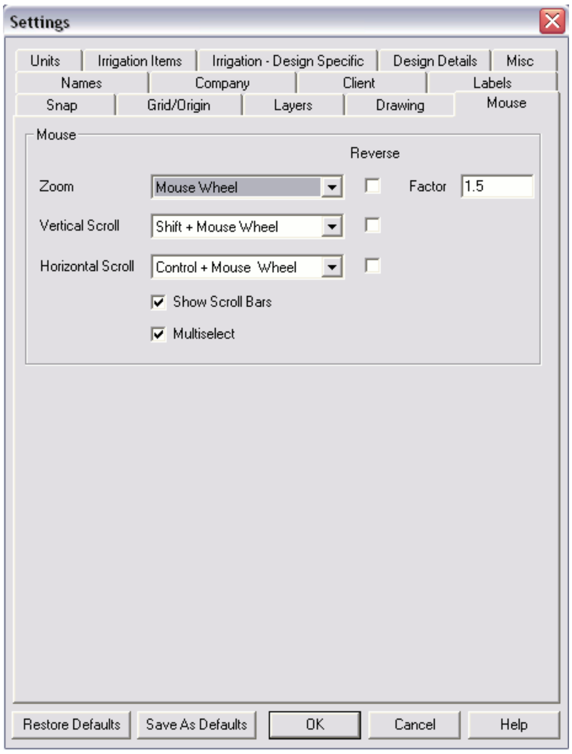


Figure 5-122

Vertical Scroll

The required mouse wheel action may be selected from the dropdown *Right-click* menu on the right. If the "Reverse" checkbox is checked then the effect of rotating the mouse wheel is reversed relative to the default effect.

By default this function is attached to the **mouse wheel with the shift key pressed** action. Rotating the mouse wheel forwards will move the view of the design up while rotating it backwards will move it down.

Horizontal Scroll

The required mouse wheel action may be selected from the dropdown *Right-click* menu on the right. If the "Reverse" checkbox is checked then the effect of rotating the mouse wheel is reversed relative to the default effect.

By default this function is attached to the **mouse wheel with the control key pressed** action. Rotating the mouse wheel forwards will move the view of the design to the left while rotating it backwards will move it to the right.

> *Note: that if the cursor is on a scroll bar then rotating the mouse wheel pans by moving the scroll bar slider appropriately regardless of whether the shift or control keys are pressed.*

Show Scroll Bars

When checked the scroll bars will be visible.

When enabled scroll bars allow the user to pan vertically and horizontally using the standard Windows scroll operations. The user can move by dragging the slider bars, clicking on the scroll arrows or left clicking in the body of the scroll bar.

Multi Select

The check box allows the user to toggle between multi-select and single select.

When the box is unchecked:

- The tool defaults to selecting a single object at a time. Multiple selections can be made by holding the <Shift> key. Permanent "Multiselect" can be enabled from the *Settings|Mouse* menu by checking this box.
- In the single select mode clicking nothing (empty space) will clear the current selection.

In both modes:

- Window-select mode can be entered by holding down the left button and dragging the mouse.
- A block may be automatically selected from a block sub-item (e.g., a lateral) by holding down the <Alt> key when selecting. The block outline (irrigation area) must be visible for this to work.
- Pressing the <Esc> key twice in quick succession will now clear the current selection and return the user to the default *Select* tool.

Note: that if the user has upgraded an existing Version, the default will be the multi-select.

5.10.14 MOVING GRID

Not available in this version.

5.10.15 NAMES

Sets the default names for Zones, Mainline Spraylines (valve-in-head sprinklers), Water Supplies and Areas including automatic numbering if required. The defaults start at number one and name the items consecutively, e.g., Water Supply No 1, Water Supply No 2, etc.

To change default names:

1. Select *Settings|Names*.
2. Change the name in the name box as required for any of the four items: Zones, Mainline Spraylines, Water Supplies or Areas.
3. Change the numbering if required – the default starts at 1.
4. Click [OK].

Note: *If the user has deleted some items, the numbering does not acknowledge the deletion and will carry on the numbering as if those items still remained. Simply change the numbering to that the user wishes to start from e.g., 3 and then continue placing the items.*

5.10.15.1 AUTOMATIC NUMBERING

If the default name contains one or more tilde (~) characters when the user places an item of that type in the design the tildes will be replaced by the next consecutive number. For example, if the default zone name is Green ~~~ and the Number From field is 5, then zone valves will be named Green 5, Green 6, etc. For mainline spraylines, since each outlet is a valve-in-head outlet, each outlet will be numbered and therefore the default name will also contain one or more carat (^) characters. When the user places a mainline sprayline in the design the carats will be replaced by the number of the outlet on the sprayline. For example, if the default name is Sprayline ~~~ - ^^ then the outlets on the first mainline sprayline will be named Sprayline 1 - 1, Sprayline 1 - 2, etc.

The outlets on the second sprayline will be named Sprayline 2 - 1, Sprayline 2 - 2, etc. and so on.

Tip: *If the user selects Right-click|Default Name after selecting the Control Valve, Water Supply, Mainline Outlet, Mainline Sprayline or Area tools then the user can change the default name temporarily just while using that tool without changing the default setting above.*

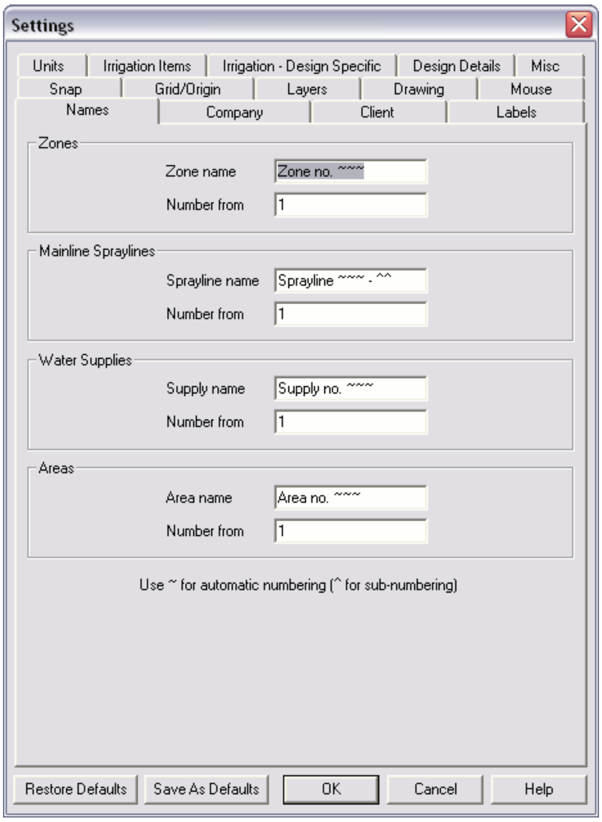


Figure 5-123

See also:

Area	*Section 5.7.7*
Control Valve	*Section 5.7.14*
Water Supply	*Section 5.8.1*
Outlet (Mainline)	*Section 5.8.7*
Mainline Cut Pipe Dialog	*Section 5.8.3*

5.10.16 SNAP

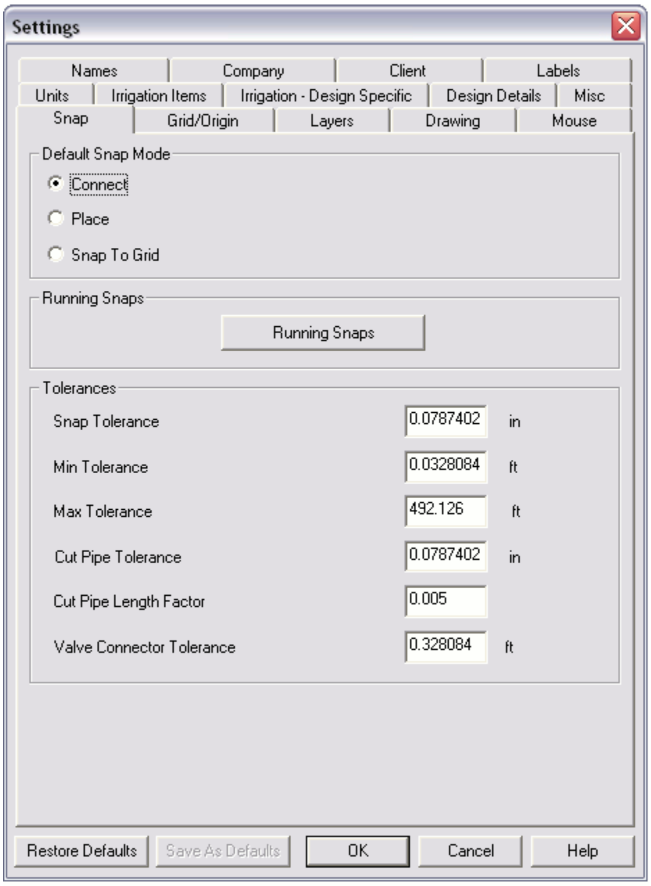


Figure 5-124

5.10.16.1 DEFAULT SNAP MODE

Connect: will ensure that all hydraulic items are physically connected if the cursor is placed close enough for IRRICAD to recognize the proximity of another hydraulic item, irrespective of which layer these items may have been designated. Connect will also mean that drawing objects are connected under the same circumstances.

Place: will allow the user to place items near, on or over existing items without connecting to them.

Snap to Grid: is a tool used for accurate drawing. With or without the grid displayed, the cursor will only allow the user to move between grid points. Note that the circular cursor is automatically turned off when snap to grid is turned on.

See also:

Snap Panel *Section 5.5.13.2*

5.10.16.2 Running Snaps

Snap tools that are used frequently can be set as running snaps so that they do not have to be selected repeatedly. Running snaps remain activated until turned off in the [Running Snaps] dialog. If the "Show Preview" option is selected, then when the cursor moves within range of a point for which a running snap is set, an icon for that snap is displayed beside the cursor. Running snaps is now available for drawing and hydraulic items.

The [Running Snaps] dialog can be displayed by selecting it from the *Right-click* menu, or from *Settings|Snap*. The functions of the various fields are described below.

Figure 5-125

Type of Snap

In the [Running Snaps] dialog, select the checkboxes for the snaps required.

RN Snaps On

If checked turns on the selected running snaps

Show Aperture

The aperture is the circle that is centered on the cross-hairs of the cursor that provides a visual clue that the cursor is close enough to an entity to snap, or select it. The "Show Aperture" checkbox allows the aperture for the cursor to be shown or hidden. If "Show Aperture" is not selected then the cursor is displayed as cross-hairs without the circle. The size of the aperture is determined by the "Snap Tolerance" value in *Settings|Snap*.

Note: *If "Show Aperture" is checked then the aperture is visible even when Running Snaps are turned off.*

Show Preview

When selected, a suitable snap icon will be displayed when the cursor is within range of a snap point. If "Show Preview" is toggled on, the object being snapped to will change color when the cursor is in range of the snap point. The "Color" dropdown box allows this color to be customized.

Tip: Hold down the alt key to temporarily disable running snaps when left clicking the mouse to place a point.

See also:

Snaps *Section 5.1.3*

5.10.16.3 TOLERANCES

Snap Tolerance: The distance to which an item will be connected to a like item (Drawing or Hydraulic) in inches or mm on the screen.

Min Tolerance: Indicates the minimum distance in world terms (ft or m) that an item will need to be placed on the screen in order to be connected to another hydraulic item.

Max Tolerance: Indicates the maximum distance in world terms (ft or m) that an item will need to be placed on the screen in order to be connected to another hydraulic item.

Cut Pipe Tolerance: The distance to which cut pipe will connect to the pipes it crosses or to the end of pipes / laterals in mm or inches on the screen. In this case, if the cut pipe tolerance is 0.2 inches, but in the design the user have laterals 0.1 inches apart, then only every second lateral will be connected to the submain.

Cut Pipe Length Factor: This factor is used along with the Cut Pipe Tolerance to determine if the cut pipe is close enough to the ends of laterals to be connected to them. This factor is used as a proportion of the total length of the cut pipe and is not related to the zoom state. The larger of the Cut Pipe Length Factor multiplied by the total length of the cut pipe, or the world value of the Cut Pipe Tolerance is used to determine if the ends of laterals are close enough to snap to.

Valve Connector Tolerance: This tolerance is used by the valve connector tool. It is the snapping distance for the pipe connecting the valve to the nearest mainline pipe segment or junction.

5.10.17 UNITS

These settings control the units displayed and entered for each type of quantity.

To change units:

1. Select *Settings|Units*.
2. Edit each measurement as required.
3. Click [OK].

Note: *The units that are present when IRRICAD is exited become the default units. The default units are used in the Database Editor, but can also be set in the Database Editor for use in IRRICAD.*

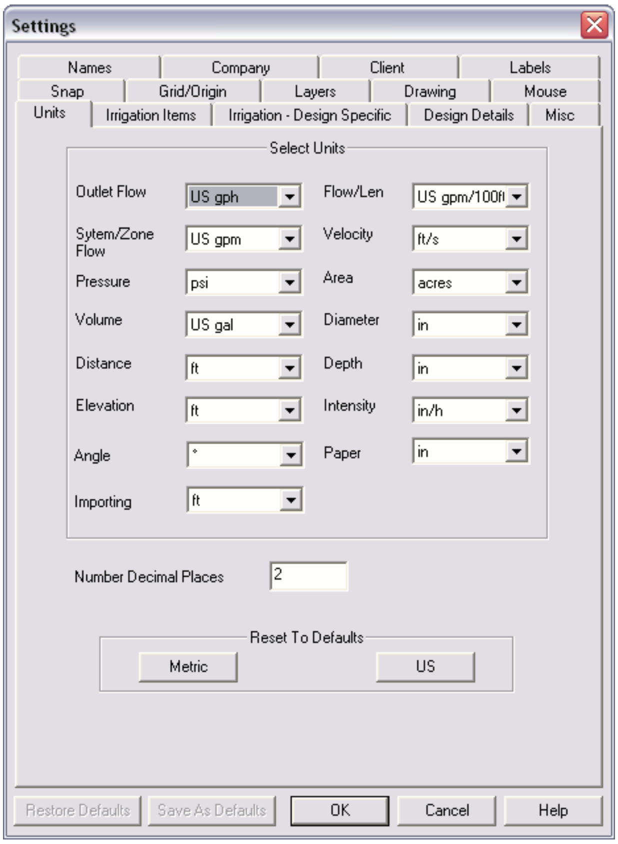


Figure 5-126

5.10.17.1 Number Decimal Places

Sets the number of digits that IRRICAD displays to the right of the decimal point on the status bar.

5.10.17.2 Reset to Defaults

The units for each quantity can be selected, or simply click the [US] button if the default set of US units is required, or click the [Metric] button if the default set of metric units is required.

5.10.18 Digitizer

A digitizer is used for tracing scaled drawings attached to the digitizer tablet.

A WinTab driver must be installed for using a digitizer in IRRICAD.

A WinTab driver can be obtained from:

- Disks which accompanied the digitizer / tablet
- The hardware supplier
- The Internet
- The tablet's manufacturer

Before digitizing the drawing IRRICAD requires the user to either specify a scale or to enter known reference points on the drawing.

5.10.18.1 Tablet Mode

In normal drawing mode, the user can use the digitizer much like a mouse to draw and select commands. In *Tablet Mode*, the user can digitize paper drawings attached to the digitizer tablet by tracing over them. *Tablet Mode* will automatically be turned off when switching to another Windows application, and turned back on when the user return to IRRICAD.

To digitize paper drawings using *Tablet Mode*:

1. Select the *Scale* or *Reference* option (*Settings|Digitizer*). These options will automatically switch *Tablet Mode* on.
2. Trace points with the digitizer puck to transfer the drawing to IRRICAD. Note that when *Tablet Mode* is on, the digitizer puck cannot select menus. Use the mouse or keys (e.g., <Alt> <S> for *Settings* menu) to select menus and menu options.
3. Select *Settings|Digitizer|Tablet Mode* (with the middle puck button, mouse or keys) to turn *Tablet Mode* off.

When *Tablet Mode* is on, a box appears around the cursor. When *Tablet Mode* is off, the box around the cursor disappears. When *Tablet Mode* is on, the puck can not select from the main *Right-click* menus, hence *Tablet Mode* may be turned off temporarily before the *Right-click* menu can be used. As well as selecting this command from the *Settings* menu to turn *Tablet Mode* on or off, this mode may also be toggled using the digitizer puck button assigned to the middle click button. Buttons can be assigned in the control panel for the digitizer. *Tablet Mode* is automatically turned off when the *Right-click* is invoked and automatically turned on again when the selection is made and the cursor is returned to the input screen.

If *Tablet Mode* is turned off temporarily, scaling or referencing does not need to be re-done to continue digitizing. As well as selecting this command from the *Settings* menu to turn *Tablet Mode* on or off, this mode may also be toggled using the digitizer puck button assigned to the middle click button.

The zoom state does not affect the digitizer referencing. Select the *View* menu options with the mouse or keys to zoom in or out as required. When in *Tablet Mode* the *Zoom*, *Draw* and *Settings* menus are also available in all *Right-click* menus to make it easier to change tools and settings while digitizing.

> Tip: *The user can only use Tablet Mode with WinTab compliant hardware and drivers.*

5.10.18.2 Scale

Select this option to specify the scale of the drawing to digitize into IRRICAD. Use this option with one-sheet digitizing.

This option can be used when the user know the scale of the drawing. If a line has a known world distance, the user can use the *Reference* option or use it as a check for the scale the user has used.

The initial zoom state automatically spans the whole-proposed drawing on the screen. The zoom state does not effect the digitizing of the drawing. Use *View* menu options or the *Right-click* menu to zoom in and out as required.

5.10.18.3 Reference

Use the *Reference* option to align the reference frames and to determine the scale factor between the screen and paper drawing. *Reference* is used to prepare to digitize a paper drawing, when at least one world distance or set of coordinates on the paper drawing is known. The coordinates need to be in a world distance. *Reference* not only calculates the scale factor of the paper drawing, but will also give a warning if the scale entered is more than 5% different to the calculated scale.

To align and digitize a paper drawing:

1. Securely attach the paper drawing to the digitizer tablet using tape or other means. Horizontal or vertical alignment is not critical.
2. Select Reference (*Settings|Digitizer|Reference*). If it was not already on, *Tablet Mode* will automatically be turned on.
3. Place a point at the bottom left corner of the drawing. Place a second point at the top right corner of the drawing. A dialog will appear requiring the coordinates of the bottom left corner (X1 & Y1, e.g., 0,0) and the top right corner coordinates (X2 & Y2, e.g., 137,99).
4. Type in the scale of the drawing. Click [OK].
5. The ratio between the two distances will be calculated automatically as the digitizer scale factor.
6. If the calculated scale is more than 5% difference from the scale the user entered, a warning will be displayed, giving the calculated scale. Click [Yes] to continue to use the scale the user entered. Click [No] to discontinue. Go back and enter the reference points again, making sure the cross hairs are exactly over the points on the drawing. Enter the scale again, or enter the scale as calculated by IRRICAD.
7. Proceed to digitize in the drawing. Use the *Right-click* menu, mouse or keys to select menu items, e.g., *Draw|Line|Continuous*.
8. Move the paper plan to place another area in active area of the tablet. Repeat Steps 3 to 7 as required.

Tips: *The digitizer scale is only used when in Tablet Mode. When in drawing mode, the digitizer scale has no effect.*

If the scale is unknown, type a scale number larger than 0. IRRICAD will calculate the scale according to the reference points entered, and display the calculated scale. Re-enter the Settings|Digitizer|Reference option as described above.

The initial zoom state spans the reference coordinates.

5.10.19 Language

This dialog can be used to change the currently installed language version.

If IRRICAD was installed without selecting the preferred language install the steps to change the language are:

In IRRICAD:

1. Select the required language in *Settings|Language.*

2. Set the plot layout path in *Settings|Drawing Items - Miscellaneous* "Plot Layout Path" to point to the required language sub-folder of layouts by clicking the button.

3. Set the report template path in *Settings|Drawing Items Miscellaneous* "Reports Path" to point to the required language sub-folder of reports by clicking the button.

Plot layouts and report templates are available in English, French, Spanish, Portuguese or Hebrew and are located in appropriate sub-folders of the standard locations (e.g., IRRICAD Pro V13\Symbols\Templates\Spanish, IRRICAD Pro V13\Reports\Spanish).

To enable the use of different layouts or reports (if the language choice was not selected at installation) the path settings can be found in *Settings|Drawing Items - Miscellaneous*. Alternatively the preferred templates and reports can be copied into the standard locations and the English templates and reports copied to another folder. Do Not remove any folders created by the IRRICAD installation.

5.11 MODIFY

The *Modify* menu has two groups of tools:

1. Tools involved in selecting items:

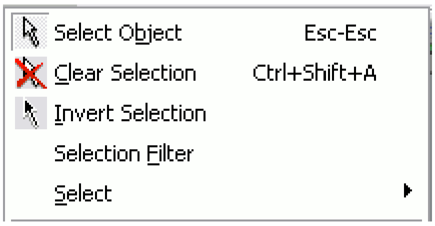


Figure 5-127

2. Tools involved in modifying items:

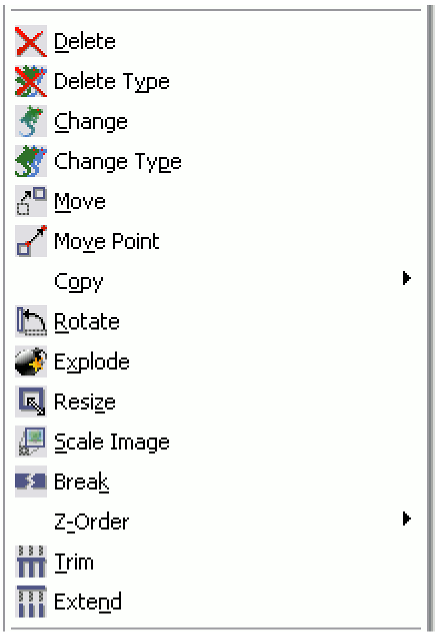


Figure 5-128

5.11.1 Select Object

Use this tool to select a single object. Selected items become highlighted in the color specified in the *Drawing Settings* (green by default).

To select one or more objects:

1. Select *Modify|Select Object*
3. Click on an object to select it.
4. Repeat Step 2 as required.

This option is available on the left-hand tool bar.

To de-select an object, click on it again or use the *Modify|Clear Selection* option which will de-select all selected objects.

The select tool has the following features:

- The tool defaults to selecting a single object at a time. Multiple selections can be made by holding the <Shift> key. Permanent multi-select can be enabled from the *Settings|Mouse* menu.
- In the single select mode clicking nothing (empty space) will clear the current selection.
- Window-select mode can be entered by holding down the left button and dragging the mouse.
- A block may be automatically selected from a block sub-item (e.g., a lateral) by holding down the <Alt> key when selecting. The block outline (irrigation area) must be visible for this to work.
- Pressing the <Esc> key twice in quick succession will clear the current selection and return the user to the default *Select* tool.

Note: *that if the user has upgraded an existing Pro Version 9, the default will be the multi-select.*

See also:

Selection Filter	*Section 5.11.4*
Select	*Section 5.11.5*

5.11.2 Clear Selection

Globally de-selects all currently selected objects. This action is performed immediately.

To clear a selection:

1. Select *Modify|Clear Selection*.

Note: In the single select mode clicking nothing (empty space) will clear the current selection.

5.11.3 Invert Selection

Selects all objects that have not been selected and de-selects all objects that have been selected.

To invert a selection:

1. Select *Modify|Invert Selection*.

5.11.4 Selection Filter

Use the *Selection Filter* tool to define a set of selection criteria based on entity type and / or properties. When the filter is on, selection operations capture only those objects meeting all of the filter criteria.

Each setting further defines the properties of the objects to be selected. Only those objects meeting all of the criteria are selected. If the user does not want to restrict the selection based on a particular object or property, click <ALL> in that dropdown list.

To use the selection filter:

1. Select *Modify|Selection Filter.*
2. Change the object group type, layer, color, line type and line width text boxes to define the selection criteria the user requires.
3. Check the Filter box to activate the filter. If this box is unchecked, the filter is inactive and any selections performed are not filtered.
4. Click [OK].

The filter will apply until the user unchecks the “Filter” check box.

Tip: The status of the selection filter is indicated by the status bar panel in the lower right corner. A red panel indicates that the filter is active.

5.11.4.1 SELECTION FILTER DIALOG:

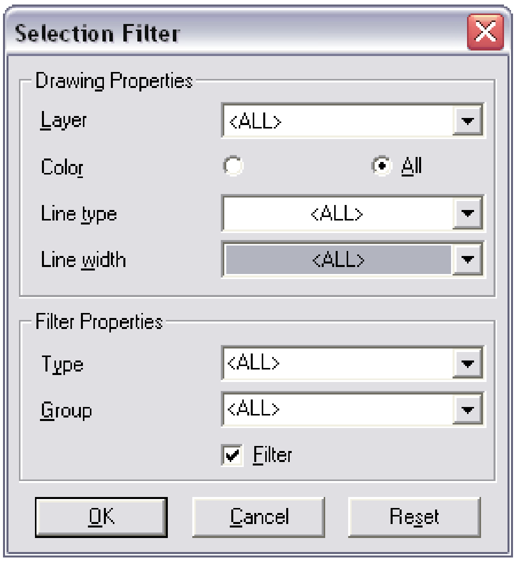


Figure 5-129

Drawing Properties

Layer: Select the specific layer to filter to if required. E.g.: if **DRAWING** is selected, only items that meet the criteria and are on the **DRAWING** layer are selected.

Color: Select the specific color to filter to if required. E.g.: if **Red** is selected, only items that meet the criteria and are **Red** are selected.

Line Type: Select the specific line typer to filter to if required. E.g.: if **DOT** is selected, only items that meet the criteria and are the **DOT** line type will be selected.

Line Width: Select the specific line width to filter to if required. E.g.: if **6** is selected, only items that meet the criteria and are line width **6** are selected.

Filter Properties:

Type:	Select the type of item to filter to if required. E.g.: if **Spot Height** is selected, only items that meet the criteria and are a **Spot Height** are selected.
Group:	Select the specific group to filter to if required. E.g.: if **Electrical** is selected, only items that are **Electrical** items are selected.
Filter:	Check the check box to turn the Selection Filter on.

Note: The selection filter dialog can be viewed by right-clicking the Selection Filter Panel on the rhight-hand side of the sataus bar.

See also:

Selection Filter Panel *Section 5.5.13.3*

5.11.5 SELECT

Use a *Select* tool to specify which objects a subsequent editing tool acts upon.

The selection operation can be performed as a separate command, prior to choosing an editing tool, or is initiated automatically if the user selects an editing tool with no objects pre-selected. However, in the latter case, only one object at a time can be selected to apply the editing command to.

Selected items become highlighted in the color specified in the *Settings|Drawing Items* (green by default).

See also:

Select Object *Section 5.11.1*

5.11.5.1 SELECT WINDOW

Selects all objects fully enclosed by a user-drawn rectangular selection window.

Note: do not confuse this window with the document or application window as used in Windows products documentation.

To select objects inside a window:

1. Select *Modify|Select|Window*.
2. Click on the screen to place any corner of the window.
3. Drag the cursor and click again to place the opposite corner.
4. All objects totally inside the Window will be selected. This tool is also available from the left-hand tool bar
5. Repeat steps 2 and 3 as required.

See also:

Select	*Section 5.11.5*

5.11.5.2 SELECT CROSSING

Selects all objects enclosed or intersecting a user-drawn selection window (do not confuse this window with the document or application window as used in Windows products documentation).

To select objects crossing a window:

1. Select *Modify|Select|Crossing*.
2. Click on the screen to place any corner of the window.
3. Drag the cursor and click again to place the opposite corner.
4. All objects partly or totally inside the window will be selected.
5. Repeat steps 2 and 3 as required.

See also:

Select	*Section 5.11.5*

5.11.5.3 SELECTLASSO

Selects all objects inside an irregularly shaped boundary.

To select objects inside a lasso:

1. Select *Modify|Select|Lasso*.
2. Place the starting point.
3. Place additional points to create the boundary.
4. Select *Right-click|Close*, or cross the last line segment over the first corner to stop drawing the boundary.

All objects totally inside the boundary will be selected. This tool is also available from the left-hand tool bar.

See also:

Select	*Section 5.11.5*

5.11.5.4 Select Last Object

Selects the last created object.

To select the last created object:

1. Select *Modify|Select|Last Object*.

See also:

Select	*Section 5.11.5*

5.11.5.5 Select Adjoining

Selects a series of objects that share end points. Used to select continuous lines or polygons that have been exploded (see *Modify|Explode*, Section 5.11.14), or any other chain of objects that have end points in common. To select the connected objects, IRRICAD starts at the object the user click, and checks in both directions for adjoining objects.

To select adjoining objects:

1. Select *Modify|Select|Adjoining*.
2. Click on an object joining another object or objects.

See also:

Select	*Section 5.11.5*

5.11.5.6 Select Connected

This options allows the user to select all hydraulic objects that are connected to the currently selected item. This function only works when a single hydraulic item is selected.

To select hydraulically connected items:

1. Select a hydraulic item.
2. Select *Modify|Select|Connected* or press <Shift>+<Ctrl>+<C>

See also:

Select	*Section 5.11.5*

5.11.5.7 Select Screen

This option allows the user to select all objects totally or partially visible on the screen.

To select all objects on the screen:

1. Select *Modify|Select|Screen*.

See also:

Select	*Section 5.11.5*

5.11.5.8 Select All

This tool allows the user to select everything in the design.

To select all objects in a design:

1. Select *Modify|Select|All*.

See also:

Select	*Section 5.11.5*

5.11.6 Delete

Use the Delete tool to delete unwanted objects.

To delete objects:

1. Select *Modify|Delete*.
2. Click on an object to delete it.
3. Repeat step 2 as required.

Tip: *Delete is reversible. To restore the last item or selection that has been erased, select Edit|Undo.*

5.11.7 DELETE TYPE

This tool is used to delete selected objects of the same type and with the same properties. The user determines the criteria for which objects are deleted. For example, the user can delete all ¾“ PVC pipes or all red lines or all outlets with a wetted radius of 30ft (m) in the Zone 1 layer.

To delete objects by type:

1. Select the objects (see Select, Section 5.11.5).
2. Select *Modify|Delete Type*.
3. Click on an object which is representative of those to be deleted.
4. A dialog will appear listing properties for that type of object. Check those properties of the object the user requires matched for deletion.

Only selected objects of the same type as the representative object and matching the representative object on the checked properties will be deleted.

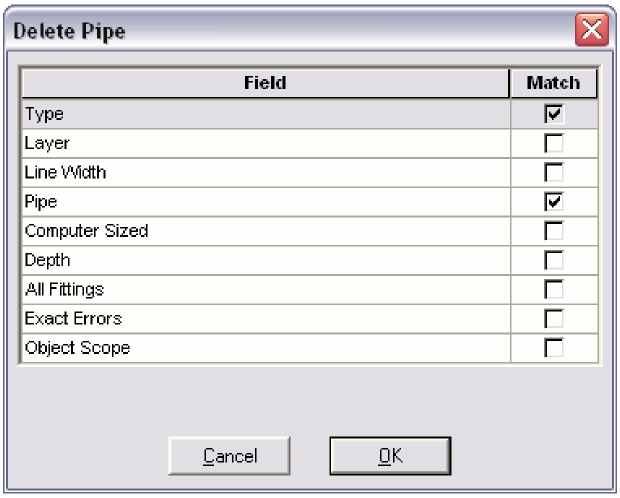


Figure 5-130

See also:

Match / Change Dialog *Section 2.4.4.1*

5.11.8 CHANGE

This tool is used to change the properties of an object.

To change objects:

1. Select *Modify|Change*.
2. Select the object to change.
3. Change the properties in the dialog as required. Click [OK].
4. Repeat steps 2 and 3 as required.

5.11.8.1 SHOW FITTINGS

When this button is clicked, another dialog will show the fittings selected for the items connecting at this junction, after running *Computer Selection of Fittings*. The dialog will also show where problems have occurred in selecting items to solve the junction.

- The [Hide Fittings] button will close the dialog and return to the *Junctions* dialog.
- The [Delete] button will delete any item on the fittings list which has been highlighted.
- The [Add] button allows the user to manually add items from the database that the user requires at the junction. To select an item, highlight it and click the [Select] button. The item will be added to the list of selected items (alternatively, click on the gray box to the left of the item description as this automatically selects the item). Select all the items required by clicking on the component groups and selecting items. Click [Close] when finished.
- The [Replace] button will replace any highlighted fittings item with one that is selected from the pop-up database. To replace an item highlight it and click the [Select] button. The item will be added to the list of selected items (alternatively, click on the gray box to the left of the item description as this automatically selects the item). Click [Close] when finished.

To change the quantity of fittings items, click in the "Quantity" column and type in the required number. Unwanted items or items mistakenly added from [Add] or [Replace] can be deleted by highlighting and clicking the [Delete] button.

See also:

Manually Adjusting Fittings *Section 2.6.7.1*

5.11.9 CHANGE TYPE

This tool is used to change selected objects of the same type and with the same properties. The user determines the criteria for which objects are changed and how they are changed. For example, the user can change all ¾“ PVC pipes to ½“ PVC pipes or all red lines to blue.

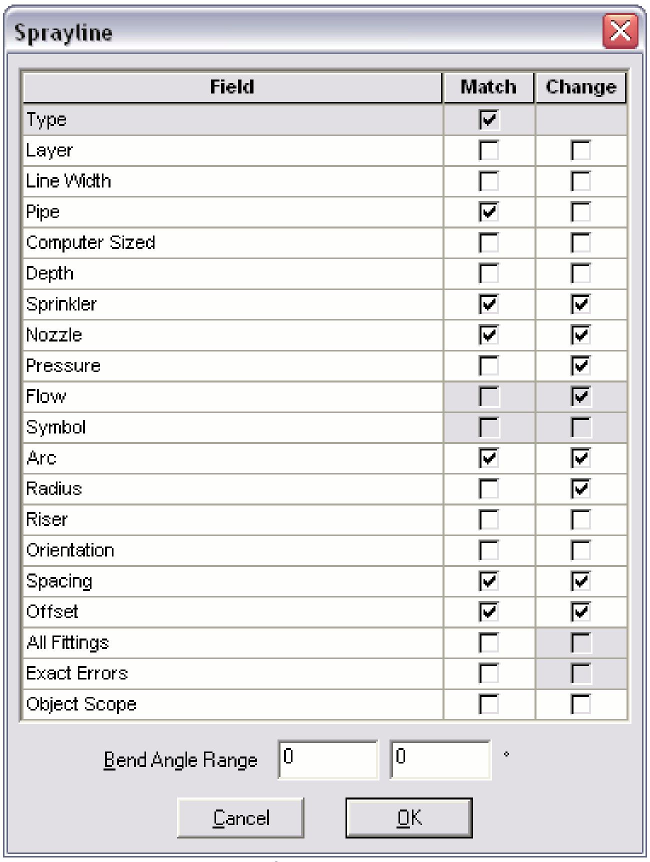


Figure 5-131

To change objects by type:

1. Select the objects (see Select, Section 5.11.5).
2. Select *Modify|Change Type*.
3. Click on an object which is representative of those to be changed.

4. The same dialog as for changing an individual object of that type will appear. Change the properties in the dialog box as required. Fittings can also be changed as required (see Show Fittings, Section 5.11.8.1). Click [OK].
5. A dialog will appear listing properties for that type of object. Check those properties of the object the user wants to be matched and those the user wants to be changed.
6. Only selected objects of the same type as the representative object and matching the representative object on the checked properties will be changed. Also only the checked properties of the matched object will be changed to new values.
7. Repeat steps 3 to 5 as required.

See also:

Match / Change Dialog *Section 2.4.4.1*

5.11.10 MOVE

Use the *Move* tool to change the location of selected objects without changing the orientation or size.

To move an object:

1. Select *Modify|Move*.
2. Select the object to move.
3. Place a reference point that will define where the object will be moved from.

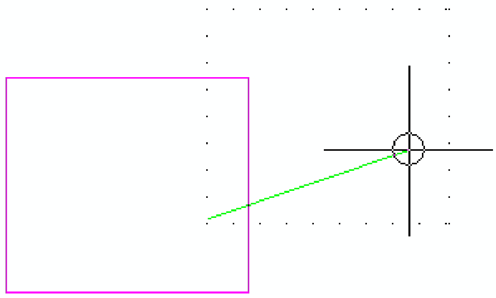


Figure 5-132

4. Place a point to define where the object will be moved to.
5. Repeat steps 2 to 4 as required.

If a single point hydraulic object (e.g., outlet or junction) is selected then step 3 is omitted; the reference point is automatically taken to be the center of the symbol.

If a single point hydraulic object is connected to another non-selected line hydraulic object (e.g., a junction on the end of a pipe), the line hydraulic object will Stretch to maintain the connection when the point hydraulic object is moved. If a line hydraulic object is selected, then all point hydraulic connections are automatically selected and moved also.

Some objects like *Continuous Line* are treated as a single object and a segment cannot be moved on its own, unless the object is first exploded. To move a group of objects reverse Steps 1 and 2 above i.e., select the objects first, then the move tool.

5.11.11 MOVE POINT

Use the *Move Point* tool to reshape or resize objects by moving definition points.

To move a point of an object:

1. Select *Modify|Move Point*.
2. Select the object to apply the tool to.
3. Place a reference point that will define where the selection will be moved from.

After the reference point is placed, the selected object with a definition point at the location defined in step 3 will drag with the cursor to provide a dynamic preview of the object after modification.

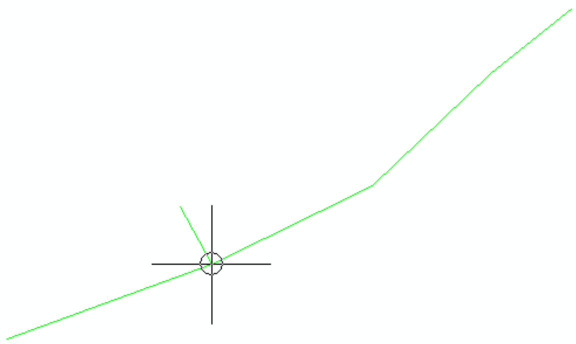


Figure 5-133

4. Click to set the point in the new location.

The point the user selected is moved to the new location, and the form or size of the selected object is updated.

5. Repeat steps 2 to 4 as required.

Steps 1 and 2 may be reversed but the tool can then only be applied once.

5.11.12 Copy

Use the *Copy* tools to duplicate objects already in the design.

See also:

Linear Copy	*Section 5.11.12.1*
Radial Copy	*Section 5.11.12.2*
Array Copy	*Section 5.11.12.3*
Multiple Copy	*Section5.11.12.4*
Mirror Copy	*Section 5.11.12.5*
Offset Copy	*Section 5.11.12.6*
Speeding Up Copy Tools	*Section 2.2.6.4*

Tip: *For all the copy tools, the user may hold down the <Shift> key when using the tool to avoid the copy dialog and repeat the copy with the previously used settings.*

5.11.12.1 Linear Copy

Use the *Linear Copy* tool to duplicate objects already in the design. The user can make multiple copies arranged in a line; each item in the series is placed at the same user-defined offset from the previous item.

To make linear copies of an object:

1. Select *Modify|Copy|Linear*.
2. Select the object to copy.

3. Enter the number of copies required and click [OK].

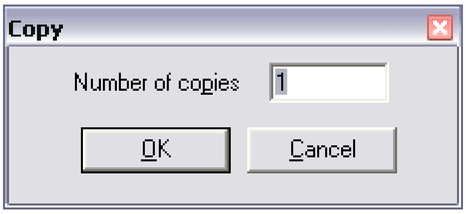


Figure 5-134

4. Place a point to define the starting point for the relative offset of each copy.

The distance and angle from this point to the next point will be used as the offset distance and direction for each new copy relative to the previous. Neither point has to actually be on, or even near the objects being copied. After this point is placed, a rubber band will display between the first point and the cursor location. This line previews the offset vector. In addition, a bounding box will appear for each copy that the user specified, each placed at the relative offset defined by the rubber band line. The location and spacing of these bounding boxes provides a dynamic preview of where the copies will be placed.

5. Place a point to define the ending point for the relative offset.
6. Repeat Steps 2 to 5 as required.

To copy a group of objects reverse Steps 1 and 2 above i.e. select the objects first then the linear copy tool.

See also:

Copy *Section 5.11.12*

5.11.12.2 RADIAL COPY

Use the *Radial Copy* tool to create copies in a radial pattern, such as spokes around the hub of a wheel. This type of tool is sometimes called a radial or circular array.

To make radial copies of an object:

1. Select *Modify|Copy|Radial*.
2. Select the object to copy.

3. Enter the number of copies required and the span angle (the angle spanned by the array of copies) then click [OK].

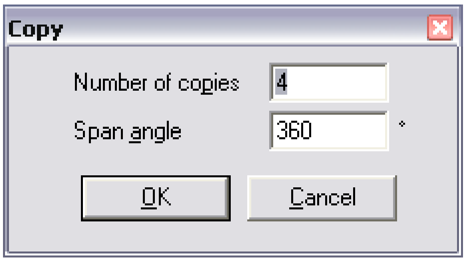


Figure 5-135

A dynamic preview will appear, showing the copies in the correct relationship to the originally selected object(s) and the cursor. The copies are shown as bounding boxes radiating around the cursor, which represents the center of the array.

4. Place a point to set the center of the array.

The copies will be placed around the center point, with the copies spanning the specified angle. Each copy will be the same distance away from the center point, with the original selection at the beginning of the angular span, and the last copy at the end of the angular span.

5. Repeat Steps 2 to 4 as required.

Tip: *In addition, a span of 360° is treated as a special case. Normally, the last copy is placed at the end of the specified span angle; however, in the case of 360°, this would cause the last copy to be placed directly on top of the original selection. Normally, when the user specify a span of 360°, the user want the original and all copies to be uniformly spaced around a full circle. IRRICAD does this by not placing the last copy when the span angle is exactly 360°.*

To copy a group of objects reverse Steps 1 and 2 above i.e. select the objects first then the radial copy tool.

See also:

Copy *Section 5.11.12*

5.11.12.3 ARRAY COPY

With the *Array Copy* tool, the user creates a grid of copies of an object. For example, the user could easily draw rows of trees of shrubs in a landscaping plan, a column grid in a structural drawing, or a block of seats in a theatre, etc. The grid need not be rectangular; it can be oriented in any direction and shaped like any parallelogram.

To make an array of copies of an object:

1. Select *Modify|Copy|Array*.
2. Select the object to copy.
3. Enter the number of copies (number of grid columns excluding the original selection) and the number of grid rows then click [OK].

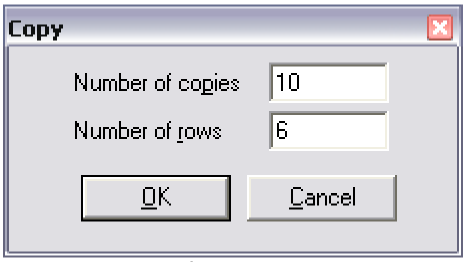


Figure 5-136

4. Place a point to define the starting point for the first relative offset vector.

The distance and angle from this point to the next point will be used as the offset distance and direction from copy to copy in the first row. Neither point has to actually be on or even near the objects being copied.

5. Place a point to define the ending point for the first relative offset vector.

The first row of copies will be placed at the first relative offset. A second rubber band line will appear, tethered to the starting point of the first vector. A bounding box will appear for each copy that the user specified for the array, with the spacing between rows determined by the relative offset defined by the second rubber band line.

6. Place a point to set the endpoint for the vector, which determines the spacing between the rows of copies.

The specified number of rows of copies will be placed, with the row-to-row spacing determined by the second offset vector.

7. Repeat Steps 2 to 6 as required.

To copy a group of objects reverse Steps 1 and 2 above i.e. select the objects first then the array copy tool.

See also:

Copy *Section 5.11.12*

5.11.12.4 Multiple Copy

Use this tool to make multiple copies of objects at user defined points within the design.

To make multiple copies of an object:

1. Select *Modify|Copy|Multiple*.
2. Select the object to copy.
3. Click to define a reference point on the object.

An image of the object now follows the cursor around the drawing area.

4. Click to place a duplicate object.
5. Repeat Step 4 as required.
6. Press the <Esc> key to end the tool or select *Right-click|Restart*.
7. Repeat Steps 2 to 6 as required.

To copy a group of objects reverse Steps 1 and 2 above i.e. select the objects first then the multiple copy tool.

See also:

Copy *Section 5.11.12*

5.11.12.5 Mirror Copy

Use this tool to make a mirrored copy of objects.

To make mirror copies of an object:

1. Select *Modify|Copy|Mirror*.

2. Select the object to copy.
3. Click once to define the start of the axis of reflection. An image of the object is now reflected in the floating axis.

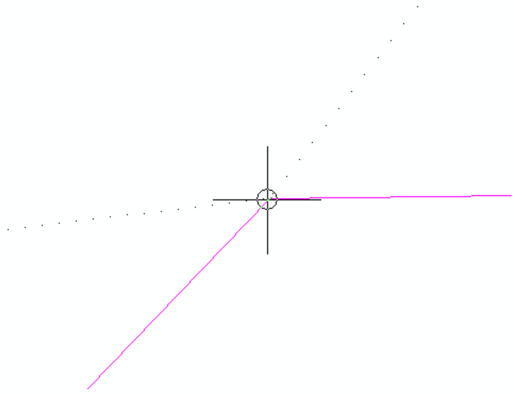


Figure 5-137

4. Click to complete the axis and place the copy.
5. Repeat Steps 2 to 4 as required.

To copy a group of objects reverse Steps 1 and 2 above i.e., select the objects first then the mirror copy tool.

See also:

Copy *Section 5.11.12*

5.11.12.6 Offset Copy

Use this tool to make a copy of objects at a user defined offset from the original. This tool is useful when the distance between two objects must remain constant (e.g., when drawing paths or roads).

> Note: *This tool only functions on single items and does not work on connected hydraulic objects.*

To make an offset copy of an object:

1. Select *Modify|Copy|Offset*.
2. Select the object to copy.
3. In the dialog, select a fixed or non-fixed offset. A fixed offset will copy the object at the specified distance. In non-fixed mode, the user may place the offset copy free hand.

4. Use the mouse to position the offset copy and click to place it.

Tip: *Hold down the <Shift> key while the tool is active to quickly repeat an offset copy.*

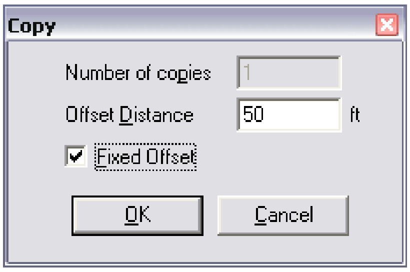


Figure 5-138

See also:

Copy *Section 5.11.12*

5.11.13 ROTATE

Use the *Rotate* tool to rotate a selection around an axis.

To rotate a selection:

1. Select *Modify|Rotate*.
2. Select the object to be rotated.
3. Place a point to serve as the center of rotation.

The selection will rotate as the cursor moves around the axis point.

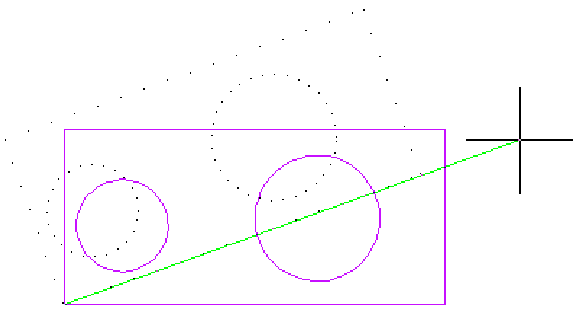


Figure 5-139

4. Place a point when the object is rotated to the correct orientation.
5. Repeat steps 2 to 4 as required.

If a single point hydraulic item (e.g., an outlet) is selected then step 3 is omitted; the reference point is automatically taken to be the center of the symbol.

Some objects like continuous line are treated as a single object and a segment cannot be rotated on its own unless the object is first exploded.

To rotate a group of objects reverse Steps 1 and 2 above i.e., select the objects first then the *Rotate* tool.

5.11.14 EXPLODE

The *Explode* tool is normally used when the user want to individually edit an object contained within a compound object. For example, to change the color of a single segment within a continuous line, the user must first explode the continuous line.

To explode an object:

1. Select *Modify|Explode*.
2. Select the object to be exploded.
3. Repeat Step as required.

Compound objects within the selection will be exploded to the next lower level.

Tip: *Continuous lines, rectangles, regular and irregular polygons, continuous Bezier curves, symbols, dimensions, fills, and hatch patterns can be exploded. Single lines, arcs, circles, ellipses, elliptical arcs, single Bezier curves, spline curves and text are basic objects which cannot be reduced further.*

The results of the explode tool depend on the object being exploded. An object may contain other objects requiring more than one exploding operation to reduce it to its elemental parts. The following list demonstrates the results when the object is exploded:

- Continuous lines, rectangles and regular and irregular polygons become single lines.

- Continuous Bezier curves become single Bezier curves.
- Symbols become the collection of objects that were used to create them, including other symbols when appropriate.
- Dimensions become lines, fills and text blocks.
- Hatch patterns become individual lines.

5.11.15 RESIZE

Use the *Resize* tool to rescale or change the size of an object.

To resize an object:

1. Select *Modify|Resize*.
2. Enter the scale. Numbers between 0 and 1 will make the object smaller. Numbers greater than 1 will make the object larger. Select the reference point required. This is the point about which an object is scaled. If "Specify Coordinates" is selected then enter the required coordinates. Click [OK].

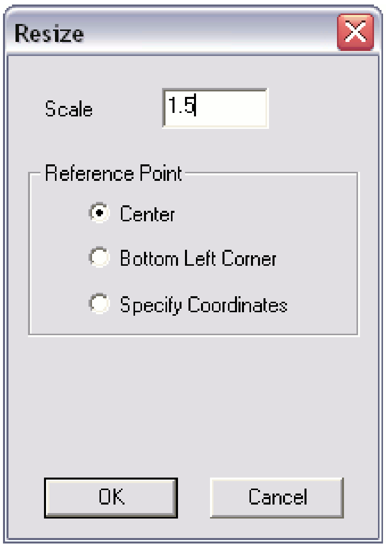


Figure 5-140

3. Select the object to be resized.
4. Repeat Step 2 and 3 as required.

To resize a group of objects select the objects first then the resize tool. Note that in this case, the scale and reference point refer to the extents of the selected objects.

5.11.16 BREAK

Use the *Break* command when creating a gap in an object. For example, the user may want to create an opening in a wall or trim where two objects intersect. The break tool can only be used on geometric objects not on hydraulic objects.

To create a break in an object:

1. Select *Modify|Break*.
2. Select the object to break.
3. Place a point at or near where the break begins.

This point need not be exactly on the object; the break will start at the point closest to the point the user place. A dynamic preview of the break appears, shadowing the cursor movement.

4. Place a point at or near where the break ends.
5. Repeat Steps 2 to 4 as required.

Tip: *To trim a line place the first point on the line where the user want to trim from and the second point beyond the line end. To break an object without creating a gap click twice in the same place.*

Note: *The user cannot use the break tool on a group of objects.*

5.11.17 SCALE IMAGE

The scale image tool (*Modify|Scale Image*) is used to scale an image to the correct world size. As with other IRRICAD tools it can be applied to an image that is already selected or set as the current tool and then applied to images individually. The tool cannot be applied to multiple images at the same time. The functions of the tool are described in detail below.

Note that using the change tool to alter the size of the bounding rectangle of an image is no longer supported and is replaced by this method.

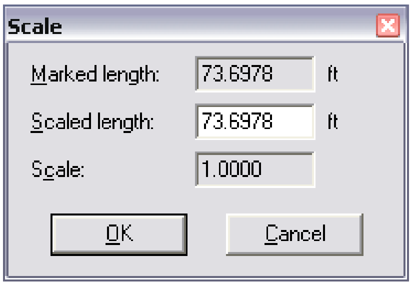


Figure 5-141

To correctly scale the image the procedure would be:-

1. Using one of the selection tools (e.g., select object) select the image rectangle or click on the image near the edge.
2. Now select *Modify|Scale Image*.
3. Click on the start and then the end of the fence line or known length.
4. Change the length displayed in the "Scaled length" field to the known length, **200** in this case.

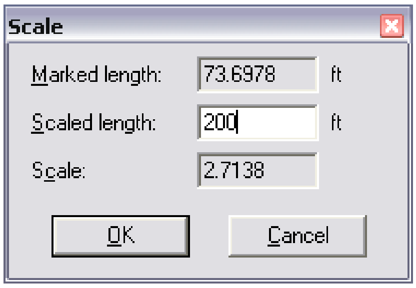


Figure 5-142

5. Click [OK] and the image will be resized so that the fence line being considered will now be 200ft (m) long.

5.11.18 Z-ORDER

Use these tools to adjust the drawing order of IRRICAD elements.

To change the Z-Order of an object or objects:

1. Select Modify|*Z-Order|Move To Front* or Modify|*Z-Order|Move To Back*.
2. Select the object to move.

3. Repeat as necesssary.

To change the drawing order of multiple objects at once, select those objects before starting the tool.

Note: Move To Front draws the selected object last, it will be 'on top'. Move To Back draws the selected object first, it will be 'underneath'.

5.11.19 TRIM

Use the Trim tool to trim lines to a common target object (or the extension of the target object).

To trim an object to a target object:

1. Select the line(s) to be trimmed.
2. Select *Modify|Trim*.
3. Click the target object or path.

As the cursor is moved back and forth across the target object, a dynamic preview displays, showing the objects as they would appear trimmed to that side of the target object.

4. Click the side of the target object to retain.

The first objects will be trimmed to the second object or path.

5.11.20 EXTEND

Use the Extend tool to extend a lines so that they all terminate on a common target object (or the extension of the target object).

To extend objects to meet a target object:

1. Select the lines to be extended.
2. Select *Modify|Extend*.
3. Click the target object.

The selected objects will be extended to meet the target object.

5.12 Tools

The *Tools* menu contains tools involved in providing special operations specifically related to generating the design:

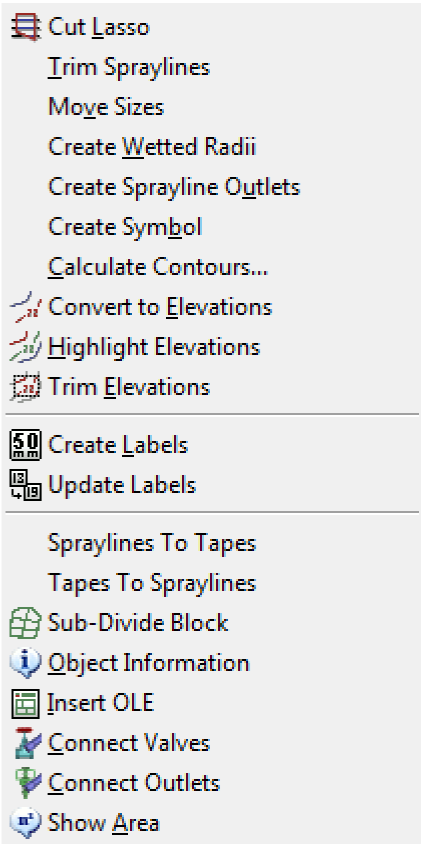


Figure 5-143

5.12.1 Cut Lasso

Cut Lasso is used to make changes to sprayline or zone pipe size and / or type, when the user require the change to apply to only parts of the existing pipes, rather than complete pipes. It also can be used to delete all pipes, including parts of pipes, within the boundaries of the lasso. It differs from the ordinary change and delete tools, which will only change or delete a pipe if it is entirely within the boundary.

To use Cut Lasso:

1. Select *Tools|Cut Lasso*.
2. Draw the lasso, selecting *Right-click|Close* after placing at least three points, or crossing the last point over the first, making sure the lasso boundary cuts the pipe in the required place.
3. Change the junction properties of the new junctions if required and select the type of cut lasso. Click [OK].
4. Repeat steps 1 to 3 as required.

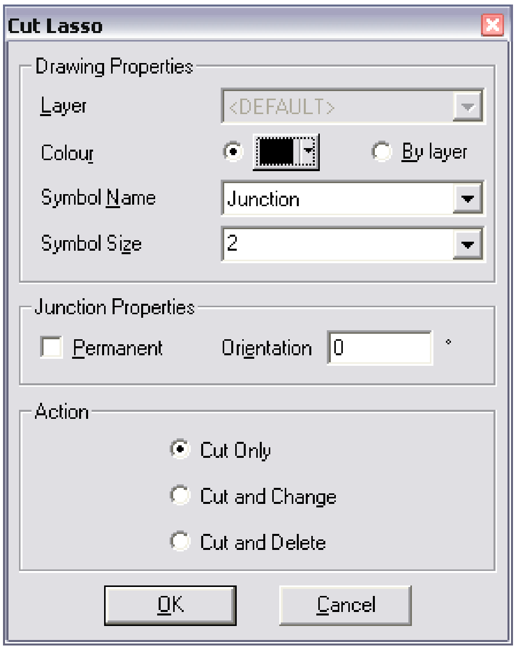


Figure 5-144

Action

Cut Only: Cuts pipe at the intersection of the pipe and the lasso, inserting a junction at this spot.

Cut and Change: Cuts pipe then invokes the *Change Type* tool on pipes inside the lasso. (Click on one of the pipes to be changed to bring up the *Change Type* dialog).

Cut and Delete: Cuts pipes then invokes the *Delete* Tool on pipes inside the lasso.

5.12.2 TRIM SPRAYLINES

This tool is used to trim connected spraylines back to the last emitter on the sprayline. It does not work on unconnected spraylines.

When the *Trim Spraylines* lasso is closed, all connected sprayline ends inside the lasso will be trimmed to the nearest emitter provided the end of the sprayline is not connected to other objects such as submain pipes, other spraylines or extra outlets.

To trim one end of a sprayline, lasso that end. If both ends are to be trimmed in one operation, then the entire sprayline must be inside the lasso. Note that if the starting end of a sprayline is trimmed, the offset is set to zero.

To trim spraylines:

1. Select *Tools|Trim Spraylines*.
2. Lasso the sprayline ends to be trimmed.
3. Repeat step 2 as required.

5.12.3 MOVE SIZES

In most situations, the points at which laterals change size in blocks with telescoping laterals can greatly vary in a block, making installation difficult. It is sometimes desirable to square things up so that the position of lateral size changes is more uniform. The *Move Sizes* tool is provided for this purpose.

To move sizes:

1. Select *Tools|Move Sizes*.
2. Draw a line through the telescoping laterals at a point where the change in size is required. This line can be continued to consist of a number of segments.
3. Finish the line by selecting *Right-click|Done*.
4. Select the lateral size to be moved to the new change size position.
6. Click [OK].
7. Repeat steps 2 to 6 as required.

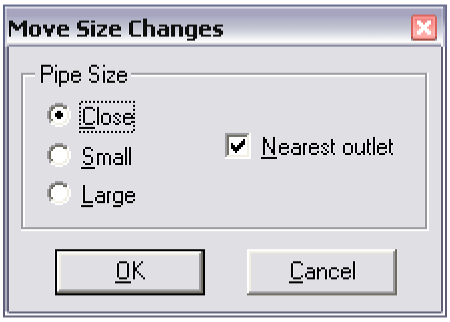


Figure 5-145

Pipe Size

Close:	The junction closest to the line will be moved to the line.
Small:	The smaller pipe will be moved to the line.
Large:	The larger pipe size will be moved to the line.
Nearest Outlet:	Check the "Nearest Outlet" box if the user wants the size change to take place at the outlet closest to the line. Leave it unchecked if the size change is to be at the intersection of the line and the laterals.

5.12.4 CREATE WETTED RADII

Use this tool to create wetted radius arcs on outlets that do not already have them.

When an outlet is placed in the design, whether or not a wetted radius arc is created for it is controlled by the "Create Wetted Radii" check box in the *Irrigation – Design Specific* option (*Settings|Irrigation – Design Specific*.

To create wetted radii:

1. Select *Tools|Create Wetted Radii*.
2. Click on an outlet to select it. A wetted radius arc will be created for that outlet.
3. Repeat Step 2 as required.

Tip: *To quickly show or hide all wetted radii in the default layer, use View|Wetted Radii. To create wetted radii on a sprayline, the user does not need to create sprayline outlets first. However, to* *view the wetted radii on the sprayline the user must turn on the SL_WETTED_RADII layer in Settings|Layers.*

5.12.5 CREATE SPRAYLINE OUTLETS

Use this tool to create outlet symbols on connected spraylines that do not already have them.

When a connected sprayline is placed in the design, whether or not outlet symbols are created for the connected sprayline is controlled by the "Create Sprayline Outlets" check box in the *Irrigation – Design Specific* option (*Settings|Irrigation – Design Specific*).

To create sprayline outlets:

1. Select *Tools|Create Sprayline Outlets*.
2. Click on a sprayline to select it. Outlet symbols will be created for that sprayline.
3. Repeat step 2 as required.

To quickly show or hide all sprayline outlets in the default layer use *View|Sprayline Outlets*.

5.12.6 CREATE SYMBOL

Use the *Create Symbol* tool to create a symbol made up of existing objects, which may then be placed repeatedly in the design (rotated and re-scaled as required) or saved to disk for future use.

To create a symbol:

1. Select the objects that make up the symbol.
2. Select *Tools|Create Symbol*.
3. Type the name of the symbol in the text box – do not exceed 32 characters.
4. Select "Drawing" or "Database" as the symbol type
5. Browse for the folder the user wishes to save the symbol in, if it is different to the default database folder currently showing. Click [OK].

The default folders for drawing or database symbols are specified in *Settings|Drawing Items* – "Drawing Symbols Path", and *Settings|Irrigation Items* – "Database Symbols Path" respectively. These symbols may be accessed through *Draw|Symbol*. If a database symbol is required as a drawing symbol, [Browse] for the folder where the database symbols are stored.

Replace Original with Symbol: Check this box to replace the objects on the screen that make up the symbol with the created symbol. Note that if the symbol contains hydraulic items these items will lose all hydraulic significance and become one geometric item (the symbol).

5.12.7 CALCULATE CONTOURS

Contours can be calculated from spot heights using the Calculate Contours tool (*Tools|Calculate Contours*). The tool allows the contour interval and the properties of the calculated contours to be set.

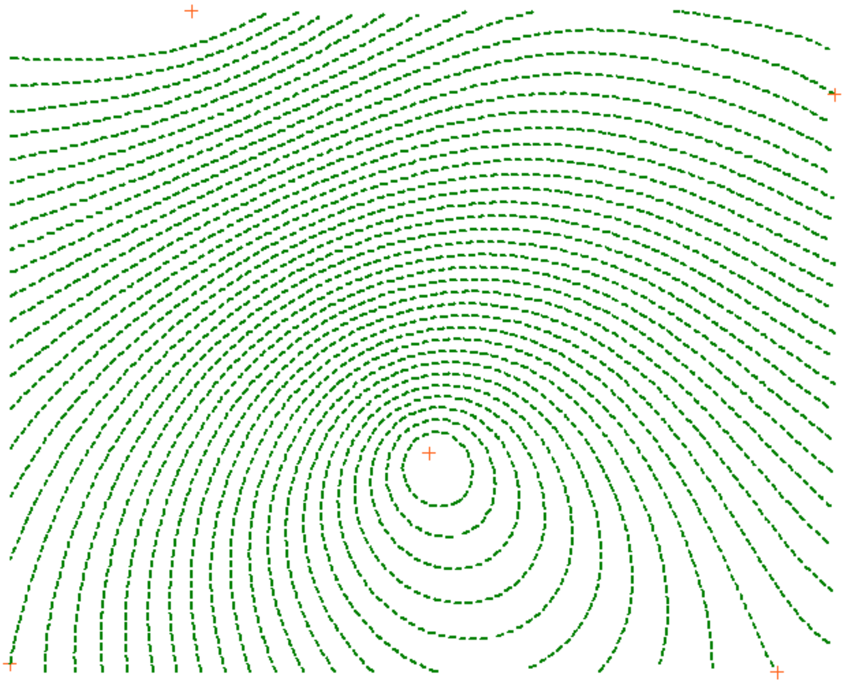


Figure 5-146

5.12.7.1 CALCULATE CONTOURS DIALOG

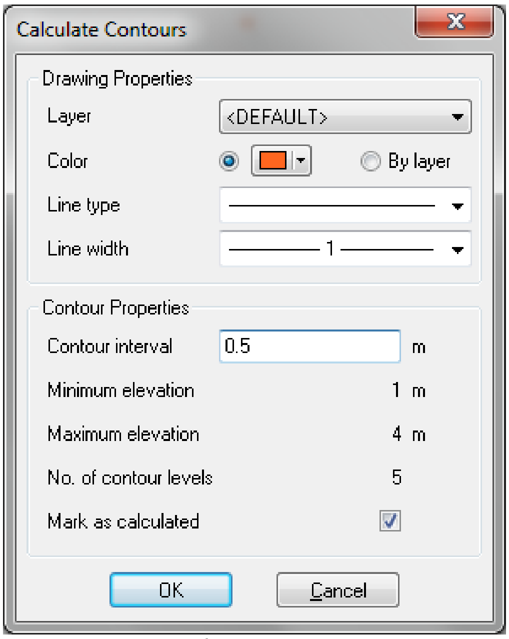


Figure 5-147

Drawing Properties

Layer: Specifies the layer which the item will be placed. The <DEFAULT> layer for calculate contours is DRAWING. Select a different layer from the dropdown list if required.

Color: Specifies the color of the displayed element. Select a new color from the color chart by clicking on the color edit box, or select the By Layer option to use the default layer color.

Line Type: Specifies the line type of the displayed element. Select a different line width from the dropdown list.

Line Width: Specifies the line width of the displayed element. Select a different line width from the dropdown list.

Contour Properties

Contour Interval: The elevation difference between contours

Minimum Elevation: the minimum elevation based on the exiting spot height elevations

Maximum Elevation: the maximum elevation based on the exiting spot height elevations

No. of Contour Levels: Based on the contour interval and the range of elevation, the number of contours to be produced will be calculated.

Mark as calculated: This is the default setting. If the setting is disabled the contours will be "real" (primary) elevations though this is not recommended.

Note: *Calculated contours are for display purposes only and their elevations cannot be edited. They are classed as secondary sources of elevation data and do not form inputs to the elevation interpolation functions.*

5.12.8 Convert to Elevations

Use this tool to convert lines, polylines and curves to contours, and points and symbols to spot heights.

To convert to elevations:

1. Select *Tools|Convert to Elevations*.
2. Select the object to be converted.
3. Change the drawing properties if required and enter the height. Click [OK].

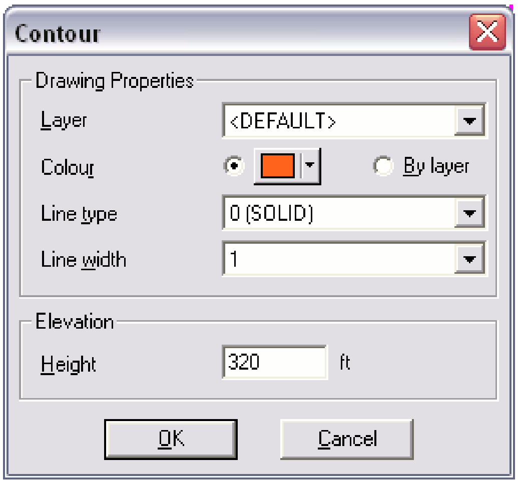


Figure 5-148

4. Repeat Steps 2 and 3 as required.

Note: *If a symbol is converted to an elevation, it is replaced by the spot height symbol (+).*

If a line segment is selected then IRRICAD will find all connected line segments and create a single contour.

To convert a group of objects to elevations with the same height reverse Steps 1 and 2 above i.e., select the objects first then the convert to elevations tool.

5.12.9 HIGHLIGHT ELEVATIONS

Occasionally elevation data imported from DXF files can be incorrect. These errors may not be apparent until problems occur during the design process and can be quite time consuming to locate. The *Highlight Elevations* tool color codes contours and spot heights based on their elevation making any anomalies much easier to locate and correct.

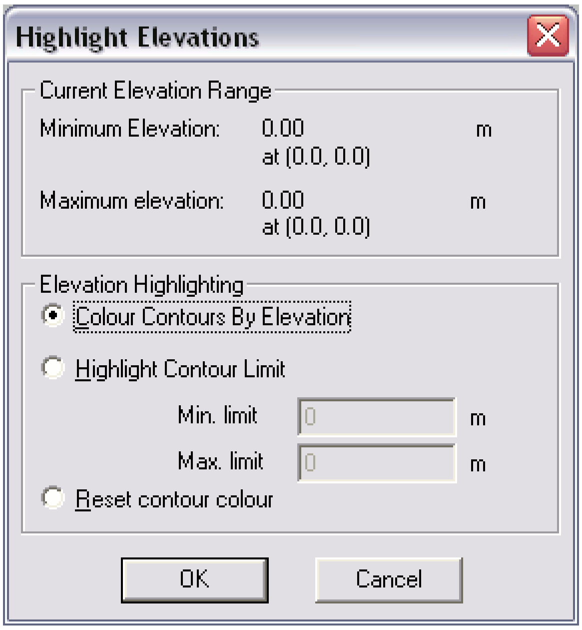


Figure 5-149

The tool is activated by selecting *Highlight Elevations* from the *Tools* menu. When the tool is selected the range of elevation is displayed on the dialog. The functions of the various options are described below:

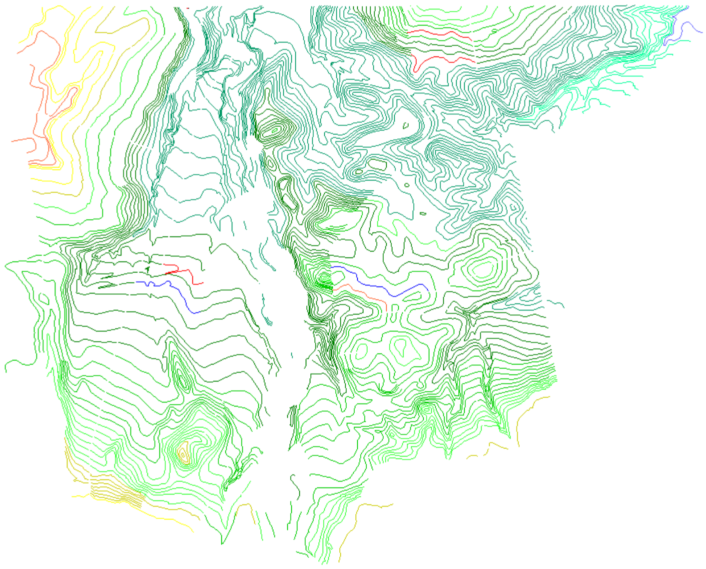


Figure 5-150

Elevation Highlighting

Color Contours By Elevation: The total range of elevation is split into 16 equal graduations and all contours and spot heights are then colored appropriately. Colors run from red through yellow, green then blue with the largest elevation graduation set to red and the smallest to blue. An example of the results of this option is shown in Figure 5-150 above.

Highlight Contour Limits: This option changes the color of all contours and spot heights that are within the range specified by the "Min. Limit" and "Max. Limit" fields to green. Items with elevations larger than the "Max. Limit" are colored red while those lower than "Min. Limit" are colored blue.

Reset Contour Color: All contours and spot heights are returned to the default color as specified in *Settings|Irrigation Items*.

5.12.10 TRIM ELEVATIONS

This tool is used to selectively trim contour lines and delete spot heights.

To use Trim Elevations:

1. Select *Tools|Trim Elevations*.
2. Draw the lasso, selecting *Right-click|Close* after placing at least three points, or crossing the last point over the first, making sure the lasso boundary cuts the countours in the required place.
3. Select the type of action to be taken. Click [OK].

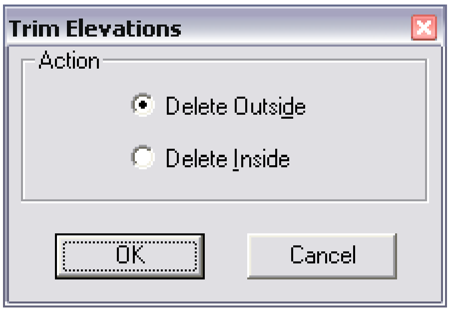


Figure 5-151

Action:

Delete Outside: Contour lines are split where they intersect with the lasso and all contours and spot heights outside the lasso are deleted. Use this mode to retain a defined area of elevation information.

Delete Inside: Contour lines are split where they intersect with the lasso and all contours and spot heights within the lasso are deleted. Use this mode to trim contours.

5.12.11 CREATE LABELS

This tool is accessed via the *Tools* menu; it works like other IRRICAD tools in that it can be used, as an action applied to an existing selection, or a tool that is applied to individual items. When there is no existing selection the label tool is applied to individual items by clicking on them. Depending on the options selected in *Settings|Labels* a suitable label will be constructed.

To label hydraulic items on the design:

1. Select *Settings|Labels* to open the Labels dialog box
2. Check the item type(s) the user wishes to label e.g., Zone Pipes and Mainline Pipes
3. Add any keyword that the user require in the [Text] properties and edit the text properties. Note that the height will be determined by the scale of the design.
4. Edit the [Background] properties as needed.
5. Select **INLINE**, **BELOW**, **ABOVE**, **LEFT** or **RIGHT** for the label placement
6. Select the items the user wishes to label (*Modify|Select All* can also be used.)
7. Select *Tools|Create Labels*.

See also:

Settings|Labels *Section 5.10.10*

5.12.12 Update Labels

Many actions can occur in IRRICAD that may mean that the information displayed in labels are no longer up to date, for example changing label settings, rerunning design etc. The *Update Labels* tool, which is selected from the *Tools* menu, remakes all labels in a design based on the current settings.

5.12.13 Multi-Labels

This tool will will create multiple labels for the selected contour(s) at the specified spacing when "Contours" are enabled for labelling and based on the Contour label properties in *Settings|Labels*.

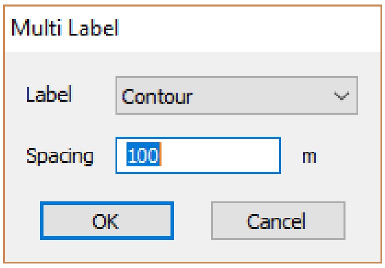


Figure 5-152

Steps to use the Multi-Label tool are:-

1. Enable the “Contours” label type in *Settings|Labels*.
2. On the screen select the contours to label.
3. Action *Tools|Multi-Label* and enter the required label spacing, for example to produce labels every 100 feet or metres along the contour enter **100**. Click [OK].

5.12.14 SPRAYLINES TO TAPES

This tool is used to change a group or block of spraylines to tapes. The user can use it to change spraylines back to tapes after flushing analysis or when the user wants to try another option for designing a block.

To change spraylines to tapes:

1. Select the spraylines to be changed.
2. Select *Tools|Spraylines To Tapes*.
3. In the tape dialog, select the required tape and enter any other values required. Click [OK].

<u>Note</u>: *If the user wishes to change an Irrigation entity (Spray Irrigation Block), the Irrigation Area must first be exploded.*

See also:

Tapes to Spraylines *Section 5.12.15*
Tape *Section 5.7.3*

5.12.15 TAPES TO SPRAYLINES

This tool is used to change a group or block of tapes to spraylines. Use it when needing to analyze the tapes under flushing conditions which requires the tapes to be simulated as spraylines. This tool can also be useful when wanting to try another option for designing a block.

To change tapes to spraylines:

1. Select the tapes to be changed.
2. Select *Tools|Tapes To Spraylines*.
3. In the sprayline dialog, select the required lateral pipe, sprinkler, nozzle and riser and enter any other values required. Click [OK].

Notes: *Only connected spraylines are allowed and the offset must be no larger than the spacing.*

If the user wishes to change an Irrigation entity (Spray Irrigation Block), the Irrigation Area must first be exploded.

See also:

Spraylines to Tapes	*Section 5.12.14*
Sprayline	*Section 5.7.2*

5.12.16 SUBDIVISION TOOL

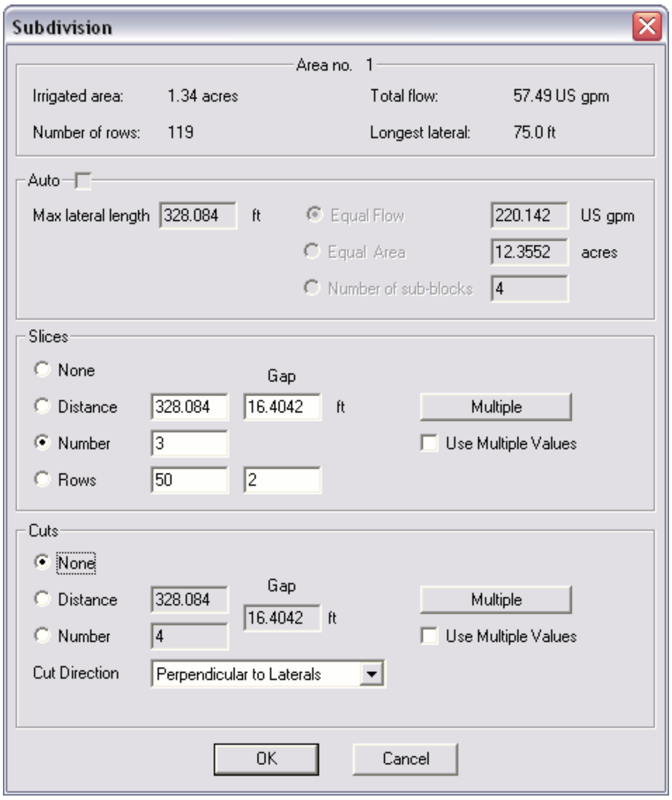


Figure 5-153

The *Subdivision* tool allows existing Irrigation entities to be subdivided into smaller sub blocks. It can be selected from the *Tools* menu. In common with the majority of IRRICAD tools it can be applied to an existing selection or, if no items are selected, applied to a particular object by clicking on that object. The operation of the tool is described in the following sections.

When a block entity is selected for subdivision some information about the block is displayed on the dialog. Information displayed at present consists of the irrigated area, block flow (as determined by the SDR from the component database), number of rows and the length of the longest lateral. Note that this information is only displayed for blocks that have had laterals created. There are two options for subdividing blocks, Automatic (checking the "Auto" checkbox) and manual. In this version only the manual option is available.

Manual subdivision is separated into partitioning a block in the direction of the laterals, known as 'slicing', and splitting the laterals lengthwise or 'cutting' (normally perpendicular to the lateral direction). Blocks may be subdivided by either slicing or cutting or both.

5.12.16.1 Slices

None:	No slices
Distance:	Slices of the specified distance will be made with the specified gap between them (the gap may be zero). The slices start from the first lateral, which is defined as the one closest to the block lateral direction, and are repeated over the extents of the block. Any remaining distance will also constitute a slice.
Number:	The block will be split into the specified number of slices as evenly as possible. No gaps are permitted.
Rows:	Similar to the distance option except that the slices and gaps are specified in terms of number of rows. Again it is permissible to set the gap to 0.
Multiple Values:	If either the "Distance" or "Rows" option is selected a series of different values can be specified by clicking the [Multiple] button and entering pairs of values into the "Slices" dialog.

These values will be used in the subdivision process if the "Use Multiple Values" check box is ticked. Note that slices specified by this method are not repeated and any remaining distance or rows not covered by the multiple values will not constitute a slice.

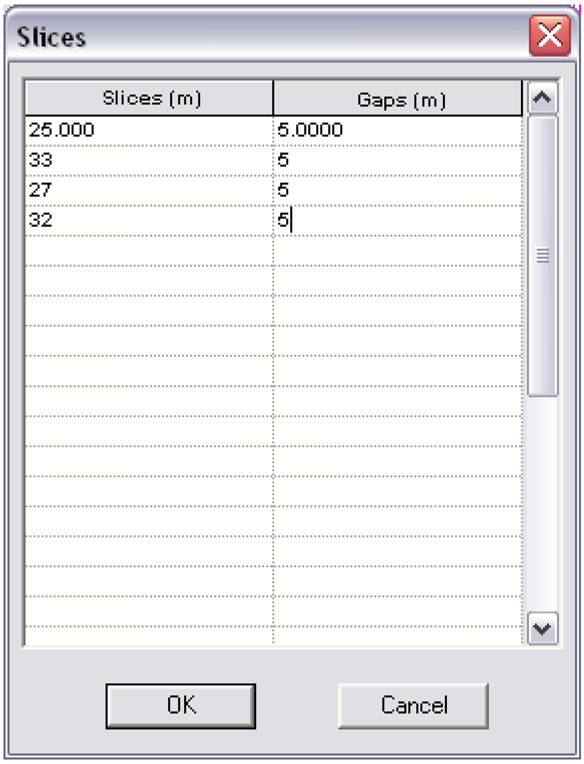


Figure 5-154

5.12.16.2 CUTS

None: No cuts.

Distance: Cuts of the specified distance will be made with the specified gap between them. Note that the gaps between cuts cannot be zero; the minimum value allowed is 0.1m while the minimum recommended value is 0.5m. Cuts span the block starting from the beginning of the first lateral (defined as the one closest to the block lateral direction) and are repeated over the extents of the block. Any remaining distance will also constitute a cut.

Number: The block will be split into the specified number of cuts as evenly as possible with the specified gap between the cuts.

Multiple Values:	If the "Distance" option is selected a series of different values can be specified by clicking the [Multiple] button and entering pairs of values into the "Cuts" dialog. These values will be used in the subdivision process if the "Use Multiple Values" check box is ticked. Note that cuts specified by this method are not repeated and any remaining distance not covered by the multiple values will not constitute a cut.
Cut Direction:	By default the direction of the cuts is **Perpendicular to Laterals** but the cut direction may also be specified by two other methods. **Select Boundary Line:** The cut direction will be parallel to one of the line segments that make up the boundary of the block being subdivided. This segment is selected by left clicking on it after the subdivision dialog is closed. **Manual:** Any direction can be specified by simply drawing a line that the cuts will be parallel to. Again this line is drawn once the subdivision dialog is closed.

5.12.16.3 Tool Operation

When the subdivision dialog has been closed and the cut direction specified (if the default option isn't selected) a preview of the subdivision is displayed (Figure 5-155) and a dialog listing the proposed sub-areas is shown. The "Sub Areas" dialog can be moved (by clicking and dragging the title bar) allowing parts of the preview that are obscured to be viewed. If large areas are being subdivided opening the *Birds Eye View* (from the *View* menu), before starting the subdivision, will give access to the zoom tools which can be used to view the preview. Zoom tools can be selected by right clicking in the BEV or a new zoom window can be created by clicking and dragging with the left mouse button. For more information on the *Birds Eye View* see Section 5.5.11.

Clicking the [Accept/View Changes] button with nothing specified in the "Join Sub-Areas" table will cause the preview dialog to close and the block will then be subdivided into the specified sub- areas. Clicking [Cancel] will return to the "Subdivision" dialog.

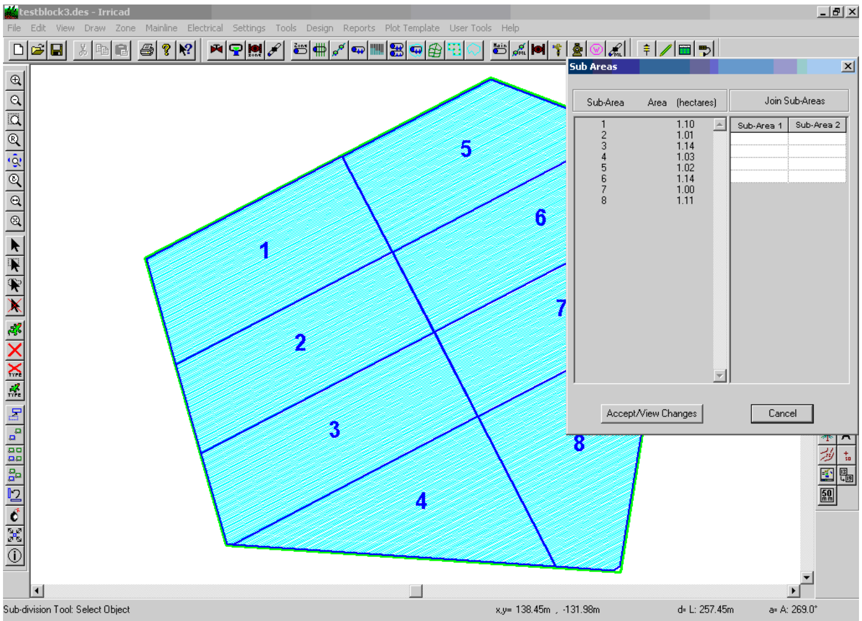


Figure 5-155

5.12.16.4 COMBINING SUB-AREAS

Sub-areas may be combined during the preview phase by entering pairs of sub-area identification numbers into the "Join Sub-Areas" table. Each pair of sub-areas will be joined together to form a new larger sub-area. When there are entries in this table clicking [Accept/View Changes] will cause the preview to be updated and the dialog redisplayed. An example of is illustrated in Figure 5-156 below.

This process can be repeated and will in effect allow more than two areas to be joined together.

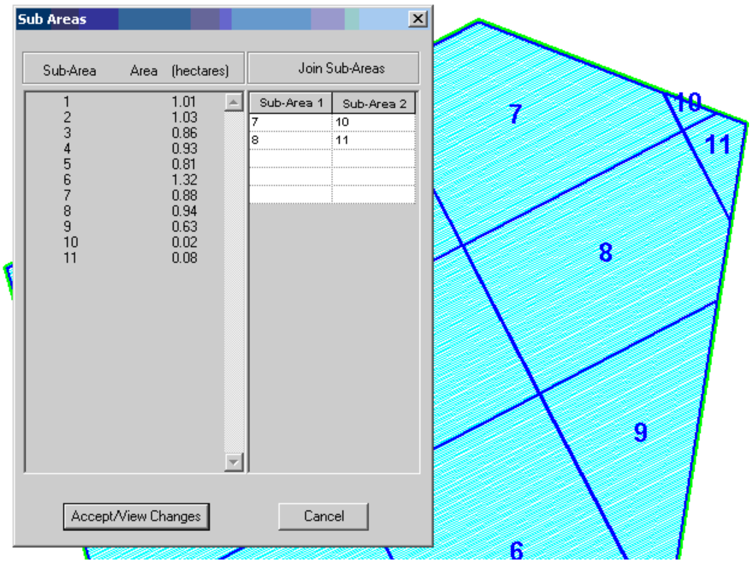


Figure 5-156

After clicking [Accept/View Changes] areas 7 and 10 and areas 8 and 11 are combined.

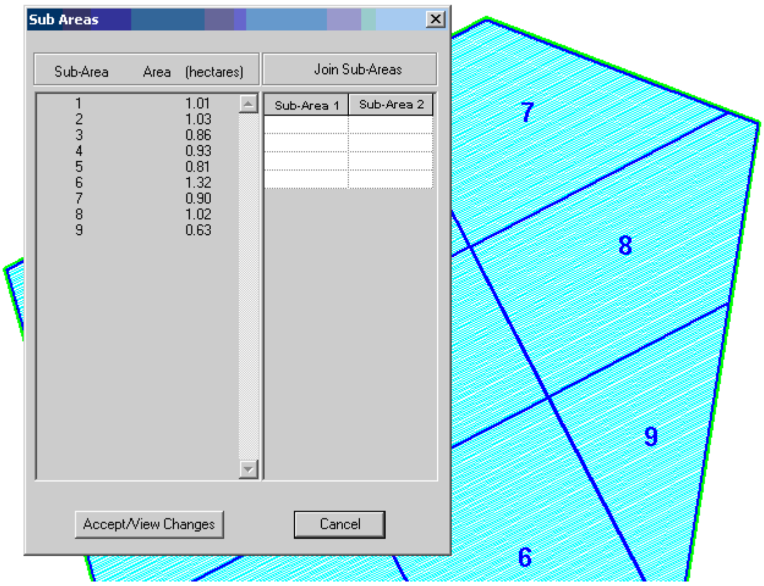


Figure 5-157

5.12.16.5 SUBDIVISION TOOL NOTES

Submain Position

Sub-blocks created by the subdivision process will have the same submain position as the parent Block. This can be altered using the *Change* or *Change Type* tools. Laterals for sub-blocks are always created regardless of the setting for the parent block.

Re-subdivision

Blocks may be re-subdivided, when this happens any existing sub-blocks are removed when [OK] is selected. Subsequently cancelling from the operation will not restore the original sub-blocks.

Subdividing Sub-Blocks

Any IRRICAD Block Entity can be subdivided. This means that blocks that are the result of subdivision can be further subdivided themselves. A useful application of this feature is where an irregular block needs to be subdivided into a number of equal areas and it is not critical that the cuts all line up. The block can be sliced without any cuts and then the resulting sub-blocks cut individually (without any slices).

Restrictions

Prior to Version 9.09 blocks with the "Lateral Group" option selected and 'Indented' blocks could not be subdivided.

When subdividing blocks that contain lateral groups there is however a restriction on the minimum size of 'slice' that can be used. If the width of a 'slice' is less than twice the total spacing (group spacing + the distance the laterals in a group occupy) then the position of the laterals in the resulting block may not match those in the parent block. A warning message (INPT 39) will be issued if this situation is encountered.

5.12.17 OBJECT INFO

Object Info can be accessed from the *Tools* menu, from the *Right-click* menu. In common with other IRRICAD tools *Object Info* can be used to apply to an existing selection (information for multiple objects can be displayed simultaneously), or if no items are selected operated by clicking on individual objects.

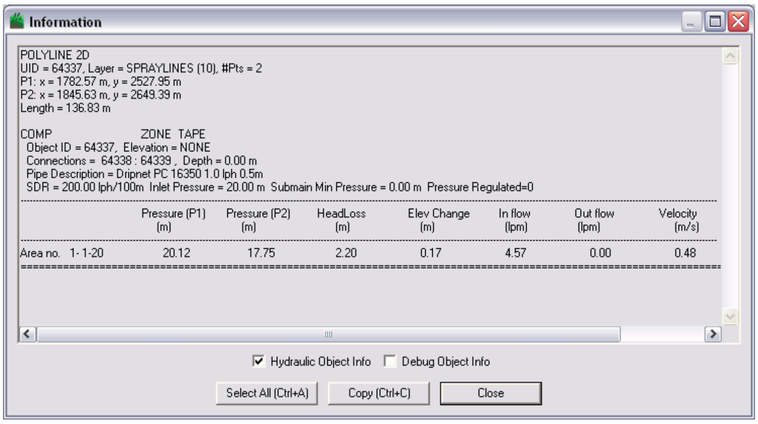


Figure 5-158

Select All

This button will select everything in the current *Object Info* window. *Select All* can also be achieved by using the <Ctrl> + <A> keys.

Copy

This button will copy the selected text on to the clipboard. Copy can also be achieved by using the <Ctrl> + <C> keys.

Close

This button will close the *Object Info* window.

Pasting in to Dialogs

The automatic pasting of coordinates into *Go To Coordinates* and into the *Settings|Grid / Origin* dialogs has been enabled. This means that a coordinate string copied from the *Object Info* screen which includes both X and Y coordinates, units and descriptors (e.g., x = 25.28 m, y = 8.46 m) can be inserted in one action into the appropriate fields in these dialogs.

> Note: *that the copied string can only contain two numbers for this function to work correctly (i.e don't include the 'P1:' from object info when selecting the coordinate string).*

5.12.17.1 Hydraulic Object Info

The "Hydraulic Object Info" check box can be checked (turned on) in this *Object Info* window or in *Settings|Miscellaneous*. *Object Info* then will show a summary of the hydraulic information for that particular hydraulic item. The start and end pressure, the dynamic headloss, the elevation change, the in and out flows and the velocity are all displayed.

5.12.17.2 Debug Object Info

This option can be turned on if IRRICAD Support asks the user to when troubleshooting or problem solving. "Debug Object Info" shows all the properties of the selected item(s).

5.12.18 Insert OLE

Items such as IRRICAD reports, spreadsheets, documents etc. can now be inserted into the IRRICAD design. The methods available to do this are described below.

Tools|Insert OLE allows multiple instances of the object to be inserted.

Notes:

The required data needs to have been copied to the clipboard in the appropriate application (e.g., the IRRICAD report viewer) or a file copied in 'My Computer'/'Windows Explorer'. The size and shape of the OLE object is selected by specifying two corners of a rectangle (clicking one corner then moving the cursor to the desired second corner and clicking again - NOT click and drag). Although there is no restriction on the shape of the OLE rectangle it is advisable to ensure that the relative dimensions of the rectangle approximate those of the OLE object to be displayed.

It is a restriction of OLE that only the first page of the copied data can be displayed. IRRICAD allows OLE data to be displayed, printed and exported to PDF. NOTE: in order for IRRICAD reports to be displayed correctly an application that can render RTF data, including tables, must be installed on the system - examples of suitable applications are MS Word, Open Office etc.

OLE items can be printed or exported to PDF files. In both cases only the enclosing rectangle is displayed in the Print/PDF preview screens.

OLE items are not exported to VCD/DXF/DWG files.

OLE items are selected by using a select tool and clicking on the bounding rectangle for the item. This rectangle is white and therefore will be invisible when using a white background. It is normally not difficult to select it but an alternative is to use a non-white background color.

See also:

Edit|Paste	*Section 5.4.4*
Edit|Open OLE Item	*Section 5.4.5*

5.12.19 CONNECT VALVES

IRRICAD has a tool that automatically connects control valves to the nearest existing mainline.

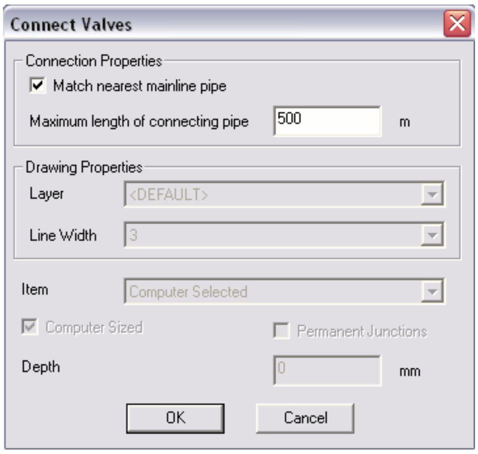


Figure 5-159

5.12.19.1 CONNECTION PROPERTIES

Match nearest mainline pipe: If this option is checked then the properties of the pipe selected to join valves to the mainline will be taken from the mainline pipe that is closest to each of the control valves.

Maximum length of connecting pipe: This field controls whether a control valve will be automatically connected to the mainline. If the distance from the closest mainline pipe exceeds this value then no connecting pipe will be placed.

Other fields

If "Match nearest mainline pipe" is not checked then the remaining pipe property fields are available. In this case control valves will be connected to the closest mainline pipe with a pipe that has the properties specified in the fields.

> <u>Note</u>: *If the valve is very close to the nearest mainline, then the valve will be connected directly to the mainline.*

5.12.20 CONNECT OUTLETS

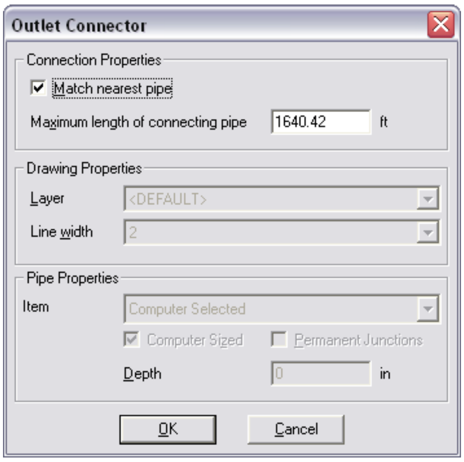


Figure 5-160

IRRICAD has a tool that automatically connects outlets to the nearest piece of mainline or zone pipe, depending on the outlet type.

5.12.20.1 CONNECTION PROPERTIES

Match nearest pipe: If this option is checked then the properties of the pipe selected to join mainline outlets to the mainline will be taken from the mainline pipe that is closest to each of the outlets and zone outlets to the zone will be taken from the zone pipe that is closest to each of the outlets.

Maximum length of connecting pipe: This field controls whether an outlet will be automatically connected to the pipe. If the distance from the closest pipe exceeds this value then no connecting pipe will be placed.

Other fields

If "Match nearest pipe" is not checked then the remaining pipe property fields are available. In this case outlets will be connected to the closest mainline pipe with a pipe that has the properties specified in the fields.

Note: If the outlet is very close to the nearest pipe, then the outlet will be connected directly to the pipe.

5.12.21 SHOW AREA

Tools|Show Area is used to calculate the area inside a closed boundary. Clicking inside the region will highlight the boundary and display the area enclosed by it.

This tool can be used to:-

- Quickly find the area within a region. For example, the paddock corners outside of a centre pivot circle.
- Manually subdivide an area.

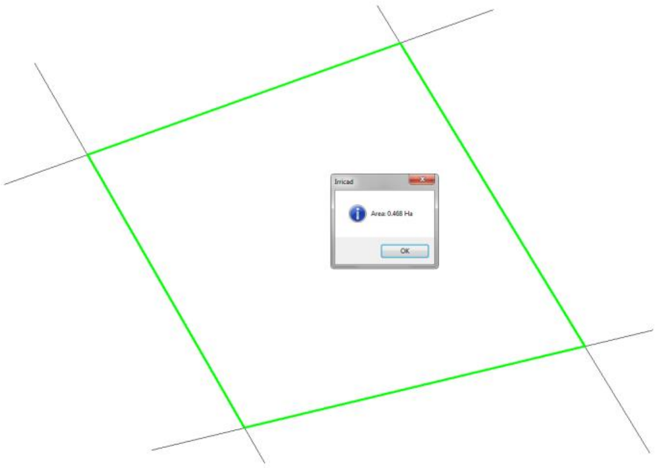


Figure 5-161

5.13 DESIGN

The *Design* menu includes settings and commands involved in the hydraulic design process.

The *Design* menu contains the following commands:

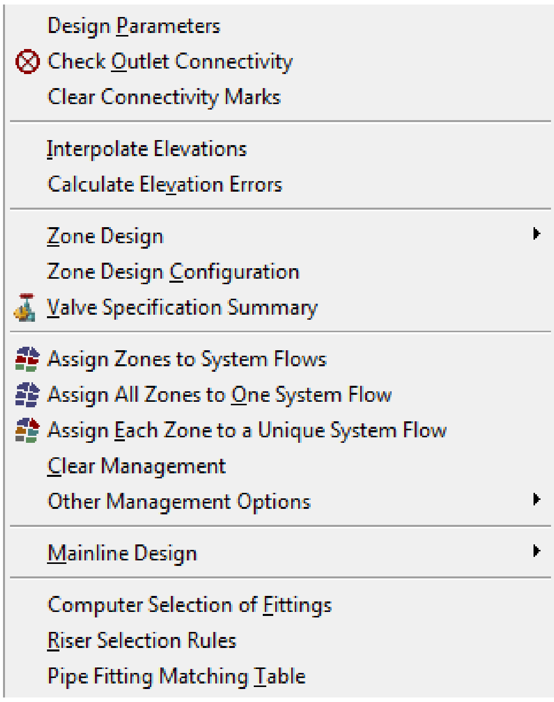


Figure 5-162

5.13.1 DESIGN PARAMETERS

These parameters influence the design process. The design parameters are in three sections accessible from tabs in the dialog.

Hydraulic Parameters: Hydraulic constraints.
Economic Parameters: Values used in the capital versus running costs trade-off.
Analysis Parameters: Internal mathematical tolerances used in the design engine.

To set design parameters:

1. Select *Design|Design Parameters*.
2. Make any changes required.
3. The [Save as Defaults] button saves the new values as default values for all subsequent designs. The [Restore Defaults] button sets all the parameters to the currently saved default values.
4. Click [OK].

5.13.1.1 HYDRAULIC PARAMETERS

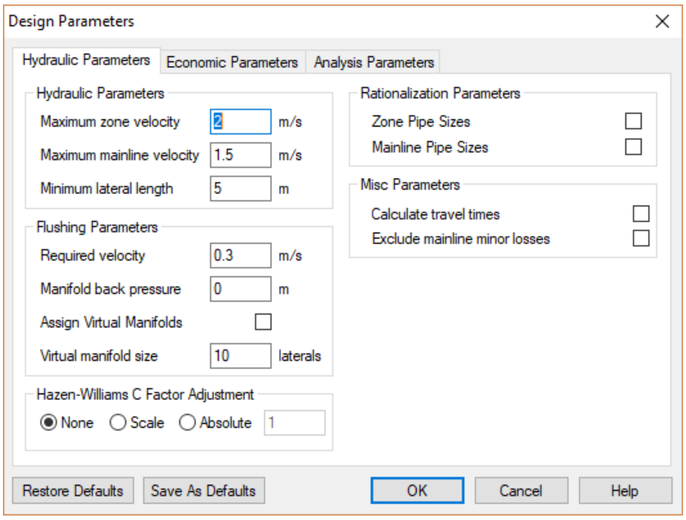


Figure 5-163

Maximum Zone Pipe Velocity

The maximum fluid velocity used in the computer selection of zone pipe diameters by the Velocity method. Zone pipes are pipes downstream from a control valve. The LP Design method checks actual velocities against this value and warns if it is exceeded but it does not form an absolute constraint.

Maximum Mainline Pipe Velocity

The maximum fluid velocity used in the computer selection of mainline pipe diameters by the Velocity method. Mainline pipes are pipes upstream from a control valve. The LP Design method checks actual velocities against this value and warns if it is exceeded but it does not form an absolute constraint.

Minimum Lateral Length

If laterals shorter than the specified length arise during the placement of laterals they will be discarded. This helps to avoid possible problem occurring during Zone Design and helps to avoid placing unrealistic lateral lengths accidentally.

Flushing Parameters

Required velocity: The minimum required flushing velocity for the tapes. If the resultant velocity is below the required velocity warning messages will be issued during the analysis process and these tapes will be indicated in the Flushing report by "**".

Manifold back pressure: The estimated back pressure in the manifold. This value indicates the pressure that must be overcome for the flow to exit. It includes the headloss as the flow exits the tapes, the headloss along the manifold (if used) and the headloss through the flush valve (if used). If no manifold exists, and the tapes will be flushed by simply opening the ends of the tapes, enter a small value close to 0.

Assign Virtual Manifolds: In zones without physical manifolds this flag controls the use of virtual manifolds. The flag has no effect if manifolds have been created via the tape irrigation block tool. If all laterals are to be flushed at the same time, leave this box unchecked; all laterals will be assigned to "0" which can then be specified in *Zone Design Configuration*.

Virtual manifold size: Controls how many tapes are to be flushing at any one time. This value has no effect if manifolds have been created via the tape irrigation block tool or if "Assign Virtual Manifolds" is not enabled.

The results of the flushing calculations will be displayed in the *Zone Flushing* report.

Hazen-Williams C Factor Adjustment

The Hazen-Williams C Factor (HWC) can be adjusted where it may be desirable to adjust the roughness factors for pipes in a particular design. A common example would be to make allowances for pipe aging. The options are:-

None Uses the Roughness C Factor (HWC) from the database.

Scale Multiplies the existing C Factor by the specified factor (HWC_{new} = HWC * factor). To increase the friction loss enter a number smaller than 1.0, to decrease the friction loss enter a number larger than 1.0.

Absolute Adds the specified factor to the existing C Factor (HWC_{new} = HWC + factor). To increase the friction loss enter a negative number, e.g., **-5**, to decrease the friction loss enter a positive number, e.g., **5**.

Note that these adjustments do not affect the database in any way and are transient in that they are only active during the design process when the option is specified.

The zone and mainline design reports will include the message “Hazen-Williams C Factor has been globally adjusted” if an adjustment was specified for the last design run.

Rationalization Parameters

Zone Pipe Sizes: When enabled, sizes will be logically rearranged from large to small, in submains and zone pipes, to produce a more practical arrangement. The rationalization process occurs after LP Design has selected pipe sizes and set the valve pressure. The resulting arrangement of pipe sizes is then re-analyzed based on the valve pressure already selected.

Mainline Pipe Sizes: When enabled sizes will be logically rearranged from large to small pipes to produce a more practical arrangement. The rationalization process occurs after LP Design has selected pipe sizes and set the water supply pressure (if not user-defined). The rationalized arrangement of pipe sizes is then re-analyzed based on the water supply pressure already selected.

Misc Paramaters

Calculate travel times: This option calculates the time it takes for water and solutes to travel through an irrigation system. Travel times from the water supply to mainline outlets or control valves and from the control valves to all emitters may be calculated and reported. This setting is disabled by default as the calculations may take additional processing time on large designs. Three reports that display travel times are Zone Design Summary, Zone Design Travel Time Report and Mainline Design Travel Time Report.

Exclude mainline minor losses: Mainline minor losses may be excluded from the mainline design process via this check box. This is useful if you wish to use an external method to calculate minor losses in the mainline. This setting is off by default and, unless enabled, minor losses will be calculated as in previous versions of IRRICAD.

5.13.1.2 Economic Parameters:

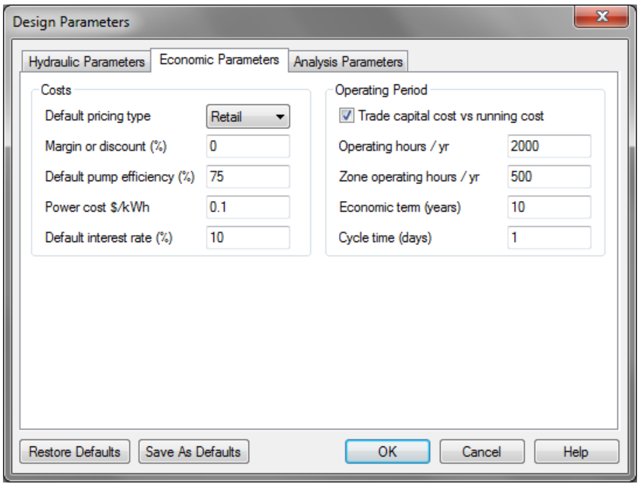


Figure 5-164

Default Pricing Type

The method for calculating the prices of components used for Bill of Materials Reports.

Wholesale: Prices for materials and components will be based on wholesale cost as listed in the database.

Retail: Prices for materials and components will be based on retail prices as listed in the database.

Multiplier: Prices for materials and components will be calculated from a base price (either the wholesale or retail price in the database) multiplied by up to a maximum of four factors or multipliers.

Margin or Discount

A modifier that can be applied to the prices of components calculated using the default pricing type. If the default pricing type is **Wholesale** then the percentage entered will be added as a margin to the wholesale price otherwise it will be subtracted as a discount from the component price.

Default Pump Efficiency, Power Cost

These are used to determine the annual operating cost of zones and mainline so that pumping costs can be taken into account.

Default Interest Rate

This value is used along with "Economic Term" to determine the annual capital cost of pipe by calculating and applying a capital recovery factor.

Trade Capital Cost vs Running Cost

This option can now be turned on or off as required for both mainline and zone LP Design. It is more usual to turn this function off when using Zone LP Design because running costs are generally not a consideration for pipe selection within a zone.

Operating Hours per Year

This value is used when trading capital costs vs running costs in *Mainline Design|LP Design*. The value is the total running time for the water supply or pump with a default of 2000 hours.

When "Trade capital cost vs running cost" is not enabled, pipe selection will select the least expensive pipe(s), within the velocity limit, where the outlet pressure tolerance is met.

Zone Operating Hours / Yr

This value is used when trading capital costs vs running costs in *Zone Design|LP Design* and is required because management (*Assign Zones...*) may not have been completed prior to Zone Design. The value is the average annual individual running time for all control valves with a default of 500 hours.

Economic Term (years)

This value is used along with "Default Interest Rate" to determine the annual capital cost of pipe by calculating and applying a capital recovery factor.

Cycle Time

The maximum time in days that the irrigation system is likely to require to complete an irrigation cycle. Its main purpose is to check that any operating times entered in the management dialogs fall within the cycle. The allowable range is 1-21 days.

See also:

Supplier Code Multipliers *Section 5.14.17*

5.13.1.3 ANALYSIS PARAMETERS

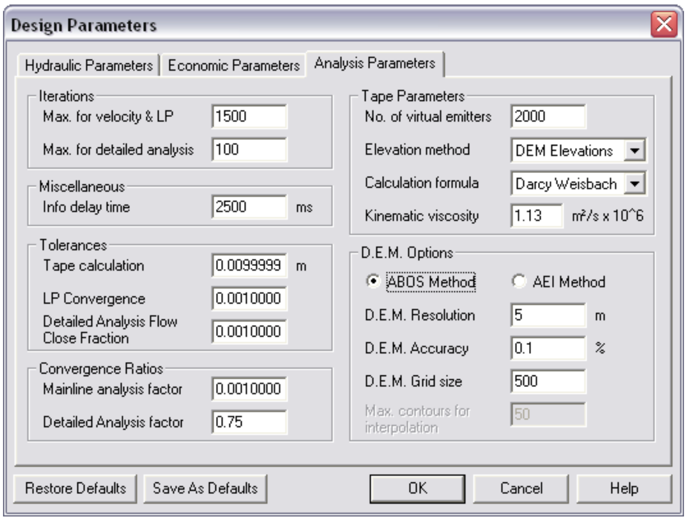


Figure 5-165

These parameters should not be changed under normal circumstances.

Iterations

Maximum for Velocity & LP: The maximum number of iterations allowed to achieve a solution during computer pipe sizing.

Maximum for Detailed Analysis: The maximum number of iterations allowed to achieve a solution during Detailed Analysis. The user can increase this number, if required; however, this will not guarantee that the solution will converge.

Miscellaneous

Info Delay Time: Information warnings, which appear during design, will stay on the screen for the length of time set here. If the user does not wish to get such messages, set the "Delay Time" option to zero. Note the units are in milliseconds, i.e., 2500 equals 2.5 seconds.

Tolerances

Tape Calculation: Pressure tolerance used to check convergence, i.e., to decide when the iterations have finished when doing tape calculations.

LP Convergence: A tolerance used to determine when LP has a close enough solution.

Detailed Analysis Flow Close Fraction: Determines how accurate the final emitter flows are – the smaller the value, the more accurate the flows. A value of 0.001 gives flows to 0.1%.

Convergence Ratios

Mainline Analysis Factor: Do not change this under any circumstances unless specifically told to do so by the technical support person. The default is 0.001.

Detailed Analysis Factor: The default value is 0.75 and in normal circumstances this should not be changed. Valid values are however between 0.0 (fastest) and 0.99 slowest), using a smaller factor may mean some systems will not converge at all.

Tape Parameters

Number of Virtual Emitters: The maximum number of virtual emitters used in the tape calculations. The smaller the number, the faster but less accurate the calculations. A value of 200 barely affects the flows and headlosses and is reasonably quick. IRRICAD uses the physical number of emitters on the tape if there are less than this number.

Elevation Calculation Method: This version includes a method of analyzing tapes where the elevation at each emitter (or virtual emitter) is used in the calculations. To enable this method select **DEM Elevations** in the "Elevation Calculation Method" dropdown box of the Analysis tab under the *Design|Design Parameters* menu item. Note that the other two options available are essentially the same and simply use the slope, one of these will be removed in future versions.

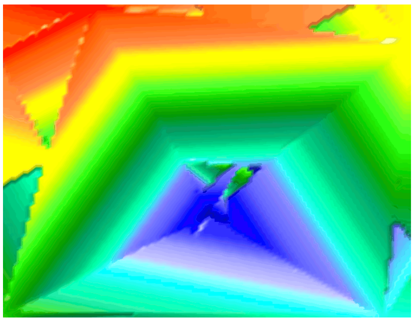
Calculation Formula: Either Darcy-Weisbach (accounting for laminar, transition, and turbulent zones) which is the current method or Diskin (which uses different coefficients depending on the Reynolds number).

Kinematic Viscosity: Used in the calculation of the Reynolds number and Darcy-Weisbach calculations. The default value is 1.13 (which was used in previous versions of IRRICAD) based on water at 60° F.

D.E.M. Options

Interpolation Method: The DEM (Digital Elevation Model) used by Irricad has been greatly improved with the implementation of an ABOS system (**A**pproximation **B**ased **O**n **S**moothing). The ABOS method is much quicker than the old AEI method, and is much better at representing likely topography, especially when based on a low number of height points. It does not show the artefacts sometimes generated by the old method. The ABOS method is the default, but the user may switch back to using the old AEI method if required.

The images below show a height map generated from five spot heights by both DEM methods


AEI Method

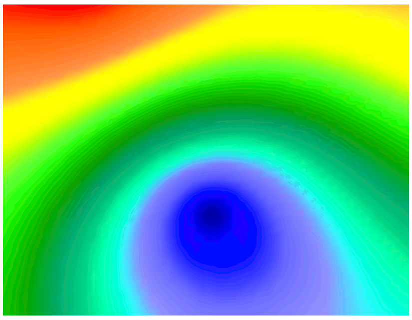

ABOS method

Figure 5-166

The ABOS method also provides an interpolation summary after calculation (see Calculate Elevation Errors, Section 5.13.5).

D.E.M. Resolution: The ABOS method internally represents contours as individual points. These points are automatically generated along contour lines at this resolution.

D.E.M. Accuracy: The target precision of the ABOS method. It is the maximum difference between the source height point data and the surface generated by ABOS and is defined as a percentage of the height range – i.e., a percentage of the difference between the maximum and minimum heights.

D.E.M. Grid Size: If this value is set to 0 then IRRICAD will choose a suitable grid size. However this may result in a large number of grid points and consequently slow the generation and loading of the 3D DEM.

The grid spans the contours and not the hydraulic parts of the design. This means that a large area of elevation data effectively reduces the resolution. Increase the DEM Grid Size to increase accuracy in these situations or leave as 0.

5.13.2 Check Outlet Connectivity

Unconnected outlets, tapes, spraylines and valves are indicated on screen by a special symbol. The coordinates of the unconnected items are no longer displayed in warning messages but are logged to the error log file and can be viewed with *View Errors* under the *Reports* menu.

The size of the symbol used is 20% larger than the "Base database symbol Size" in the *Miscellaneous Settings* tab. Note that the symbol used is named 'Unconnected.vcs' and is located in the Symbols\Drawing folder – users may alter this symbol as they wish.

Note: *This check is optional but it should be used immediately after entering the irrigation system on the screen and after making any significant changes to the layout.*

To check the design for unconnected items:

1. Select *Design|Check Outlet Connectivity*.

IRRICAD will check that all hydraulic items in the design are connected.

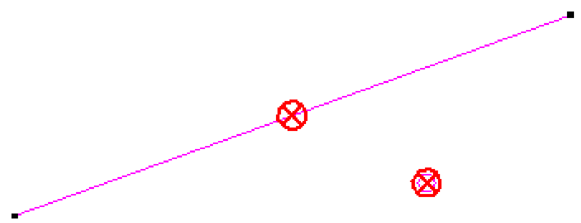


Figure 5-167

If there are any unconnected items, a warning message will tell the user the coordinates of the item(s).

5.13.3 Clear Connectivity Marks

The *Clear Connectivity Marks* menu item will remove all connectivity symbols, any existing symbols are also removed as part of the connectivity check.

5.13.4 INTERPOLATE ELEVATIONS

This option causes IRRICAD to completely re-interpolate elevations for all irrigation components in the design, regardless of whether elevations had been previously interpolated, and also regenerates the DEM.

This tool should only be used if changes to contours or spot heights have been made during the course of the design causing the elevation of objects already included in the design to change.

It is not necessary to select this option for a new design, as elevation will be automatically calculated for all objects. For subsequent runs of design, elevations for new objects that have been added will also be automatically calculated. Elevations for objects, which previously had elevations calculated, would not have elevations recalculated unless *Interpolate Elevations* is first selected.

The elevation interpolation is automatically performed when *Zone Design* is selected, or when *Mainline Design* is selected if it had not previously been completed in *Zone Design*.

To interpolate elevations:

1. Select *Design|Interpolate Elevations*.
2. Wait until the process has finished.

5.13.5 CALCULATE ELEVATION ERRORS

The *Calculate Elevation Errors* tool provides an interpolation summary after the DEM Calculation or *Interpolate Elevations* if the ABOS Method is used (see Analysis Parameters, Section 5.13.1.3). This tool can also be actioned from *Design|Calculate Elevation Errors*. The tool will provide information if the "AEI Method" is used however it is only relevant if the "ABOS Method" is selected in *Design|Design Parameters|Analysis Parameters*.

To go to the coordinates in the message (for example to find any errounous heights) click on the blue coordinates. In this way errors can be found and fixed. Note that the 'errors' are simply the differences between the interpolated DEM grid and the values used to create it. Reasons for this could be insufficeint data, the grid size is too coarse, or incorrect values. Check the surrounding elevations to determine if the values are acceptable.

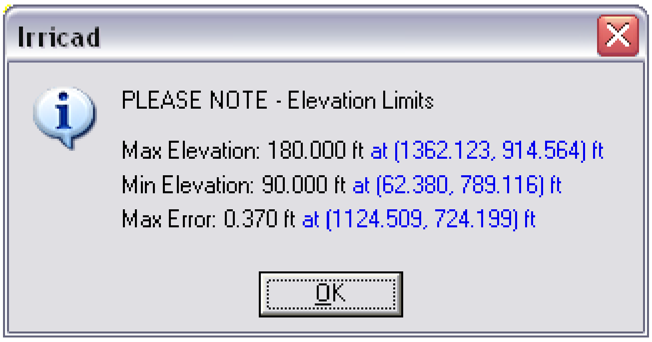


Figure 5-168

Tip: If changes have been made (e.g., erroneous spot heights or contours deleted or changed) re-run Design|Interpolate Contours *to update the DEM information.*

5.13.6 Zone Design

To design the system, there are four options:

Analyze: Calculate flows and pressures when the designer has manually specified zone pipe sizes or IRRICAD has previously sized Computer Sized pipes.

LP Design: LP (Linear Programming) is a method that attempts to select pipe diameters such that the required pressures of the zone outlets are met. Note that LP sizing cannot be used for looped systems.

Velocity Design: This method of computer sizing selects the smallest diameter, for the flow in the given pipe, such that he maximum velocity (specified in *Design Parameters*) is not exceeded. When sizing pipes in a looped system *Velocity Design* must be used.

Detailed Analysis: An iterative process to exactly match the flow of an emitter or sprayline to the pressure at that point. Used after all pipes have been sized and a valve pressure has been specified in Zone Design Configuration (*Design|Zone Design Configuration*).

5.13.7 ZONE DESIGN CONFIGURATION

This table allows the user to select zones to be sized or analyzed and to specify the number of lateral and submain sizes to be used in computer sizing. Selection of zones to be sized or analyzed is particularly useful where the majority of zones in a design are successfully completed and one or two zones only need to be modified and reanalyzed as reanalysis of all the zones is not required. It also allows progressive or staged design where the basic design parameters of some blocks (e.g., lateral pipe types) may be different.

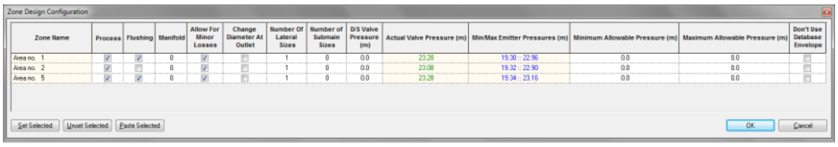


Figure 5-169

To specify the Zone Design Configuration:

1. Select *Design|Zone Design Configuration*.
2. Change the settings for any zone as required.
3. Click [OK].

Process: Check this box if the named zone is to be processed (analyzed or have pipes computer selected).

Flushing: A flag to control whether this zone is to be analyzed for flushing

Manifold: The ID of the manifold operating under flushing conditions. Enter a negative number to denote a virtual manifold. See Manifold Numbering, Section 2.6.5.2.

Allow for Minor Losses: Check this box if minor losses should be included when processing the zone. Note that for tape blocks, minor losses are not included.

Change Diameter at Outlet: Check this box if pipe size changes in spraylines with telescoping diameters is to take place at sprinkler locations. Leave unchecked for the size change to take place at the position calculated by IRRICAD.

Number of Lateral Sizes: The maximum number of pipe sizes that can be used during computer selection of pipe sizes for each lateral. The options are 1, 2 or 3.

Number of Submain Sizes: The maximum number of pipe sizes that can be used during computer selection of pipe diameters for submain pipes (non-laterals). The options are 1-9, with 0 (the default) being used to indicate no restriction.

D/S Valve Pressure: Pressure on the downstream of the control valve. If LP Design is used, IRRICAD treats this pressure as a maximum allowable pressure and may calculate a lower value if it is necessary or more economical to do so. If Velocity Design, Detailed Analysis or Analyze is used, IRRICAD fixes the downstream control valve pressure at the specified value. If IRRICAD is to calculate the required valve pressure, leave this at the default value of zero.

Actual Valve Pressure: Shows the actual valve pressure resulting from the last design/analysis run. Note - these fields are not editable.

Min/Max Emitter Pressures: Shows the actual minimum and maximum emitter pressures in each zone resulting from the last design/analysis run. Note - these fields are not editable.

Overriding Database Pressure Envelope

Normally the pressure window (envelope) used during design and analysis is determined by values in the database. Depending on the particular emitters in the design, a combination of percentage flow /pressure ranges and the minimum and maximum allowable emitter pressure is used. In the revised dialog the database ranges can be overridden, on a zone by zone basis, by checking the "Don't Use Database Envelope" column. In this case the pressure range specified by the values in the "Minimum Allowable Pressure" and "Maximum Allowable Pressure" columns is used.

Note: No range checking is done for these values, it is the user's responsibility to make sure that the pressures chosen are appropriate for the emitters/tapes used in the zone.

5.13.7.1 Edit Operations

Selection

Three methods of selecting values are available. Simply clicking on any editable cell will select the value in it. Clicking and dragging (including not editable cells) will select multiple values. All items in a column may be selected by clicking on the description at the head of the column.

Setting/Unsetting

The [Set Selected] and [Unset Selected] buttons set and unset all selected checkbox values. For example to turn off the processing for all zones the "Process" column would be clicked and then [Unset Selected]. Note these buttons only affect checkbox cells. The Space bar may also be used to toggle the state.

Copying

A selection is copied to the windows clipboard by using the standard windows shortcut <Ctrl> + <C> (hold the Ctrl key down and press 'c').

Paste Selected

This button pastes a single value from the clipboard into all selected cells. For example to set all D/S valve pressures to **30.0** the following process would be used.

1. Enter **30.0** as the valve pressure for a single zone.
2. Select this by clicking on the cell then copy it by <Ctrl> + <C>.
3. Select all valve pressure cells by clicking on the column description.
4. Click [Paste Selected] - all cells in the valve pressure column will be set to 30.0.

Note: only numeric cells are affected by this button.

Pasting

Cells that have been selected and copied may be pasted by using the standard windows shortcut <Ctrl> + <V>. For example to set all the D/S Valve pressures to the results of the last zone design (as a precursor to running detailed analysis, for example) the following process would be used.

1. Select the "Actual Valve Pressure" values by clicking on the column description.
2. Press <Ctrl> + <C> to copy.
3. Select the "D/S Valve Pressure" column by clicking on the column description.

4. Press <Ctrl> + <V> to paste. All the values in the "Actual Valve Pressure" column will be transferred into the "D/S Valve Pressure" column.

Note: that groups of cells may be selected and pasted into the same or other columns. Data may not however be pasted into any non-editable cells.

Undo

The results of previous pasting operations may be 'undone' by using the <Ctrl> + <Z> undo shortcut.

5.13.8 VALVE SPECIFICATION SUMMARY

After running *Zone Design* open this dialog to see the valves and their design flows. Valves that have flows outside of their specified range will be displayed in red. Individual zone valves can be changed in this drop down dialog, which shows the available valves and their flow ranges. *Valve Analysis* is rerun automatically when the dialog is closed.

List suitable valves: Only valves which have flow ranges appropriate for the zone flow will be listed as well as the currently selected valve.

List all valves: All valves enabled in the database will be listed.

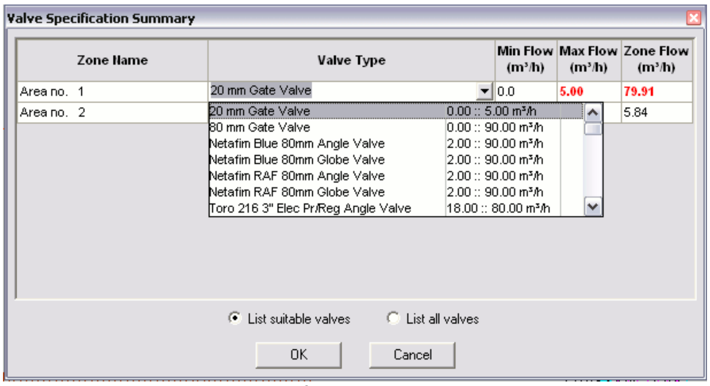


Figure 5-170

The Valve Summary dialog can also be used to streamline pressure changes to mainline outlets and pressure and flow changes to mainline demand points.

Mainline Outlet: the new "Pressure" field can be edited and the "Zone Flow" field will be updated with the new flow.

Mainline Demand Point: both the "Pressure" and "Zone Flow" fields are available for editing.

Zone Control Valve: the "Pressure" field displays the upstream pressure however it cannot be edited.

Note that after making changes in the dialog you should re-run *Mainline Design/Analysis* to incorporate the revised pressures and/or flows.

5.13.9 Assign Zones to System Flows

This is a graphically based management tool. It works by displaying symbols of all zones and water supplies (when more than one) on screen, these symbols can then be selected individually, or in groups, and then assigned to a particular system flow. The process works as follows:-

1. Select *Design|Assign Zones to System Flows*. A dialog specifying the number of systems flows is displayed. The system flow times default to the running time of one hour. These times can be changed as required.

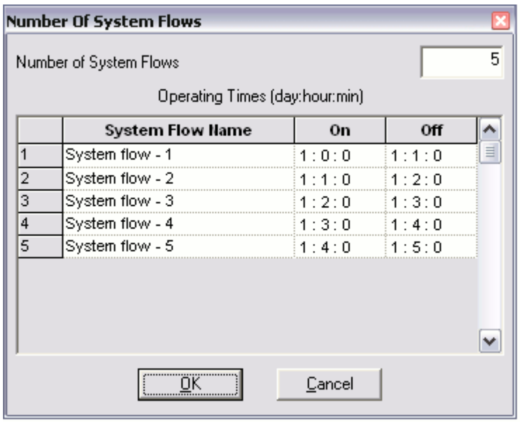


Figure 5-171

2. On clicking [OK] hatched symbols are displayed for all zones and water supplies (if more than one) in the design.

3. The floating ‘System Flows’ window shows the total flow currently assigned to each system flow.
4. Zones are selected by simply left clicking on them. Multiple zones can be selected at once. Zones can be deselected by left clicking or using the *Clear Selection* tool. Note that the status bar displays the cumulative flow of the selected zones and the total Design Flow from all water supplies.
5. The selected zones are then assigned to a particular system flows by either clicking the [Assign Zones to Sys Flows] button on the ‘System Flows’ window, or by selecting the *Assign to Sys Flow* item from the *Right-click* menu.
6. The required system flow number can be specified in the “System Flow Number” field. If “Replace Existing System Flows in Zones” is checked (the default) then the selected Zones will be assigned to the specified system flow and removed from any others. By leaving this field unchecked zones can be assigned to more than one system flow.

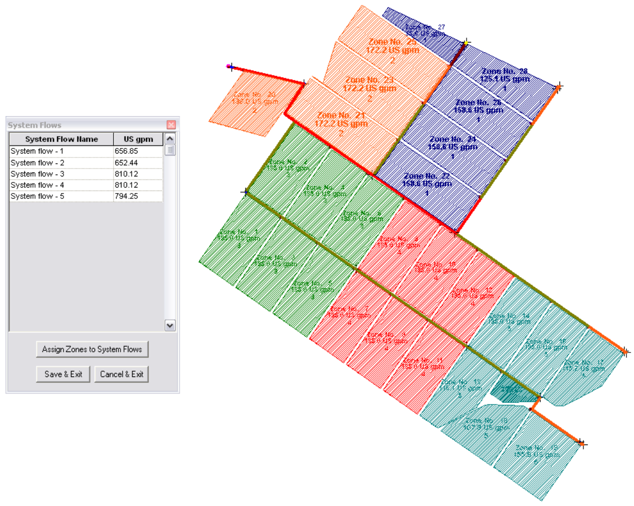


Figure 5-172

7. When the arrangement of zones is acceptable (see Figure 5-172) it can be saved by clicking the [Save & Exit] button or choosing *Save and Exit* from the *Right-click* menu.
8. Clicking the [Cancel & Exit] button will exit from the tool without saving the current arrangement. This option is also available from the *Right-click* menu or by pressing the <ESC> key.
9. The process can be restarted (all changes made will be discarded) by selecting *Restart* from the *Right-click* menu.

5.13.10 Assign All Zones to One System Flow

This method of entering zone management information saves time by automatically assigning all zones in the design to one system flow, operating all zones at one time.

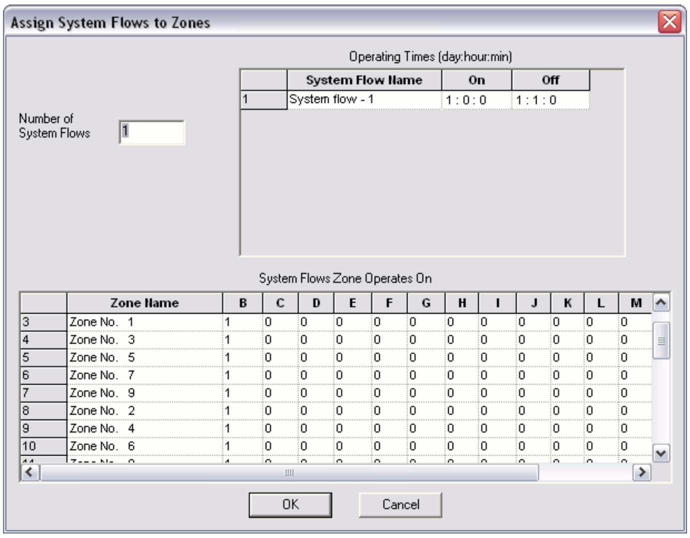


Figure 5-173

To assign all zones to one system flow:

1. Select *Design|Assign All Zones To One System Flow*.
2. Make any changes required in the dialog.
3. Click [OK].

The default On / Off times are set for one hour, one hour apart. The user can change the On / Off times if the actual starting and stopping times are important.

See also:

Assign Zones to System Flows	*Section 5.13.9*
Assign Each Zone to a Unique *System Flow*	*Section 5.13.11*
Assign System Flows to Zones	*Section 5.13.13.3*
Partial Management	*Section 2.6.2*

5.13.11 ASSIGN EACH ZONE TO A UNIQUE SYSTEM FLOW

This method of entering zone management information saves time by automatically assigning each zone in the design to a unique system flow, operating the zones sequentially.

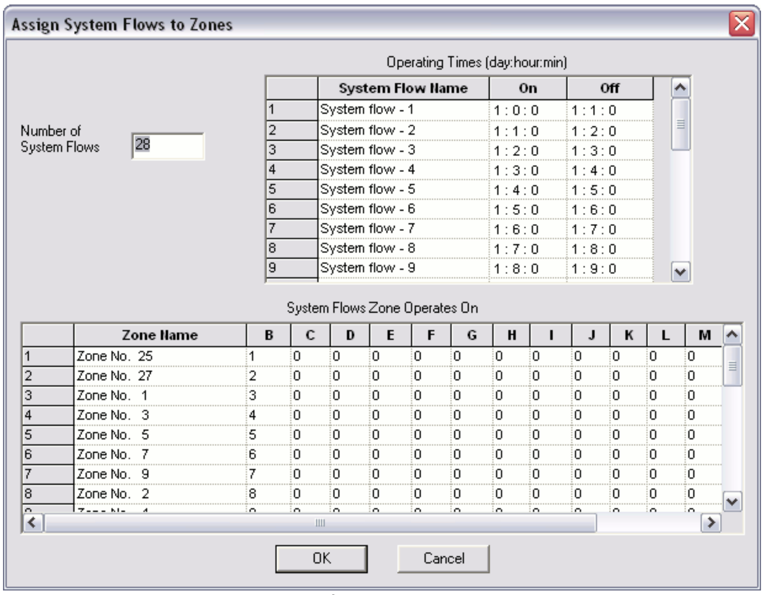


Figure 5-174

To assign each zone to a unique system flow:

1. Select *Design|Assign Each Zone to a Unique System Flow*.
2. Make any changes required in the dialog.
3. Click [OK]

The default On / Off times are set for one hour, one hour apart. The user can change the On / Off times if the actual starting and stopping times are important.

If more than one water supply is present, it is still necessary to allocate which system flow will operate on which water supply.

<u>Note</u>: *If the number of zones exceeds 23, and the cycle time is 1 day, a warning message will occur. To fix this, the user can either allocate less than 1 hour to each system flow, or increase the cycle time in Design|DesignParameters|Economic Parameters.*

See also:

Assign Zones to System Flows	*Section 5.13.9*
Assign All Zones to One System Flow	*Section 5.13.10*
Assign System Flows to Zones	*Section 5.13.13.3*
Partial Management	*Section 2.6.2*

5.13.12 CLEAR MANAGEMENT

The *Clear Management* option in the *Design* menu deletes all the current zone and water supply management information.

5.13.13 OTHER MANAGEMENT OPTIONS

5.13.13.1 WATER SUPPLY TIMES

This table will allow the user to enter and designate On times and Off times for the water supply.

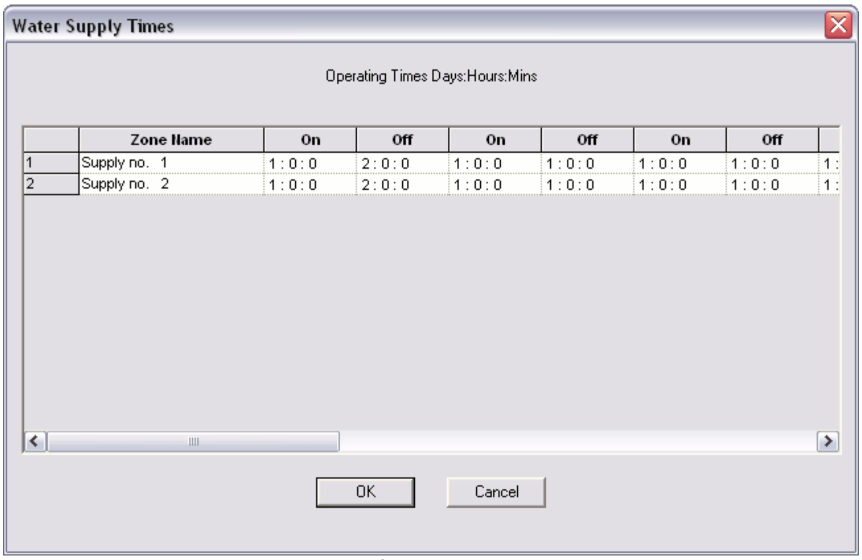


Figure 5-175

The water supply can be specified as being available at specific times during the irrigation cycle time.

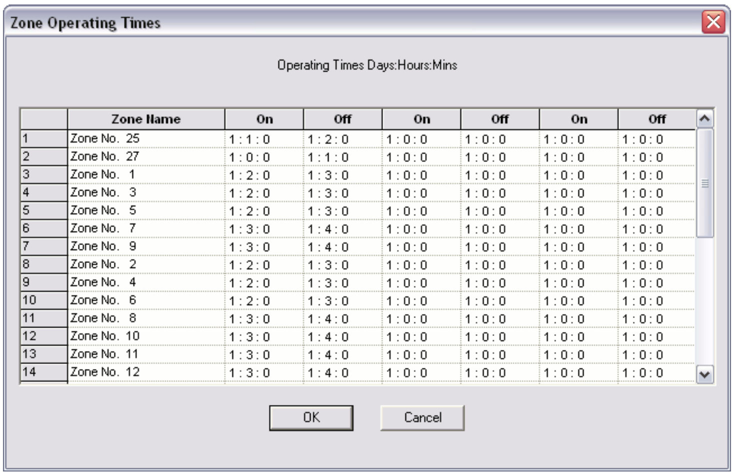
Examples of where this may occur are:

- Where the water supply may be turned off for weekends, or
- Where irrigation cannot take place during certain hours of the day.

Up to 10 start and stop times for each water supply can be specified.

Where the *Assign System Flow…* options are used, multiple water supplies can be designated to operate on certain system flows or groups of zones. If *Zone Operating Times* are used, *Water Supply Times* must be entered if more than one water supply is present. This ensures that the resulting system flows from overlapping operating times will have the information required to know which water supply they are running on.

5.13.13.2 ZONE OPERATING TIMES



	Zone Name	On	Off	On	Off	On	Off
1	Zone No. 25	1 : 1 : 0	1 : 2 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
2	Zone No. 27	1 : 0 : 0	1 : 1 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
3	Zone No. 1	1 : 2 : 0	1 : 3 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
4	Zone No. 3	1 : 2 : 0	1 : 3 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
5	Zone No. 5	1 : 2 : 0	1 : 3 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
6	Zone No. 7	1 : 3 : 0	1 : 4 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
7	Zone No. 9	1 : 3 : 0	1 : 4 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
8	Zone No. 2	1 : 2 : 0	1 : 3 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
9	Zone No. 4	1 : 2 : 0	1 : 3 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
10	Zone No. 6	1 : 2 : 0	1 : 3 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
11	Zone No. 8	1 : 3 : 0	1 : 4 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
12	Zone No. 10	1 : 3 : 0	1 : 4 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
13	Zone No. 11	1 : 3 : 0	1 : 4 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0
14	Zone No. 12	1 : 3 : 0	1 : 4 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0	1 : 0 : 0

Figure 5-176

To specify operating times:

1. Select *Design|Other Management Options|Zone Operating Times*.
2. Enter up to 3 On and Off times for each zone valve. The times for any zone may overlap or be the same as times for other zones.
3. Click [OK].

Use the scroll bar or the arrow keys to move up and down the screen.

5.13.13.3 ASSIGN SYSTEM FLOWS TO ZONES

This method of entering zone management information allows the designer to choose the number of system flows (stations) and their operating times, and then to select which of these system flows each zone will operate on. It is the preferred option for larger systems where valve grouping rather than actual valve start and stop times are important.

Allocate times to the system flows and designate which zones will operate on which system flows.

Times allocated to system flows must not overlap otherwise a warning will be issued requesting the data to be corrected. Likewise, the times must not violate the irrigation cycle time (as set in *Design|Design Parameters|Economic Parameters*) and the water supply availability (if used).

For systems with two or more water supplies, each supply can be assigned to any or all of the system flows. This means the user can control which water supply will supply each valve. If there is only one water supply, the supply is not mentioned as all system flows operate on the one water supply.

To assign system flows to zones:

1. Select *Design|Other Management Options|Assign System Flows To Zones*.
2. Enter the number of system flows and the on / off times for each system flow. Allocate the system flows to the water supplies and zones. More than one zone can operate on a system flow.
3. Click [OK].

Tip: *This method can also be used for partial management.*

If the user increases or decreases the number of system flows, the user may need to click on the screen, for this change to take place.

The default On / Off times are set for one hour, one hour apart. The user can change the On / Off times if the actual starting and stopping times are important.

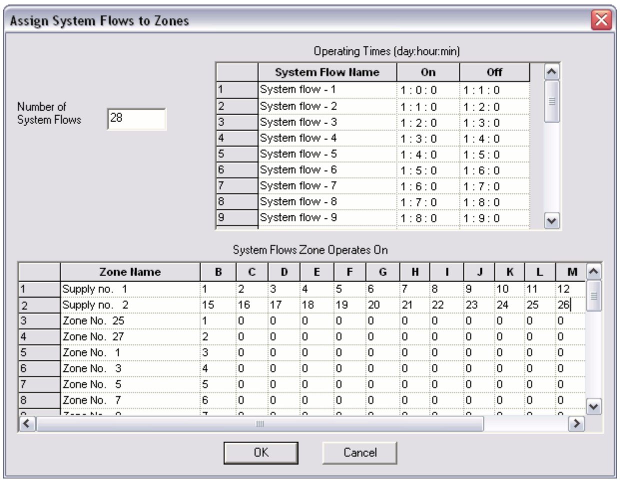


Figure 5-177

If more than one water supply is present, it is still necessary to allocate which system flow will operate on which water supply.

See also:

Assign Zones to System Flows *Section 5.13.9*
Assign All Zones to One System Flow *Section 5.13.10*
Assign Each Zone to a Unique System Flow Section 5.13.11
Partial Management *Section 2.6.2*

5.13.14 MAINLINE DESIGN

To design the system, there are four options:

Figure 5-178

Analyze: Calculate flows and pressures when the designer has manually specified mainline pipe sizes or IRRICAD has previously sized Computer Sized pipes.

LP Design: LP (Linear Programming) is a method that attempts to select pipe diameters so that the required pressures of the mainline outlets or control valves are met. Note LP sizing cannot be used for looped systems or in systems with multiple water supplies.

Velocity Design: This method of computer sizing is selects the smallest diameter, for the flow in the given pipe, such that the maximum velocity for pipes (specified in *Design Parameters*) is not exceeded. When sizing pipes in a looped system *Velocity Design* must be used.

Detailed Analysis: An iterative process to exactly match the flow of an outlet or control valve to the pressure at that point. Used after all the pipes have been sized and a water supply pressure has been specified in the water supply dialog.

5.13.15 COMPUTER SELECTION OF FITTINGS

When this option is selected, IRRICAD refers to the databases and chooses the fittings required to connect the pipes and components, which have been previously selected. Before any fitting selection takes place, junctions that should not require any fittings (such as when two straight pipes are joined together) are removed.

To computer select fittings:

1. Select *Design|Computer Selection of Fittings*.
2. IRRICAD will automatically select the required fittings at each junction.
3. Refer to the *Costings/BOM Reports* for any fitting selection errors.

See also

IRRICAD Selecting Fittings for the Design *Section 2.6.6*

5.13.16 MISCELLANEOUS COSTS

This feature allows the inclusion of any additional items that may be required to complete Bill of Materials or Costing reports.

To use Miscellaneous Costs:-

1. Select *Design|Miscellaneous Costs*.
2. Click the [Add] button to add new items from the database.
3. Click the [Replace] or [Delete] buttons to make changes if required.
4. Click [OK] to save the changes.
5. Open a Costing/BOM report to see the miscellaneous items added to the design costings.

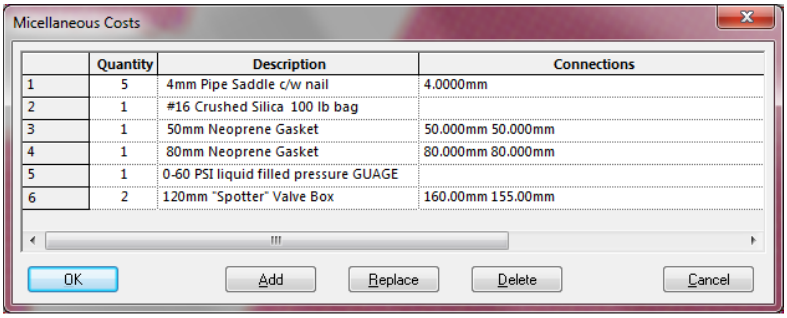


Figure 5-179

Note that items specified in *Design|Miscellaneous Costs* are persistent and will not be affected if *Design|Computer Selection of Fittings* is subsequently run.

5.13.17 RISER SELECTION RULES

When entering hydraulic components into a design, depths can be specified for spraylines, zone and mainline pipes, control valves and miscellaneous hydraulic items.

To over ride the default riser selection rules, select the selection rules for the specified depths or select a riser pipe to be used.

To edit the Riser Rules:

1. Select *Design|Riser Selection Rules*.
2. Edit the dialog as required.
3. Click [OK].

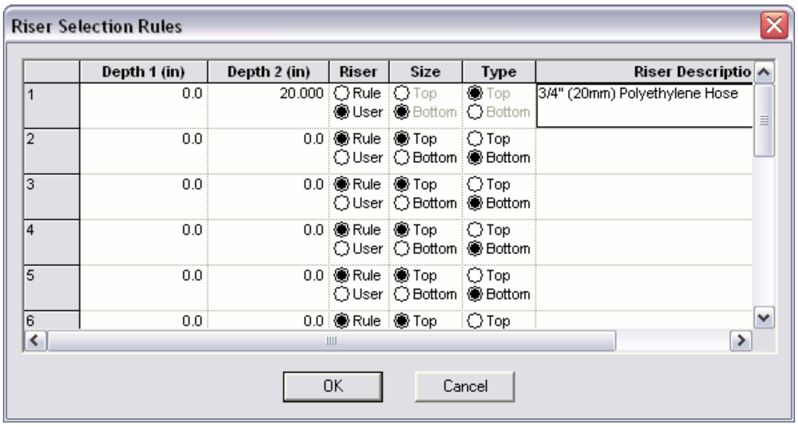


Figure 5-180

Depth 1: The higher of the two depths.

Depth 2: The lower of the two depths.

Riser: Select **Rule** or **User**. If **Rule** is selected, specify the **Rule** in the "Size" and "Type" fields. If **User** is selected specify the pipe to be used in the "Riser Description" field.

Size: Specifies if the size of the riser is to match the top pipe or the bottom pipe size

Type: Specifies if the pipe type of the riser is to match the top pipe or the bottom pipe type.

Riser Description: Selects a pipe from the database to be used as the riser.

See also:

Entering Items at Different Levels — *Section 2.4.2.3*

5.13.18 PIPE FITTING MATCHING TABLE

This table is very important in that it sets out which fittings can be used with which pipes. This information then governs the selection of fittings for all junctions and hence the cost.

To edit the Pipe Fitting Matching Table:

1. Select *Design|Pipe Fitting Matching Table*.
2. Make any changes required. Use the [Insert] and [Remove] buttons to add rows to and remove rows from the table.

3. Click [OK].

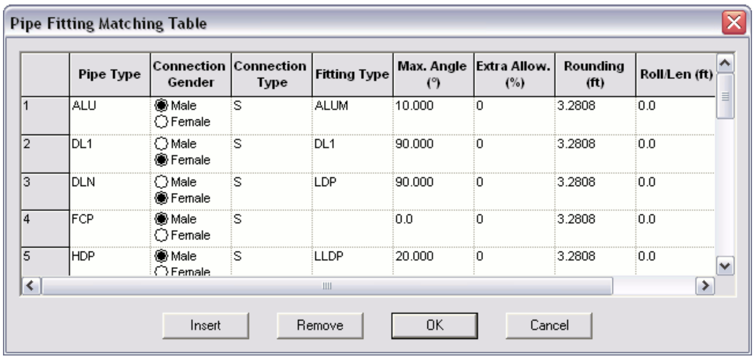


Figure 5-181

Pipe Type: A code that defines the material and construction of the pipe. The codes from this table provide the dropdown list used when entering pipe data in the database editor. Enter a new code into this table before using it in the database. This code can not contain more than 4 characters.

Connection Gender: The gender of the pipe connection. Note that all pipes are assumed to have only one connection gender and pipes that actually have both (i.e. socketed one end) are always assumed to have the same gender as specified in this table. This means that in practice the socketed end would be cut off or removed if it was required to connect to a fitting. This convention applies in practice to virtually all types of fitting.

Connection Type: A single character code that signifies whether the pipe connection is threaded, press-fit, flanged, etc. The code used must be consistent with that used in the database.

Fitting Type: A connector matching code that defines the particular fittings that this pipe type can be connected to. The matching codes used must be consistent with the system of matching codes used when entering data in the database editor. This code must not contain more than four characters.

Maximum Angle: The maximum angle that the pipe system can safely be deflected through without the use of a specific fitting. For rigid pipes, such as asbestos cement, it will be the maximum angle of the pipe-to-pipe connection system used. For semi-rigid pipes, such as smaller diameter PVC, it will be the allowable joint deflection plus an allowance for bending the pipe itself. For flexible pipe, such as polyethylene it will be the maximum angle the pipe can be safely bent through. Typical data for these values should be available from the various pipe manufacturers' handbooks.

Extra Allowance: After determining the total length of each pipe required for a design, IRRICAD adds an additional length which is calculated by applying the extra allowable percentage to the total length to give a final reported length. The new lengths apply to all Bill of Materials reports. This does not affect the quantities reported in any *Costing reports*.

Rounding: After the extra allowance has been added to the original pipe lengths determined by IRRICAD, the new total is rounded up to the nearest figure defined by the rounding figure. This rounding applies to all Bill of Materials reports except the Zone / Mainline BOM. This does not affect the quantities reported in any *Costing reports*.

Roll / Len: The length of a roll or length of pipe. IRRICAD will use this value to determine how many rolls or lengths of pipe are required for a design and this number will be reported in the Bill of Materials reports. A value of zero tells IRRICAD to report the total length of pipe required. This does not affect the quantities reported in any *Costing reports*.

5.14 REPORTS

Reports are formatted correctly for specific printers and can be customized by users, distributors, or AEI Software without the need for reprogramming IRRICAD.

The reports available in the *Management Reports*, *Zone Design Reports*, *Mainline Design Reports* and *Costing/BOM Reports* sub-menus are determined by the report templates present in the \Reports sub-folder. These menus are populated on startup.

All reports have a header showing the client, job address, quote number, date and description as entered in *Settings|Design Details* and *Settings|Client*.

The *Reports* menu contains the following commands:

- Report Settings
- Show Flow
- View Errors
- 3D DEM View
- Show Zone Pressure Limits
- Show Zone Pressure Map
- Show Zone Flow Map
- Show Allowable Submain Position
- Hydraulic Gradeline
- Management Reports
- Zone Design Reports
- Mainline Design Reports
- Costing/BOM Reports
- Miscellaneous Costs
- Supplier Code Multipliers
- Costing Reports Options
- Zone Design Reports Configuration
- Mainline Design Reports Configuration

5.14.1.1 VIEWING AND PRINTING REPORTS

When a report is selected IRRICAD collects the information and renders it for the printer. During this process, which can take a moment for large reports, counters showing the pages and records processed are displayed. Once the report is visible it can be viewed using the scroll bars and normal keyboard commands (<Page Up>, <Page Down>, <Home>, <End> arrow keys etc.). The functions of the menu items are as follows.

File

Save: Saves the report to a file. To do this select the file type required in the "Save as Type" dropdown, Enter a filename, navigate to the desired folder using "Save In" and click the [Save] button. Four different file formats are supported.

Rich Text Format (*.rtf): this format can be read by most word processing software, graphics and formatting are retained.

Html Format (*.htm): readable by web browsers and most word processors. Graphics and formatting are retained but .rtf is generally better.

Text Format (*.txt): Simple text format that can be opened in almost all word processors and text editors. Although graphics and formatting are not retained this format can be useful to import inventory reports into other programs (Microsoft Excel ® for example).

Native Format (*.frc): Native format of the report writer, not recommended.

Print: Opens the standard Windows Print dialog and is used to print the report.

Preview: If checked shows a complete page in the report viewer window.

Exit: Closes the report.

Edit

Jump: Moves to the page number specified.

Copy: Copies individual pages or the complete report to the clipboard.

5.14.1.2 Setting the Default Printer

The default printer for reports can be specified under *File|Reports Print Setup* option.

5.14.1.3 CUSTOMIZING REPORTS

The content, formatting and appearance of Reports is determined by predefined report templates located in the \Reports sub-folder. It is possible to create completely new, or modify existing, report templates. Creating new reports from scratch, or making substantial changes to existing reports, is beyond the scope of most users and is normally best left to Lincoln Agritech Ltd or their distributors. Consequently detailed documentation on report customization is contained elsewhere.

It is however quite feasible for users to make minor or cosmetic changes to the existing reports by using the following procedures:

1. Open the standalone report editor; this is available under the Start/Programs/IRRICAD Pro menu or by navigating to the IRRICAD installation folder and double clicking on ReportEditor.exe.
2. On the *File* menu choose *Edit Report*.
3. Select the template file; these are located in the \Reports sub-folder which should be the default location.

The selected template will now be displayed.

It is generally desirable to make any significant changes in new template so that the original one, shipped with IRRICAD, remains intact. To do this, select *Save As* from the *File* menu and choose a new file name for the template. Note that in order for templates to be added to the IRRICAD report menus they need to be saved in the \Reports sub-folder.

The report menus are constructed by using the 'Report Name' from the template not the filename. It is therefore important to change this to avoid having two items with the same name in the menu. The report name can be changed via the *File|Report Parameters* menu item. Note that if #Sort# appears at the end of the report name it MUST be retained (it will not be displayed in the menu).

Now make the changes that are required. On-line help can be found under the *Help* menu, note that double clicking with the left mouse button opens a dialog for editing an item while double clicking with the right button allows the font properties to be altered.

It is not recommended that any Filters or Sections are added, deleted or altered by users.

Save the template when all changes have been made then exit both the template and Report Editor application.

When IRRICAD is restarted any new templates will be added to the appropriate Reports menu. Change to existing templates will be reflected when the report is next run.

Requests for new reports may be made to AEI Software.

5.14.1.4 VERSION 7 REPORTS

It is possible to display the old version 7 style reports although this feature is not enabled by default. To display these, the value of the registry key HKCU\Software\AEI Software\IRRICAD\Appsettings\Misc\ShowOldReports needs to be changed to '1'. The old style reports can now be accessed under an *Old Reports* item in the *Reports* menu. Note IRRICAD must not be open when these settings are being changed and it is recommended that editing the Registry is only attempted by experienced Windows users.

5.14.2 REPORTS SETTINGS

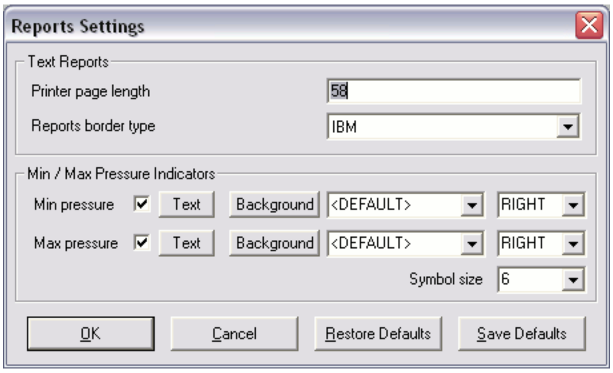


Figure 5-182

5.14.2.1 TEXT REPORTS

The "Page Length" and "Border Type" fields available through *Reports|Reports Settings* menu item only apply to the Version 7 style reports. A font can be selected in the report screen by selecting *Edit|Set*

Font. Only fixed width fonts are displayed, as proportional fonts change the length of each line and distort the borders (if used).

This dialog allows the user to change settings that affect the reports.

Printer Page Length:	The maximum number of lines that will fit on one printed page. Used for automatic pagination of reports.
Report Border Type:	Controls the appearance of the border around each report. Note not all fonts can display an IBM type border.

The "Page Length" and "Border Type" fields only apply to the Version 7 style reports.

5.14.2.2 MIN / MAX PRESSURE INDICATORS

These settings available in *Reports|Report Settings* control the *Show Zone Pressure Limits* labels.

Min Pressure

When checked, the minimum zone pressure will be labelled, based on the following settings:

Text:	The text size of the label
Background:	The background, border and line thickness properties
Layer:	The layer, if changed, that the label will be on
Position:	The position of the label – INLINE, ABOVE, BELOW, LEFT, RIGHT

Max Pressure

When checked, the maximum zone pressure will be labelled, based on the following settings:

Text:	The text size of the label
Background:	The background, border and line thickness properties
Layer:	The layer, if changed, that the label will be on
Position:	The position of the label – INLINE, ABOVE, BELOW, LEFT, RIGHT

Symbol Size

The size of the pressure gauge symbol on the plan. Adjust according to the scale of the plan.

5.14.3 Show Flow

This tool makes the process of zoning or grouping sprinklers easier by giving the flow required to service a particular area in the design.

The following information is displayed on the screen:

Area:	The plan area enclosed by the lasso.
Outlets:	The number of outlets in the enclosed area.
Flow:	The total flow of all outlets in the enclosed area.
Precipitation rate:	The average intensity of application within the enclosed area.

To show the flow for an area:

1. Select *Reports|Show Flow*.
2. Draw a lasso on the screen around the area the user which to view. Close the lasso by clicking on the starting point or by selecting *Right-click|Close*.
3. Upon closing the lasso, a dialog appears which displays the area, outlets, flow and precipitation rate. Click [Close] to exit, or highlight the required text and click the [Copy] button to copy selected information to the clipboard.

Note: *Keep in mind that in calculating the precipitation rate, IRRICAD assumes that all the water from the enclosed sprinklers falls in the area lassoed.*

5.14.4 View Errors

This option will let the user view a list of the errors that have occurred during the last IRRICAD session, e.g., Zone Design. The report will show all the error messages that were displayed during the design process. If the user has set design to run and had to leave the computer, the error messages can be viewed here. Alternatively, if the Delay Time for information warnings is zero (hence, does not display error messages during design) then the errors can be viewed in this report.

5.14.5 3D DEM VIEW

If **DEM Elevations** has been selected for the "Elevation Calculation Method" in *Design Parameters|Analysis Parameters* then it is also possible to view a 3D representation of the resulting ground surface. The advantage of this 3D view is that small inconsistencies in elevations, that are not apparent with color coding, can be located visually.

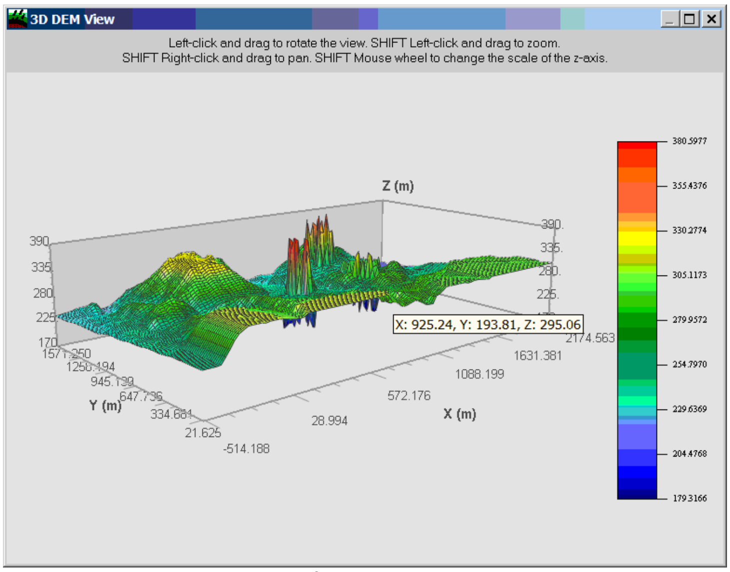


Figure 5-183

5.14.5.1 OPERATION

This facility is available by selecting *3D DEM View* from the *Reports* menu. Elevations of the DEM points are color coded in a similar fashion to contours - from red through yellow green and then blue.

The 3D view can be: rotated by Left-click and dragging; zoomed with <Shift> Left-Click and drag; panned with Right-click and drag.

The scale of the Z axis can be altered by holding down the shift key and using the mouse wheel.

Figure 5-183 above shows and example of a 3D DEM view.

Note: Pausing the mouse pointer over the grid will display a tooltip showing the X,Y location and elevation (Z value).

5.14.6 Show Zone Pressure Limits

A graphical report that indicates the position and value of the minimum and maximum pressure emitters in a zone. This report can be accessed via *Show Pressure Limits* on the the *Reports* menu. Options available are:-

Figure 5-184

Format

The size, format and colors of the indicator text and the size of the indicator are specified via the *Report Settings* option in the *Reports* menu.

This dialog operates in exactly the same way as for *Label Settings* . The size of the indicator symbol is determined by the "Symbol Size" field.

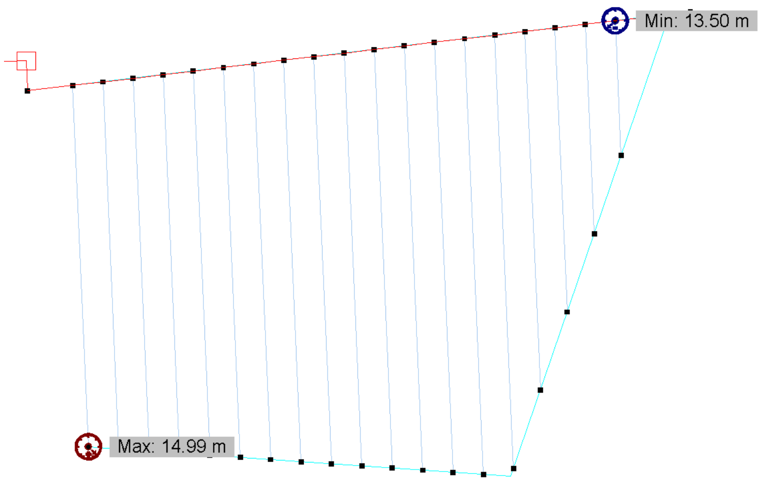


Figure 5-185

Note: Zone design must be completed before this tool can be used. The markers and labels, which make up the graphical indication, can be moved and or deleted independently from each other. This is useful, for example, when the indicators obscure each other or parts of the design.

5.14.6.1 All Valves

This displays the minimum and maximum pressure markers and labels for all control valves (i.e. zones) in the design.

5.14.6.2 Selected Valves

Display the markers for the selected valves only.

5.14.6.3 Clear Markers

Removes all the markers and labels.

5.14.7 Show Zone Pressure Map

A graphical representation of the pressures in a zone can be created using the *Reports|Show Zone Pressure Map* function.

5.14.7.1 Selected Valves

Select a control valve (Design / Analyse needs to have been completed for the zone) and choose *Reports|Show Zone Pressure Map|Selected Valve*.

The pressure map dialog shows the pressure limits from zone configuration, as well as the actual maximum and minimum emitter pressures in the zone.

Map Info

Zone Pressure Limits: The minimum and maximum allowable zone pressure limits.

Actual Limits: The minimum and maximum actual pressure limits within the zone.

Number of Emitters: Number of emitters within the Zone.

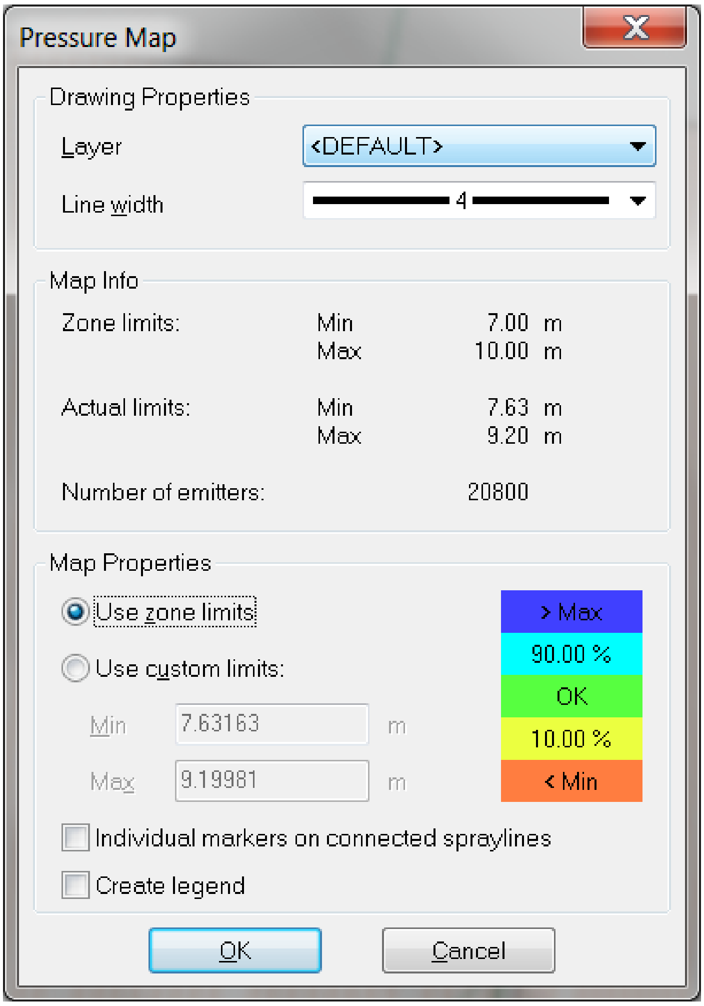


Figure 5-186

Map Properties

The pressure map can be created using the zone pressure limits or custom limits may be specified on the dialog.

Use Zone Pressure Limits: Select this option if the actual pressure limits are outside of the allowable pressure limits

Use Custom pressure limits: Select this option if the actual pressure limits are inside of the allowable pressure limits and set custom limits to give the view of where the outlets which are just in or just out of the pressure limits are.

Min Pressure: Editable when "Use Custom pressure limits" is selected. Set a minimum pressure limit above the actual minimum pressure limit to view the outlets which are just in range.

Max Pressure: Editable when "Use Custom pressure limits" is selected. Set a maximum pressure limit below the actual maximum pressure limit to view the outlets which are just in range.

Individual markers on connected spraylines: Individual circular fills can be placed at the location of each emitter by enabling the check box (as below in the Spray Block image). This can cause slow redrawing at higher numbers of emitters, uncheck the "Individual markers on connected spraylines" check box.

Create Legend: A legend can be created and placed on the left-hand side of the pressure map. The legend can be moved using the *Move* tool.

Tape Block:

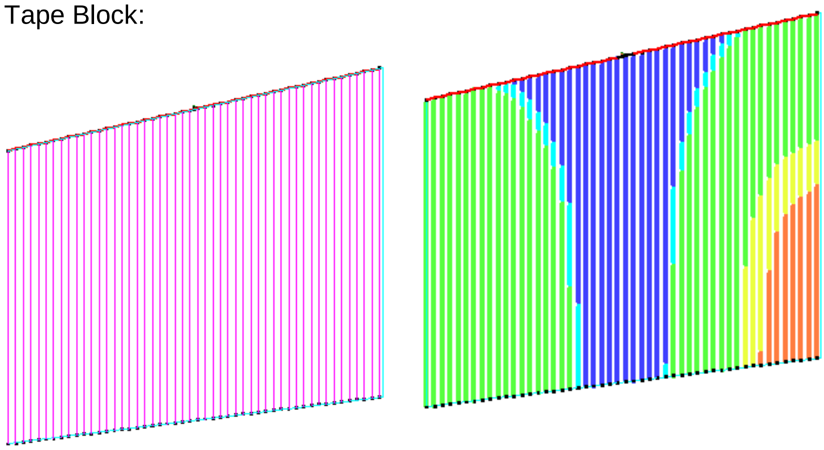


Figure 5-187

Spray Block:

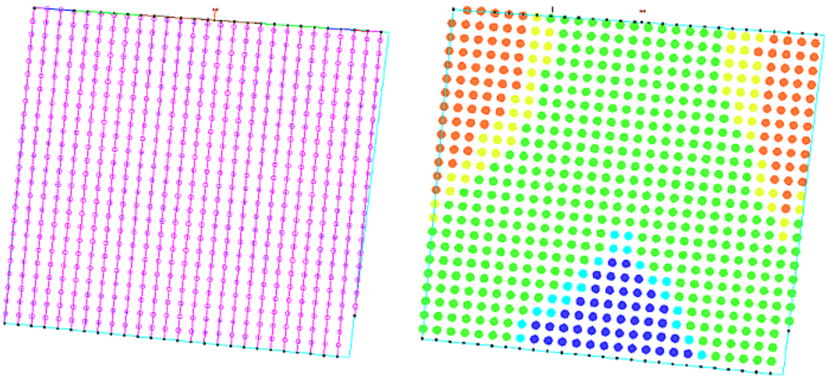


Figure 5-188

The pressure map symbol is colour coded as follows:

- Emitter pressure is below the minimum allowable pressure.
- Emitter flow is above the minimum flow, but inside the lower 10% of the flow range.
- Emitter pressure is within the allowable pressure range
- Emitter flow is below the maximum flow, but inside the upper 10% of the flow range..
- Emitter pressure is above the maximum allowable pressure.

5.14.7.2 CLEAR MARKERS

Removes all the markers and labels.

5.14.8 SHOW ZONE FLOW MAP

A graphical representation of the flow variation in a zone can now be created using the *Reports|Show Zone Flow Map* function.

5.14.8.1 SELECTED VALVE

Select a control valve (Design / Analyse needs to have been completed for the zone) and choose *Reports|Show Zone Flow Map|Selected Valve*.

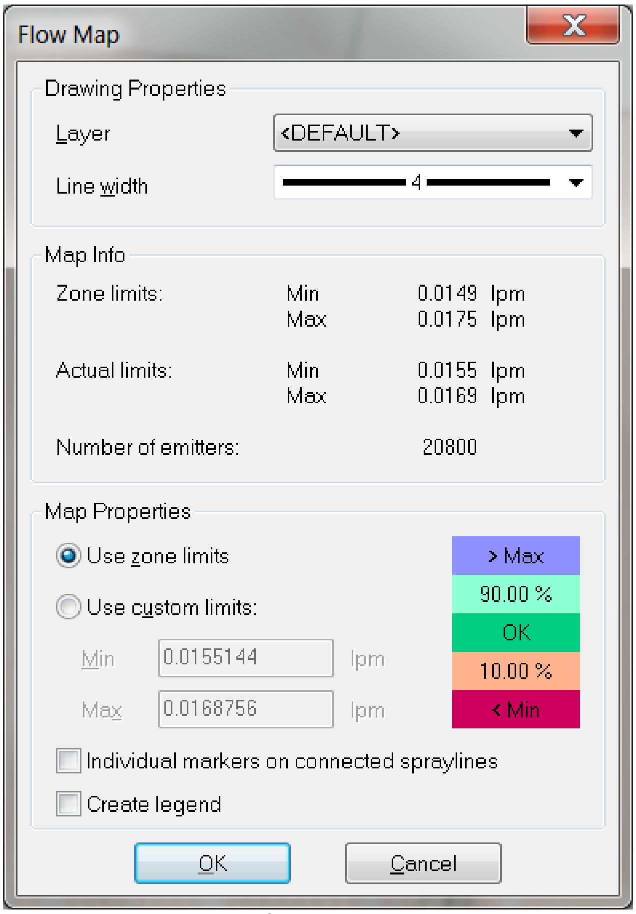


Figure 5-189

Map Info

The flow map dialog shows the flow limits for the zone, as well as the actual maximum and minimum emitter flows in the zone.

Zone Flow Limits: The minimum and maximum allowable zone flow limits.

Actual Limits: The minimum and maximum actual pressure limits within the zone.

Number of Emitters: Number of emitters within the Zone.

Map Properties

The flow map can be created using the zone limits or custom limits may be specified on the dialog. Custom limits could be used to show the range within a smaller tolerance if required e.g., 0.86lpm– 0.90lpm.

Use Zone Pressure Limits: Select this option if the actual pressure limits are outside of the allowable pressure limits

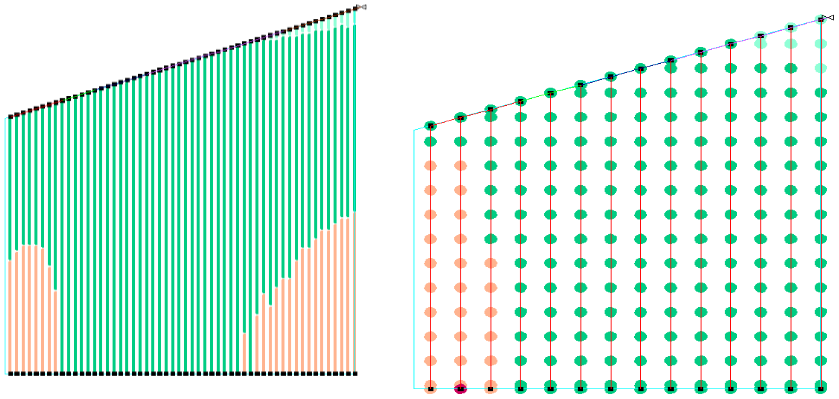
Use Custom pressure limits: Select this option if the actual pressure limits are inside of the allowable pressure limits and set custom limits to give the view of where the outlets which are just in or just out of the pressure limits are.

Min Pressure: Editable when "Use Custom pressure limits" is selected. Set a minimum pressure limit above the actual minimum pressure limit to view the outlets which are just in range.

Max Pressure: Editable when "Use Custom pressure limits" is selected. Set a maximum pressure limit below the actual maximum pressure limit to view the outlets which are just in range.

Individual markers on connected spraylines: Individual circular fills can be placed at the location of each emitter by enabling this check box (as below in the Spray Block image). This can cause slow redrawing at higher numbers of emitters.

Create Legend: A legend can be created and placed on the left-hand side of the flow map. The legend can be moved using the *Move* tool.



Tape Block *Spray Block*

Figure 5-190

The flow map symbol is color coded as follows:

- Emitter flow is above the maximum allowable flow.
- Emitter flow is below the maximum flow, but inside the upper 10% of the flow range.
- Emitter flow is within the allowable flow range
- Emitter flow is above the minimum flow, but inside the lower 10% of the flow range.
- Emitter flow is below the minimum allowable flow.

5.14.8.2 CLEAR MARKERS

Removes all the markers and labels.

5.14.9 SHOW ALLOWABLE SUBMAIN POSITION

The *Show Allowable Submain Position*, in the *Reports* menu, provides a visual representation of the possible locations for submains such that hydraulic design constraints for laterals are met. The optimum position may also be shown.

5.14.9.1 Deciding on Suitable Submain Locations

Sometimes it can be difficult to decide on the best submain positions for zones or blocks. This is especially true in situations where laterals have significant differences in length or elevation. Therefore it is helpful to know where laterals can be fed so that emitter pressures are maintained within a specified range. To find the area in which submains could be positioned use *Reports|Show Allowable Submain Position*. Each lateral is analysed individually and the possible and optimal submain positions are determined, and shaded, as specified in the dialog.

It is important to note that this tool inherently does not take into account any zoning considerations (i.e. the location or number of control valves). The shaded area simply shows where **submains** (i.e. not necessarily a single submain and valve) could be placed such that the resulting lateral lengths are acceptable. Obviously if the shaded area doesn't exist, or span all laterals, it is an indication that laterals are too long and need further subdivision.

Multiple laterals or blocks can be selected, before invoking the tool, thus aiding in the decision on the best placement of mainlines.

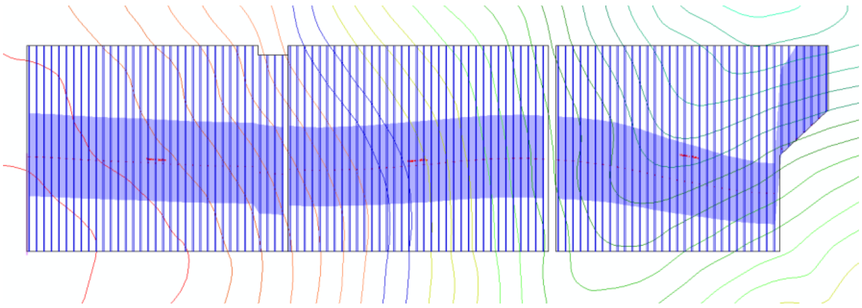


Figure 5-191

It is generally a good idea to use the "Customize Pressure Limits" to set a pressure range that is smaller than the allowable range. This allows for any submain headloss and ensures that submains placed near the edge of the shaded area will provide adequate pressure.

5.14.9.2 How to Operate the Tool

1. Select the required laterals or Irrigation Blocks.
2. Select *Reports|Show Allowable Submain Position|Selected Items*.
3. Modify the settings in the dialog as required.
4. Click [OK].

5.14.9.3 Allowable Submain Position Dialog

Drawing Properties

Layer: The layer on which the submain placement envelope will be placed. The default is DRAWING.

Envelope Color: The color of the envelope depicting possible submain locations.

Optimum Color: The color of the symbol depicting the optimum submain location.

Options

Show Envelope: Unchecking "Show Envelope" will turn off the display of the submain placement.
Selecting "Fill" or "Points" determines how the envelope is displayed – "Fill" shows the area as a filled polygon, whilst "Points" displays the points that define the polygon individually. The points can have a specified size.

Show Optimum Submain Position: Checking this will display the optimum submain position point on each lateral in the "Optimum Color".

Pressure Range: The allowable pressure range from the database or from *Zone Design Configuration*.

Show Pressure Limits: Checking this option will display the allowable, or customized, pressure limits as text in the centre of the envelope.

Customize Pressure Limits: Overrides the pressure limits displayed in the pressure range field.

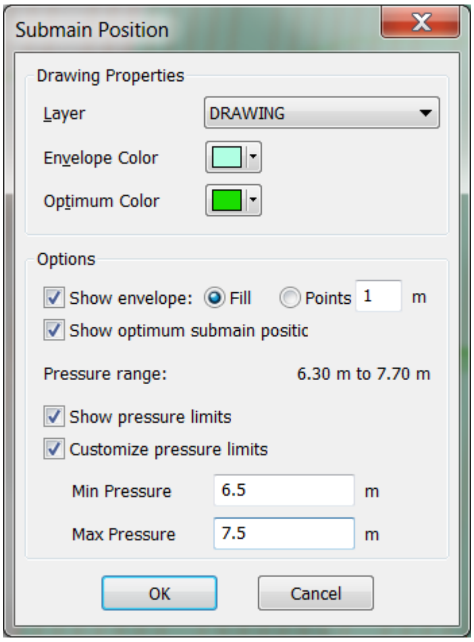


Figure 5-192

5.14.9.4 NOTES

Show Allowable Submain Position *is a guide only and other considerations (e.g., suitable pipes available in the database, elevation changes along the submain etc.) may mean that it is not possible to successfully design a submain placed within the designated area. This will be more likely near the edge of the area. Conversely it does mean that it will not be possible to design submains placed outside the area.*

If required remember to allow for some submain headloss by choosing a suitable custom pressure range.

The visual representation of the possible sub-main locations given assumes that suitable pipe sizes are available in the database.

This tool works on complete laterals. If a lateral is already cut by a submain, solutions will be shown for either side of the existing submain.

Multiple laterals or blocks can be selected before running the Show Allowable Submain Position tool.

The laterals must have been sized for this tool to work. Tapes are inherently pre-sized.

This tool uses the Slope Elevation method when calculating the possible and optimum submain locations.

5.14.10 HYDRAULIC GRADELINE

After a design is completed view the hydraulic gradeline (HGL) of mainline pipes, zone pipes, spraylines and tapes. The tool can be access from the *Reports* menu.

The selection methods are:-

- Click on a mainline, junction, outlet, misc. hydraulic item, pump or valve and action *Hydraulic Gradeline* to view the gradeline from the selected item back to the water supply.
- Select single or contiguous multiple mainline pipes and action *Hydraulic Gradeline* to view the hydraulic gradeline for that section of selected pipes, as in previous versions.
- Select one submain pipe and action *Hydraulic Gradeline* to view the hydraulic gradeline for zone, complete with latreal pressure band.
- Select one lateral and action *Hydraulic Gradeline* to view the hydraulic gradeline for the lateral.

5.14.10.1 GRADELINE TOOLBAR

Figure 5-193

Copy	This button copies the current chart to the clipboard. It may then be inserted into the design using the 'Insert OLE' tool.
Save	This button allows the users to save the current chart to

<table>
<tr><td></td><td>file in one of several graphic formats (BMP, JPEG, WMF, EMF, GIF, PNG, PCX, EPS and PDF).</td></tr>
<tr><td>Print</td><td>This button opens a preview dialog allowing the user to print the current chart.

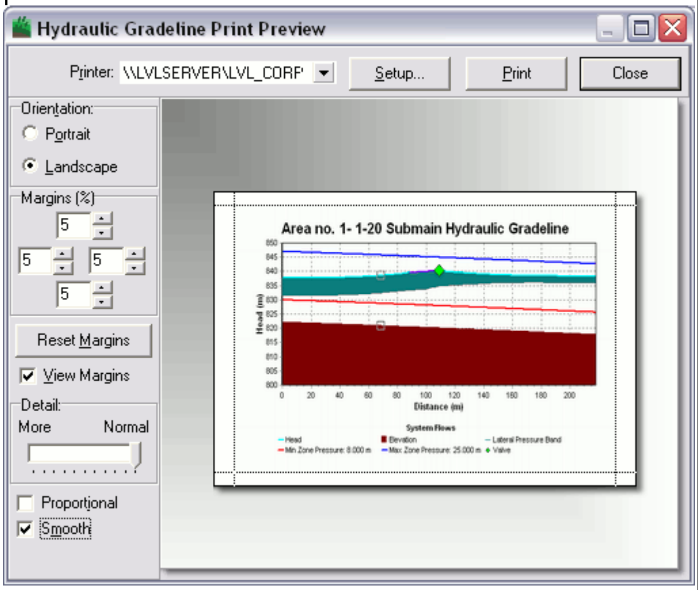


Figure 5-194</td></tr>
<tr><td>Legend</td><td>This button toggles the visibility of the legend(s).</td></tr>
<tr><td>Elevation</td><td>This button toggles the visibility of the elevation series.</td></tr>
<tr><td>Limits</td><td>This button toggles the visibility of the limit(s) series.</td></tr>
<tr><td>Pipe Colors</td><td>This button controls whether the pipe head series are displayed using the pipe colors from the design</td></tr>
<tr><td>Exit</td><td>Closes the dialog.</td></tr>
</table>

5.14.11 ELEVATION PROFILE

This feature is available for depicting high and low elevation points in your design and can be useful to ascertain air-release valve placements.

The tool creates a height profile based on a non-branched path by selecting one pipe segment, line segment, or based on a contiguous selection of pipes.

Clicking specific locations along the profile will place green markers on the design. These markers are placed on the DRAWING layer. In the dialog clicking on a marker will remove it or, alternatively, they can be individually deleted in the main window.

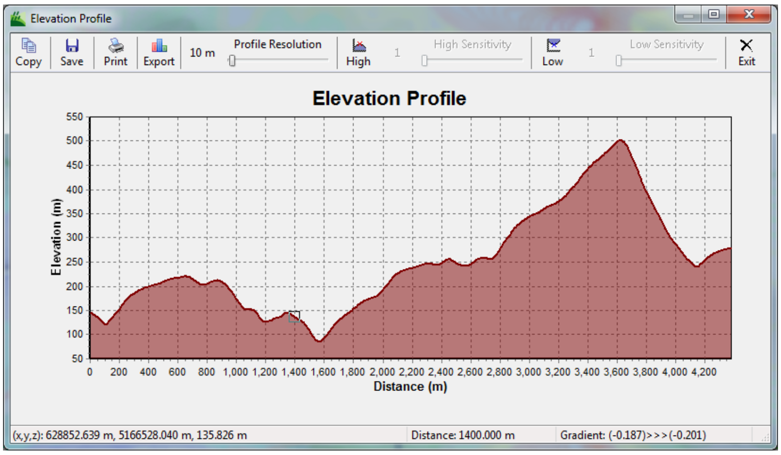


Figure 5-195

This tool will profile:-

- a singly-selected drawing entity (lines, polylines, curves)
- a singly selected pipe (zone or mainline), by tracing to the nearest branch (tee or cross intersections)
- a multiple selection of contiguous mainline pipes.
-

Automatic High and Low Options

- High and Low points may be automatically marked by clicking the [High] and/or [Low] buttons.
- Change the sensitivity via the sliders to filter out unwanted points for both the high and low points as required. A larger number will tend to ignore small changes in topography.
- To manually add extra high points (a brown marker) use Shift-Click. To manually add extra low points (blue marker) use Ctrl-Click.

Profile Resolution

The “Profile Resolution” slider controls the distance between points on the profile where elevations are interpolated. Note that this also inherently affects where manual or automatic markers can be placed.

Note: Advanced settings that modify the elevation profile dialog, such as chart theme, can be accessed by pressing the E and D keys on the keyboard at the same time. Please note that these changes are not retained after exiting the Elevation Profile tool.

5.14.12 MANAGEMENT REPORTS

These reports are produced from the management strategy entered.

The *Management Report* options are:

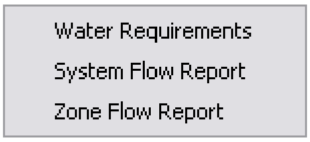


Figure 5-196

Note if Zone Design is performed prior to assigning zones to system flows, actual flows, will be used during the management process.

However, as per previous versions, it is possible to run Management initially and in this case the nominal flows will be indicated as such by parentheses on the management symbol during *Assign Zones To System Flows*.

The Management Reports use actual flows if they are available.

5.14.12.1 WATER REQUIREMENTS

This report only applies if Irrigation Areas have been previously defined.

So that a check can be made to ensure that the required amount of water is applied to each Irrigation Area, this report summarizes the calculated and required applications made to each area on a zone-by-zone basis.

Name:	The name of the zone contributing to the area.
Flow:	The flow that the zone is contributing to the Area. Outlets outside of the Irrigation Area are not included.
Contrib. Area:	The area within the Irrigation Area that the zone is assumed to be applying water.

Depth App.:	The depth of water the zone is calculated to be applying to the contributing area, based on the operating times specified for the zone by the designer.
Depth Req.:	The required depth of water for the area.
Volume App.:	The calculated volume of water the zone is applying to the contributing area based on the specified operating times.
Volume Req.:	The required volume of water for the contributing area.

The above information for each zone is summarized for the Irrigation Area, where:

Name:	Name of the Irrigation Area.
Flow:	The total flow into the Area.
Contrib. Area:	The total area of the Irrigation Area.
Depth App:	The mean depth of water applied to the Irrigation Area.
Depth Req.:	The mean depth of water required for the Irrigation Area.
Volume App:	The total volume of water applied to the area.
Volume Req.:	The total volume of water required for the area.

Note: *The amount of water applied is based on the current operating time specified for the zone. This may be the default run time of 1 hour. Reset the operating times to that specified in the Zone Flows report for the Depth Applied and the Volume Applied to be that of the recommended run time.*

See also:

Management Reports *Section 5.14.12*

5.14.12.2 System Flow Report

This report gives a summary of total flows in the irrigation system resulting from the management strategy entered.

It is divided into sections or time intervals according to the irrigation system flows. A new system flow time interval is created when there is a change in the flow required by the system due to valves being turned on or off in particular time intervals or due to changes in water supply operation. In this way, each system flow is unique in that it has a discrete time interval and flow.

Within each system flow section listed in the report the following information is presented:

System flow No: Generated internally by IRRICAD.
Flow: Flow required at the Water Supply.
Design flow: From Water Supply dialog.
Maximum flow: From Water Supply dialog.
On time: Beginning of time interval.
Off time: End of time interval.
Zones operating: In the above time interval.
Water supplies: Operating at the time.

See also:

Management Reports *Section 5.14.12*

5.14.12.3 Zone Flow Report

This report provides a summary of zone flows, required operating times and precipitation rates for all zones.

This report includes:

Zone Name: A name to identify the zone.
 # Outlets: The total number of outlets in the zone.
Flow: The total flow into the zone regardless of whether any outlets fall outside Irrigation Areas.

If an Irrigation Area has been specified:

Operating Time: The time in days, hours and minutes within the irrigation cycle that the zone needs to operate to apply the amount of water specified in Irrigated Areas dialogs.
Precip. Rate: The mean precipitation rate for the zone and the water supplies operational at the time.
Maximum Precip. Rate: The maximum allowable mean precipitation rate for the Irrigation Area.

> Note: *For a design which contains tapes, the zone flows reported in this and other management reports will be based on the nominal*

specific discharge rate of the tape as specified in the Tape component group in the database.

In determining zone operating times, only those zone outlets that are placed within an Irrigation Area are assumed to contribute to the area. The operating time for the area (and therefore the zone operating times) is determined by dividing the total volume requirement of the Irrigation Area by the total flow into the area. For this reason, all zones that contribute to the same area will have the same operating times and precipitation rates regardless of how the outlets are physically placed within the area.

Operating time, precipitation rate and maximum precipitation rate are only calculated if Irrigation Areas have been previously defined.

If in reality zones within a common Irrigation Area are known to have different precipitation rates and should therefore have different operating times then create separate Irrigation Areas for each of these zones.

See also:

Management Reports — *Section 5.14.12*

5.14.13 ZONE DESIGN REPORTS

These reports are produced from the design analysis process and tell the user what is happening hydraulically in each area of interest.

The *Zone Design Report* options are:

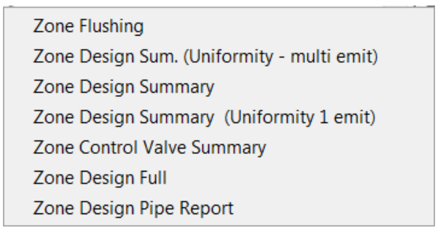


Figure 5-197

5.14.13.1 ZONE FLUSHING

Flushing calculation and reporting is available for *Tapes, Tape Blocks* and *Tape Irrigation Blocks*. The flushing report is located in *Reports|Zone Design Reports*. After running *Design|Zone Design|Analyse* or *Detailed Analysis,* under Flushing conditions, this report will display results for each zone as per the image below:-

Required Flush Velocity: 0.30 (m/s) **Assumed Flush Back Pressure:** 1.00 (m)

Actual manifold flow is based on either total flush (endflow plus emitters),
or irrigation, flow from tapes assuming the Inlet Pressure.

Zone Name : Area no. 1 **Valve Description :** 3/4" (20mm) Electric Valve
Zone Irrigation Flow : 18.32 (m3/h) **Zone Head (D/S) :** 13.98 (m)
Run Type : Detailed Analysis **Flushing Run :** Y
Manifold Flushing : -21

Tapes

From X (m)	From Y (m)	To X (m)	To Y (m)	Inlet Pressure (m)	Total Flow (lpm)	End Flow (lpm)	End Velocity (m/s)	Manifold Number
115.9	92.0	115.3	39.5	13.41	2.10	0.0	0.00	-22
116.9	92.0	116.7	74.6	13.41	0.70	0.0	0.00	-22
Manifold Irrigation Flow =			2.80 (lpm)		Manifold End Flush Flow =		0.00	(lpm)
111.9	92.0	111.3	39.6	13.46	9.15	7.3	0.82	-21 **
110.9	92.0	110.3	39.6	13.49	9.16	7.3	0.82	-21 **
109.9	92.0	109.3	39.6	13.50	9.17	7.3	0.82	-21 **
114.9	92.0	114.3	39.6	13.41	9.13	7.3	0.82	-21 **
113.9	92.0	113.3	39.6	13.43	9.14	7.3	0.82	-21 **
112.9	92.0	112.3	39.6	13.44	9.14	7.3	0.82	-21 **
Manifold Flushing Total Flow =			54.89 (lpm)		Manifold End Flush Flow =		43.65	(lpm)
105.9	92.0	105.3	39.6	13.59	2.10	0.0	0.00	-20
104.9	92.0	104.3	39.6	13.60	2.10	0.0	0.00	-20
103.9	92.0	103.3	39.7	13.60	2.10	0.0	0.00	-20
108.9	92.0	108.3	39.6	13.52	2.10	0.0	0.00	-20
107.9	92.0	107.3	39.6	13.55	2.10	0.0	0.00	-20
106.9	92.0	106.3	39.6	13.57	2.10	0.0	0.00	-20
Manifold Irrigation Flow =			12.60 (lpm)		Manifold End Flush Flow =		0.00	(lpm)
99.9	92.0	99.3	39.7	13.62	2.10	0.0	0.00	-19
98.9	92.0	98.3	39.7	13.63	2.10	0.0	0.00	-19

Figure 5-198

The report displays information for both tapes and manifolds (virtual if no physical ones are defined) that are operating under flushing conditions and those in irrigation mode. The tapes that are currently flushing are indicated by ** in the right-hand column. Values displayed are:-

- Total Flow for each tape – total emitter flow plus any flushing flow.
- End Flow for each tape.
- End Velocity for each tape
- Manifold Flushing Total Flow - the total combined irrigation plus flushing flow.
- Manifold Irrigation Flow - the total combined irrigation flow.
- Manifold End Flushing Flow - the total combined flushing flow.

See also:

Flushing Calculations *Section 2.6.5*

5.14.13.2 Zone Design Summary

This report gives a summary of the hydraulic performance of each zone.

Zone: The name of the zone.
Total zone flow: The total flow for the zone.
Min allowable outlet pressure: The minimum allowable outlet pressure based on the flow tolerance given in the Outlet Database.
Max allowable outlet pressure: The maximum allowable outlet pressure based on flow tolerance given in the Outlet Database.
Allowable outlet pressure variation: The difference between the minimum and maximum allowable outlet pressures expressed as a % of the nominal outlet pressure.
Actual outlet pressure variation: The difference between the actual minimum and maximum outlet pressures expressed as a % of the nominal outlet pressure.
Present pressure downstream of valve: The actual pressure downstream of the zone control valve.
Pressure loss through valve: The actual pressure loss through the zone control valve.
Present min outlet pressure: The actual minimum outlet pressure in this zone.
Present max outlet pressure: The actual maximum outlet pressure in this zone.

All reports have a header showing the Client, Site, Designer and Date information as entered in *Settings|Design Details*.

See also:

Zone Design Reports *Section 5.14.13*
Zone Design Reports Configuration *Section 5.14.19*

5.14.13.3 Zone Design Sum. (Uniformity Multi Emit)

For emitter spacing of 2-10 emitters per plant, use this uniformity report.

Note: Zone Analysis or Design need to be rerun to make the uniformity values available in existing designs.

The design process calculates a number of zone uniformity parameters, which are available in the zone reports. The parameters are:

Distribution uniformity (DU):

$$DU = \frac{Low\ Quarter\ Mean\ Emitter\ Flow}{Total\ Mean\ Emitter\ Flow}$$

Christiansen's Coefficient of Uniformity (CU):

$$CU = 100\left(\frac{1-D}{M}\right) \qquad D = \frac{1}{n}\sum_{i=1}^{n}\left|X_i - M\right| \qquad M = \frac{1}{n}\sum_{i=1}^{n} X_i$$

where:

CU:	Christiansen's Coefficient of Uniformity (%)
D:	Average absolute deviation from the mean
M:	Mean application
$X_{i:}$	Individual application
n:	number of individual applications

Emission uniformity (EU):

$$EU = \left(1 - 1.27\frac{CV_M}{\sqrt{n}}\right)\left(\frac{Q_{lq}}{Q_{avg}}\right) \times 100\%$$

CV_M:	is the manufacturers' coefficient of variation for emitters,
n:	is the number of emitters per plant
$Q_{lq:}$	is the mean of low-quarter emitter flows, and
$Q_{avg:}$	is the mean of emitter flows

Note: that it is assumed that all emitters in the zone have the same coefficient of variation.

Mean Emitter Flow

Simply the mean of the emitter flows in a zone. Note that in the case of Tapes the mean is calculated from the flows resulting from the pressures at virtual emitters, this however will normally be extremely close to the actual mean.

See also:

Zone Design Reports	*Section 5.14.13*
Zone Design Reports Configuration	*Section 5.14.19*

5.14.13.4 ZONE DESIGN SUMMARY (UNIFORMITY1 EMIT)

For emitter spacing of one emitter per plant, use this uniformity report.

Note: Zone Analysis or Design need to be rerun to make the uniformity values available in existing designs.

The design process calculates a number of zone uniformity parameters, which are available in the zone reports. The parameters are:

Distribution uniformity (DU):

$$DU = \frac{Low\ Quarter\ Mean\ Emitter\ Flow}{Total\ Mean\ Emitter\ Flow}$$

Christiansen's Coefficient of Uniformity (CU):

$$CU = 100\left(\frac{1-D}{M}\right) \qquad D = \frac{1}{n}\sum_{i=1}^{n}\left|X_i - M\right| \qquad M = \frac{1}{n}\sum_{i=1}^{n}X_i$$

where:

CU:	Christiansen's Coefficient of Uniformity (%)
D:	Average absolute deviation from the mean
M:	Mean application
X_i:	Individual application
n:	number of individual applications

Emission uniformity (EU):

$$EU = \left(1 - 1.27\frac{CV_M}{\sqrt{n}}\right)\left(\frac{Q_{lq}}{Q_{avg}}\right) x\ 100\%$$

CV_M:	is the manufacturers' coefficient of variation for emitters,
n:	is the number of emitters per plant
Q_{lq}:	is the mean of low-quarter emitter flows, and
Q_{avg}:	is the mean of emitter flows

Note: that it is assumed that all emitters in the zone have the same coefficient of variation.

Mean Emitter Flow

Simply the mean of the emitter flows in a zone. Note that in the case of Tapes the mean is calculated from the flows resulting from the pressures at virtual emitters, this however will normally be extremely close to the actual mean.

See also:

Zone Design Reports — *Section 5.14.13*
Zone Design Reports Configuration — *Section 5.14.19*

5.14.13.5 Zone Design Pipe Report

Detailed pressure and flow information is listed for each zone in the system.

For each pipe in the zone (listed zone by zone):

From (x,y,z):	The x, y, z coordinates at the start of the pipe. Z is the elevation of the start of the pipe.
To (x,y,z):	The x, y, z coordinates at the end of the pipe. Z is the elevation of the end of the pipe.
Depth:	The depth of the pipe below ground level.
Pressure (Start):	The pressure at the beginning of the pipe.
Pressure (End):	The pressure at the end of the pipe.
Pressure (Allow):	The pipe pressure rating (from the pipe database).
Flow (Start):	The flow at the start of the pipe.
Flow (End):	The flow at the end of the pipe.
Size:	The nominal diameter of the pipe.
Code:	The pipe type code from the database.

Note: If actual pipe pressure exceeds the pressure rating for the pipe, a + will be printed at the end of the entry (after the type code) for the pipe.

See also:

Zone Design Reports — *Section 5.14.13*
Zone Design Reports Configuration — *Section 5.14.19*

5.14.13.6 Zone CV Table

This report is useful for Block Entities. It will display:

Zone Name:	Name of the zone
Area:	The area encomplased by the Irrigation Area
Valve:	Description of control valve
Flow:	Flow for the zone
Required Pressure:	Actual Valve Pressure
Mean Flow:	Average flow for the zone
Flow Variation:	The difference between the minimum and maximum allowable outlet flows expressed as a % of the nominal outlet flow

See also:

Zone Design Reports	*Section 5.14.13*
Zone Design Reports Configuration	*Section 5.14.19*

5.14.13.7 Zone Control Valve Summary

A report which lists the control valves used for each zone.

Zone:	The name of the zone
Valve:	Description of control valve
Flow:	Flow for the zone
Pressure:	The downstream valve pressure

See also:

Zone Design Reports	*Section 5.14.13*
Zone Design Reports Configuration	*Section 5.14.19*

5.14.13.8 Zone Design Full

Detailed pressure and flow information is presented for each zone in the design.

Zone:	The name of the zone.
Flow:	Total zone flow.
Valve:	Description of control valve.
Valve pres. upstream:	The pressure on the upstream side of the control valve.

Valve pres. downstream: The pressure downstream of the control valve.

Note: *The flow reported in this and other design reports for zones that contain tapes is based on the calculated flow into each tape, not based on the nominal specific discharge rate for the tapes. The calculated flow takes into account the length, slope and nominal inlet pressure of the tape.*

A + or - sign following the zone flow indicates the maximum or minimum flow limits for the control valve have been exceeded.

For each pipe in the zone:

From:	The x, y coordinates at the start of the pipe.
To:	The x, y coordinates at the end of the pipe.
Pipe Size:	The diameter of the pipe.
Pipe Code:	The pipe type code from the pipe database.
Flow (start):	The flow at the start of the pipe.
Flow (end):	The flow at the end of the pipe.
Vel:	The velocity at the end of the pipe with the highest flow.
Length:	The length of the pipe.
H Diff:	The pressure loss from the start to the end of the pipe including elevation change.

Notes:

A negative flow indicates that the flow direction in the pipe is from the end coordinate of the pipe to the start coordinate.

A negative pressure loss indicates a gain in pressure from the start to the end of the pipe.

*If the allowable velocity has been exceeded, a * will be printed beside that value.*

For each pipe in the zone the flow is reported at the start of the pipe and at the end. For ordinary zone pipes these two values will be the same, but for connected spraylines or tapes the end flow will be less than the start by an amount equal to the total outlet flow which has occurred between the two points.

For each outflow or inflow in the zone:

Location (x,y,z):	The x, y coordinates of the outlet and its elevation (ground level).
Out loss:	The pressure loss in the outlet connector, if any.
Flow:	The flow from the outlet.
Pres.:	The actual pressure at the outlet.
Min Pres.:	The minimum allowable pressure at the outlet.
Max Pres.:	The maximum allowable pressure at the outlet.

Note: *Outlets operating above or below the allowable pressure range will have a + or - beside them.*

Junctions with negative flows indicate a net inflow into the junction (normally the inflow at the valve).

Max Pres. and Min Pres. are the maximum and minimum allowable pressures which result from the flow tolerance specified in the emitter database when applied to the nominal flow of the emitter.

Valve-in-Head Outlets

For a valve-in-head sprinkler the zone pressure loss is zero because there are no pipes in the zone - the sprinkler is a zone in itself.

If an outlet connector such as a swing joint is used to connect the outlet to the mainline pipe the pressure loss for the connector is shown as a control valve pressure loss in the Zone Full Design report.

If an outlet connector is not used, no pressure loss will be shown.

The pressure required for the zone is the pressure required at the valve inlet of the VIH sprinkler.

Valve-under-Head Outlets

Where an outlet is connected directly to a control valve (i.e. a valve and outlet are connected at the same position), the pressure loss through the valve is shown in the Zone Full Design report as the difference between upstream and downstream pressure loss at the control valve.

Where an outlet connector is used, the pressure loss through the connector is added to the pressure on both the upstream sides and downstream side of the valve.

The required pressure for the outlet excludes the connector pressure loss.

The required pressure at the valve includes the connector pressure loss.

Connected Spraylines (Laterals) and Tapes

Each section of a lateral with a given diameter is reported as a separate length of pipe in the Sprayline part of the report (and also in the Pipe part of the report mentioned above). For each pipe in the sprayline the report includes:

From:	The x, y coordinates at the start of the sprayline section.
To:	The x, y coordinates at the end of the section.
Start Pressure:	The pressure at the outlet closest to the start of the sprayline section.
End Pressure:	The pressure at the outlet closest to end of the sprayline section.
Min Pres.:	The minimum allowable outlet pressure.
Max Pres.:	The maximum allowable outlet pressure.
Flow:	The flow from a single outlet used in this sprayline section or, if a tape, the inlet flow for the tape.
O/Loss:	The pressure loss in the outlet connector, if any.

Note: *Outlets on a sprayline section which are operating above or below the allowable pressure range will have a + or - respectively in the most right hand column of the report. A single symbol (+ or -) indicates the pressure at one end of the sprayline is out of range while a double symbol (++ or --) indicates the outlets at both ends of the sprayline section are out of range.*

See also:

Zone Design Reports — *Section 5.14.13*
Zone Design Reports Configuration — *Section 5.14.19*

5.14.14 MAINLINE DESIGN REPORTS

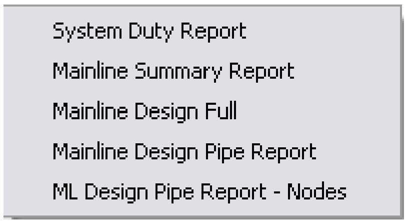


Figure 5-199

5.14.14.1 MAINLINE SUMMARY REPORT

A summary of pressures at each of the water supplies and zone control valves is given for each grouping of valves.

Zone Name:	The name given to the zone control valve.
x,y:	The x and y coordinates of the zone valve.
Valve Pressure:	The pressure on the upstream side of the valve resulting from the specified or calculated water supply pressure.
Required Pressure:	The pressure required on the upstream side of the zone control valve.
Water Supply:	The name of the water supply.
x,y:	The x and y coordinates of the water supply.
Pressure:	The pressure at the water supply for the valve grouping.
Flow:	The flow at the water supply for the valve grouping.

The above information is repeated for the different flow conditions (System Duties) arising from the management for the system.

See also:

Mainline Design Reports Configuration *Section 5.14.20*

5.14.14.2 SYSTEM DUTY REPORT

This report is a summary of the duty required at each water supply for each system flow.

Water Supply:	The name of the water supply referred to.

Duty No:	The system flow number.
Time On:	Beginning of time interval for which the duty applies.
Time Off:	End of time interval.
Pressure:	Pressure required at water supply during the above time interval.
Flow:	Flow required at the water supply during the above time interval.

See also:

Mainline Design Reports *Section 5.14.14*
Mainline Design Reports Configuration *Section 5.14.20*

5.14.14.3 MAINLINE DESIGN FULL

Detailed pressure and flow information is presented for each system flow in the mainline.

System flow Name:	As defined in Management.
Flow:	The flow required at the first water supply.
Pressure:	The pressure required or specified at the first water supply.
Main Supply:	The name of the water supply supplying the system flow.

The information printed for each pipe in the mainline system is the same as for zone pipes in the Zone Full Design Report.

For each inflow, outflow or junction in the mainline system:

Location (x,y,z):	The x, y coordinates and elevation of the junction, valve or water supply.
Out Loss:	The pressure loss in the outlet connector, if any.
Flow:	The flow from the valves operating during the time of the system flow operation (the negative flow represents the inflow from the water supplies).
Pres:	The actual pressure at each junction, valve or water supply.
Min Pres:	The minimum allowable pressure at the zone valves that are operating at that time.
Max Pres:	The maximum allowable pressure at the zone valves that are operating at that time.

*Note: An * alongside the valve entry in this report indicates that the flow rate through the valve is outside of specification.*

See also:

Mainline Design Reports	*Section 5.14.14*
Mainline Design Reports Configuration	*Section 5.14.20*

5.14.14.4 ML Design Pipe Report – Nodes

A version of the *Mainline Design Pipe Report* that lists nodes rather than coordinates has been added. Normally this would be used in conjunction with labeling using the 'UID' keyword to identify junctions on the plan.

See also:

Mainline Design Reports	*Section 5.14.14*

5.14.14.5 Mainline Design Pipe Report

Detailed pressure and flow information is listed for each system duty.

For each mainline pipe:

From:	The x, y, z coordinates at the start of the pipe. Z is the elevation of the start of the pipe.
To:	The x, y, z coordinates at the end of the pipe. Z is the elevation of the start of the pipe.
Depth:	The depth of the pipe below ground level.
Pressure (Start):	The pressure at the beginning of the pipe.
Pressure (End):	The pressure at the end of the pipe.
Pressure (Allow):	The pipe pressure rating (from the pipe database).
Flow (Start):	The flow at the start of the pipe.
Flow (End):	The flow at the end of the pipe.
Size:	The nominal diameter of the pipe.
Code:	The pipe type code from the database.

Note: If actual pipe pressure exceeds the pressure rating for the pipe, a + will be printed at the end of the entry (after the type code) for the pipe.

See also:

Mainline Design Reports — *Section 5.14.14*
Mainline Design Reports Configuration — *Section 5.14.20*

5.14.15 COSTING/BOM REPORTS

These reports are primarily intended for the designer to view. They contain detailed technical and costing information that is not usually provided to clients. They also contain options for transferring basic information into inventory systems.

The component costs are calculated using the default pricing type (only as set in *Design|Design Parameters|Economic Parameters* from the costs entered in the database.

The component costs are calculated using the default pricing type in conjunction with the costs entered in the database - **Retail**, **Wholesale**, or **Multiplier**. If **Multiplier** is selected (*Design|Design Parameters|Economic Parameters*) and the multipliers are set in *Reports|Supplier Code Multipliers* the multiplier used is reported at the start of each Costing report. Multipliers do not affect the *BOM with Costs* report.

Pipe lengths include the extra allowance and are rounded according to the settings in the *Design|Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

All reports have a header showing the client, job address, quote number, date and description as entered in *Irricad Options|Design Details* and *Irricad Options|Client*.

Screen Selection for Costing/BOM Reports

The Bill of Materials and Costing reports can be based on the current screen selection. This feature can be useful for a number of procedures including, but not limited to:-

- Obtaining a staged BOM/Costing report.
- Costing different sections separately
- Comparing costs between different design options for the selected section

Note that only items which are visible will be included in the selection report. For example if the junction display is off then any fittings selected at junctions will not be included in the report.

Steps to use the selection filter for BOM/Costing reports are:-

1. Select the required items on the screen.
2. Select a Bill of Materials or Costing report.
3. Enter a name for the selection. This name will be displayed in the report and can be used to identify the selection set used when viewing saved reports at a later time.

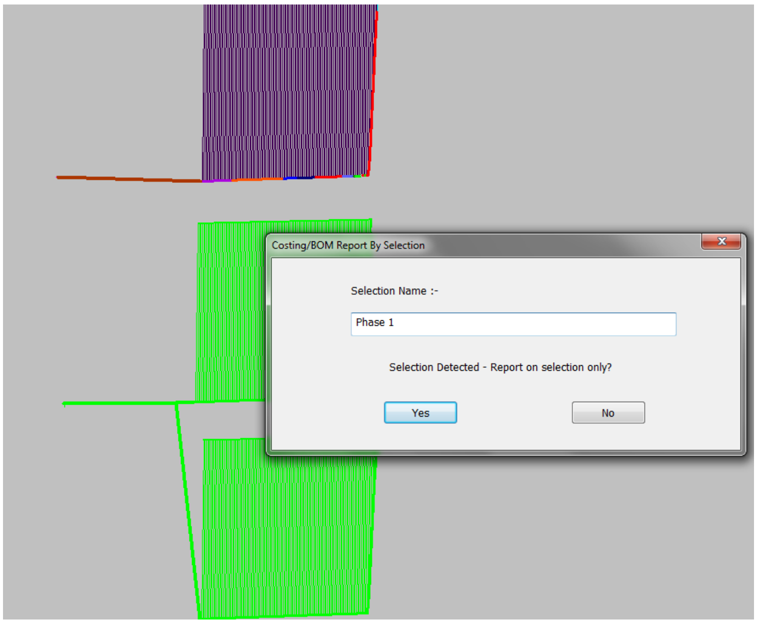


Figure 5-200

4. Click [Yes] to include only the selected items in the report. Note that if items are selected when accessing a BOM/Costing report and a filtered report is not required simply click [No].
5. The report will open displaying the name given in step 3 and listing only the selected items:-

Prices reported are RETAIL discounted by 0.0 %

*** Report By Selection *** Phase 1

Length/Number (m)	Description	Price
240	13mm LDPE Pipe	271.20
4	15 mm Class 15 PVC	8.28
2	16mm Lateral Tube	1.08
31812	AmnonDrip CNL 16MM 1.6 L/H 1.0m Spacing	34,993.20
2	19mm LDPE Black Pipe	1.08
8	20 mm Class 12 PVC	32.56
2	25mm LDPE Black Pipe	1.66
16	32mm LDPE Black Pipe	22.16
40	40 mm Class 6 PVC	286.00
22	50 mm Class 6 PVC	181.72
26	FlatNet 2" 51mm	153.40
73	65 mm Class 6 PVC	821.98
46	FlatNet 3" 78mm	377.20
253	100mm Class 6 PVC	4,414.85
2	2" Nelson 800 Series Valve F BSP	48.00
1	Monoflo VRC 40/65 2950 RPM	6,000.00
	Total Capital Cost	47,614.37

Figure 5-201

Assemblies

The reporting of assemblies is controlled by the usage codes given to the assemblies in the databases.

Where the usage code **Y** is used, any assemblies used in a design will be broken down into their individual components and these components will be listed in the report.

Where the usage code **A** is used, the assemblies will be listed in the reports as an assembly description and not be broken down into individual components.

Where the usage code **X** is used, the assemblies will be listed in the reports as in A above but will also be listed at the end of each report with a list of their components.

The *Costing Report* options are:

Figure 5-202

5.14.15.1 ZONE / MAINLINE SUMMARY

This report lists each zone separately and the mainline below.

Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Description of item.
Unit Price:	The price of the item used for the costing.
Price:	The total cost for the number of items.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.2 Zone Summary / Mainline BOM

This reports combines the Zone items however separates from the Mainline items. A cost for the combined zones is given as well as a cost for the mainline items. A combined total cost is also given.

Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Description of item.
Warehouse code:	The item's warehouse code.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.3 Zone / Mainline BOM

A bill of materials on an individual zone and mainline basis is provided in this report.

Length / No:	Length of pipe or wire or number of items. Includes any extra allowance, rounding and / or number of rolls / lengths.
Description:	Full description of item.
Warehouse Code:	The warehouse code of the item.

Pipe lengths include the extra allowance but do not include the rounding. The length is rounded so as not to have any decimal places to the nearest number (down if less than 0.5, up if greater than 0.5). The extra allowance is also rounded up or down to the nearest whole number, instead of rounding up as in all other BOM reports. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

Fittings errors are also listed.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.4 ZONE / MAINLINE DETAILED COSTING

Costs and full details of connection types are given. This makes this report useful for identifying problems in the database that may have caused fitting selection errors.

Zone name (or Mainline): Name of each zone

Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Full description of item.
Unit Price:	The price of the item used for the costing.
Price:	The total cost for the number of items.
Warehouse code:	The item's warehouse code.
Fitting:	The fitting type code for the pipe or major diameter of the item.
Size:	The nominal diameter of pipe or major diameter of item.
Fitting:	The fitting type code for the minor diameter of the fitting.
Size:	The nominal diameter of the minor connection.
Total Price:	The total price for each zone on the mainline.

Following each zone or mainline report, fitting selection error messages are given.

Finally, a summary of all items used in the design is given in the same format as the data presented above.

A total final cost is also given.

Note: Unit prices (and therefore total prices) can also be adjusted according to the settings for "Default Pricing Type" in Design|Design Parameters|Economic Parameters, and therefore may not necessarily be the same as those listed in the databases.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.5 Inventory by W / H Code

So that a summary of materials required for a design can be easily transferred into inventory packages, a simplified list containing the number of items required and the warehouse code for those items is given. All titles, borders and paging have been removed.

This report can be saved as an ASCII file (using *File|Print*) and has the following format:

Number of items:	Columns 1 to 7
Comma:	Column 8
Warehouse code:	Columns 9 to 20

Pipe lengths include the extra allowance and are rounded according to the settings in the *Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

See also:

Costing/BOM Reports — *Section 5.14.15*
Costing Reports Options — *Section 5.14.18*

5.14.15.6 Junction BOM

This report shows each fitting at each junction.

Junction ID:	The Unique ID of the item
Loctaion:	The X and Y coordinate of the location of the item
Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Full description of item.

See also:

Costing/BOM Reports — *Section 5.14.15*
Costing Reports Options — *Section 5.14.18*

5.14.15.7 Inventory by Description

So that a summary of materials required for a design can be easily transferred into inventory packages, a simplified list containing the number of items required and the description for those items is given. All title, borders and paging have been removed.

This report can be saved as an ASCII file (using *File|Print*) and has the following format:

Number of items:	Columns 1 to 7
Comma:	Column 8
Item Description:	Columns 9 to 48

Pipe lengths include the extra allowance and are rounded according to the settings in the *Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.8 Design Detailed Costing

A full costing of all components in the design is given.

Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	A full description of the item.
Unit Wholesale:	The wholesale cost of the item listed in the database or the buying price calculated from the base price and multiplier A.
Unit Retail:	The retail price of the item listed in the database or the selling price calculated from the base price and all the enabled multipliers.
Total Wholesale:	The total wholesale or buying price of the items.
Total Retail:	The total retail or selling price of the items.
Margin:	The difference between the total retail (or selling) price and wholesale (or buying) price for the item.

Note: Unit prices (and therefore total prices) can also be adjusted according to the settings for "Default Pricing Type" in Design|Design Parameters|Economic Parameters, and therefore may not necessarily be the same as those listed in the databases.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.9 Inventory

So that a summary of materials required for a design can be easily transferred into inventory packages, a simplified list containing the number of items required and the description and warehouse code for those items is given. All title, borders and paging have been removed.

This report can be saved as an ASCII file (using *File|Print*) and has the following format:

Number of items:	Columns 1 to 7
Comma:	Column 8
Item Description:	Columns 9 to 48
Comma:	Column 49
Warehouse code:	Columns 50 to 61

Pipe lengths include the extra allowance and are rounded according to the settings in the *Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.10 BOM with Costs

A summarized list of all items used in the design is given.

Length / No:	Length of pipe or wire or number of items. Includes any extra allowance, rounding and / or number of rolls / lengths.

Description:	Full description of item.
Price:	Total price of each item.
Total Price:	The total price for the design.

Pipe lengths include the extra allowance and are rounded according to the settings in the *Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

Any fittings errors are also listed.

> Note: *Unit prices (and therefore total prices) can also be adjusted according to the settings for "Default Pricing Type" in Design|Design Parameters|Economic Parameters, and therefore may not necessarily be the same as those listed in the databases.*

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.11 Costing Report By Supplier

This costing report groups by supplier code.

Supplier Code:	Name of supplier
Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Full description of item.
Unit Price:	The price of the item used for the costing.
Price:	The total cost for the number of items.
Warehouse code:	The item's warehouse code.
Fitting:	The fitting type code for the pipe or major diameter of the item.
Size:	The nominal diameter of pipe or major diameter of item.
Fitting:	The fitting type code for the minor diameter of the fitting.
Size:	The nominal diameter of the minor connection.
Total Price:	The total price for each supplier.

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.12 Unconnected Items

This report will list unconnected items. Note that if zone items are connected to a valve, but the valve is not connected to the water supply, only mainline pipes connected to the valve will be listed.

Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Full description of item.
X:	X coordinate of unconnected item
Y:	Y coordinate of unconnected item

See also:

Costing/BOM Reports	*Section 5.14.15*
Costing Reports Options	*Section 5.14.18*

5.14.15.13 Design Summary Costing

A summary of all items used in the design is given in this report. The items are grouped in the following order:

- Pipes
- Zone control valves
- Couplers
- Bends
- Tees
- Emitters
- Connectors
- Miscellaneous

Length / No:	Length of pipe or wire or number of items. Note that no rounding allowance is included in these lengths.
Description:	Full description of item.
Unit Price:	The price used for the costing.
Price:	The total price of the individual items.

Total Price: The total price for the design.

This information is followed by a summarized list of fitting selection errors.

> <u>Note:</u> *Unit prices (and therefore total prices) can also be adjusted according to the settings for "Default Pricing Type" in Design|Design Parameters|Economic Parameters, and therefore may not necessarily be the same as those listed in the databases.*

See also:

Costing/BOM Reports — *Section 5.14.15*
Costing Reports Options — *Section 5.14.18*

5.14.15.14 BOM BY SUPPLIER

This report provides a list of all items used in the design summarized on a supplier code basis. All items with the same supplier code are grouped together with each supplier code list beginning a new page to make distribution of these lists easier.

Length / No: Length of pipe or wire or number of items. Includes any extra allowance, rounding and / or number of rolls / lengths.
Description: A full description of the item.
Warehouse Code: The warehouse code of the item.

Pipe lengths include the extra allowance and are rounded according to the settings in the *Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

Any fittings errors are also listed.

See also:

Costing/BOM Reports — *Section 5.14.15*
Costing Reports Options — *Section 5.14.18*

5.14.15.15 BOM

This report is a listing of the number and description of all items used in the design. No prices are given.

Length / No: Length of pipe or wire or number of items. Includes any extra allowance, rounding and / or number of rolls / lengths.

Description: A full description of the item.

Pipe lengths include the extra allowance and are rounded according to the settings in the *Pipe Fitting Matching Table*. If "Roll / Length" is used in the *Pipe Fitting Matching Table*, then the number of rolls is reported instead of the total length.

Any fittings errors are also listed.

See also:

Costing/BOM Reports *Section 5.14.15*
Costing Reports Options *Section 5.14.18*

5.14.16 Miscellaneous Costs

Not available in this version.

5.14.17 Supplier Code Multipliers

This table has three major functions:

- To define the four character Supplier Codes that the designer wishes to use to identify suppliers and / or product groups for the various components in the databases
- To associate with each code a base price and up to four multipliers which are then used to calculate the cost of each database item for the costing reports
- To allow the user to select which of the four multipliers should be used in any given design.

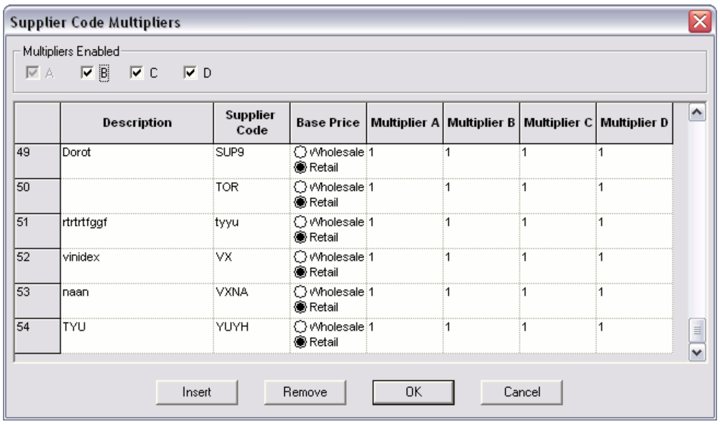


Figure 5-203

To edit the Supplier Code Multipliers:

1. Select *Reports|Supplier Code Multipliers*.
2. Make any changes required. Use the Insert and Remove buttons to add rows to and remove rows from the table.
3. Click [OK].

Note: *For multipliers to be used in Costing reports, the user must first enable **Multiplier** as the "Default Pricing Type" in Design|Design Parameters|Economic Parameters.*

Multipliers Enabled: Indicates which of the multipliers will be used to calculate prices. Multiplier A must always be checked as it is used to calculate the buying price from the base price but there are no restrictions on the use of the other three multipliers.

Description: A purely informative description that can be used to identify the particular supplier or product group represented by the Supplier Code.

Supplier Code: A four-character code the designer wishes to use to identify suppliers or product groups for the components in the database. The code has two functions: firstly, to link database items with the costing multipliers used to calculate prices for the *Costing and Bill of Materials reports* and, secondly, it is used for making global changes to the prices recorded in the databases. When entering database items, the list of supplier codes is taken from this table so new supplier codes must be added to the table before they can be used in the database. Up to 260 different supplier codes can be entered.

Base Price: Indicates whether the database wholesale or retail price is to be used as the base price for the costing calculations.

Multiplier A,B,C,D: Any value between 0.0001 and 9.9999 can be entered for each multiplier.

5.14.18 Costing Reports Options

Sometimes it is desirable to provide Costing or Bill of Material reports that contain a restricted group of components. For example, a list of pipes or fittings only, or sprinklers and nozzles only is required. This dialog allows the user to select which groups of items are to be included in any Costing or Bill of Materials report.

The groups are:

Figure 5-204

The last group is used to include or exclude the listing of assembly components at the end of a report for assemblies with usage code X.

To generate a report for a selection of hydraulic items:

1. Select *Reports|Costing Report Options*.

2. Check those items to be included and uncheck those to be excluded.
3. Click [OK].
4. Select one of the BOM reports. Only the selected hydraulic items will be reported.

5.14.19 Zone Design Reports Configuration

Design reports can be generated on a single or multiple zone basis. This removes the necessity to generate a report that includes all zones, when the user only requires details of a few zones.

The default setting is that all zones are included in the reports.

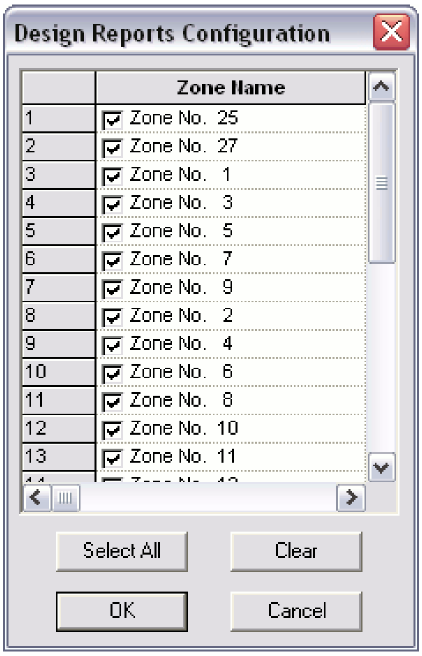


Figure 5-205

To generate a report for a selection of zones:

1. Select *Reports|Zone Design Reports Configuration*.
2. Check those zones to be included and uncheck those to be excluded.
3. Click [OK].

4. Select one of the zone design reports. Only the selected zones will be reported.

5.14.20 MAINLINE DESIGN REPORTS CONFIGURATION

Design reports can be generated on a single or multiple system flow basis. This removes the necessity to generate a report that includes all system flows, when the user only requires details of a few system flows.

The default setting is that all system flows are included in the reports.

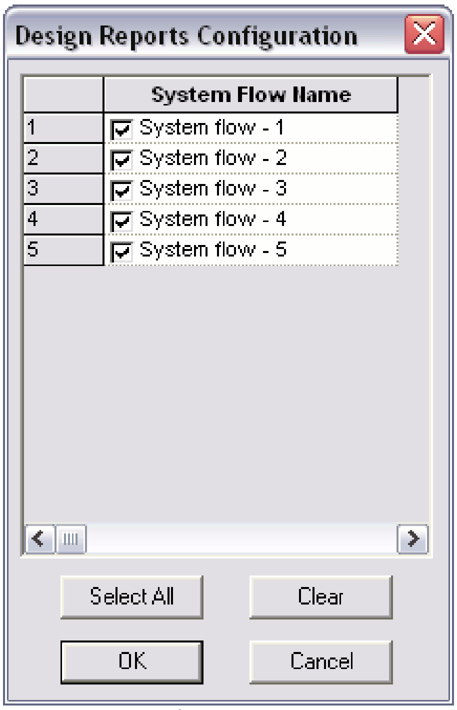


Figure 5-206

To generate a report for a selection of system flows:

1. Select *Reports|Mainline Design Reports Configuration*.
2. Check those system flows to be included and uncheck those to be excluded.
3. Click [OK].
4. Select one of the mainline design reports. Only the selected system flows will be reported.

5.15 PLOT TEMPLATE

The *Plot Template* menu allows the user to customize the templates used to generate the plot layout in *Draw|Plot Layout*. A plot layout contains text, logos, symbols, legends, title blocks etc., that will be printed on the final plan. The user can edit an existing template (recommended) or create a new template.

Note: *Start a new design in order to have a clean screen when editing templates.*

5.15.1 EDIT TEMPLATE

Use this option to select an existing template to edit.

To edit a template:

1. Select *Plot Template|Edit Template*.
2. By default, IRRICAD lists templates found in the folder specified in *Settings|Drawing Items* – "Plot Layout Path". If necessary, change the path and drive to locate the template to open.
3. Select a template by double-clicking the file name or by selecting the file name and clicking [Open].

The template will be drawn on the screen.

See also:

Using Plot Layouts	*Section 2.8.2.1*
Editing Plot Templates	*Section 2.9.8*

5.15.1.1 KEYWORDS

Keywords created as text objects may form part of the template. When IRRICAD generates the plot layout in *Draw|Plot Layout* it recognizes these keywords and replaces them with the required information. Keywords start and end with #.

See also:

Keywords For Use in Plot Templates	*Section 6.10.2*

5.15.2 Make Active Area

The active area of a plot layout defines the area of the layout that will fit on the paper minus the margins. It is drawn as a dashed yellow rectangle. Every plot template must have an active area.

To make an active area:

1. Select the entity or entities whose extents will define the active area.
2. Select *Plot Template|Make Active Area*.

See also:

Using Plot Layouts	*Section 2.8.2.1*
Creating a New Template	*Section 2.9.8.2*

5.15.3 Make Legend

Use this option to create a legend object as part of a template.

To make a legend object:

1. Select the objects making up the legend.

Tip: *Use a selection window or lasso for this as clicking on a fill will only select the fill not the objects behind it.*

2. Select *Plot Template|Make Legend*.
3. Fill in the "Legend" dialog. Click [OK].

See also:

Using Plot Layouts	*Section 2.8.2.1*
Creating a New Template	*Section 2.9.8.2*
Creating Legends	*Section 2.9.8.3*

5.15.3.1 Legend Dialog

Type

Type: The type of legend to create. Pipe lists the pipes and wires used in the design. Symbol lists the outlets, valves, pumps, electrical and misc.

	hydraulic items used in the design. Combined combines both pipe and symbol legends.
Order:	The order in which legends are filled when there is more than one of the same type in the template. The lowest number is filled first.
Between Line Spacing:	The space between items in the legend as a percentage of the text height.

5.15.4 MOVE FILLS TO BACK

Use this option to move any fills that are obscuring text or other items occupying the same space to behind those items.

1. Select the fill(s) and objects being obscured.

Tip: Use a selection window or lasso for this as clicking on a fill will only select the fill not the objects behind it.

2. Select *Plot Template|Move Fills To Back*.

Note: Move Fills to Back can be used for normal drawing items and fills. However, Fills cannot be moved behind hydraulic items.

See also:

Using Plot Layouts	*Section 2.8.2.1*
Creating a New Template	*Section 2.9.8.2*
Creating Legends	*Section 2.9.8.3*
Fills	*Section 2.9.8.4*
Moving Fills to Back	*Section 2.9.8.5*
Z-Order	*Section 5.11.18*

5.15.5 SAVE TEMPLATE

Use this option to save a template.

1. Select the objects that will be part of the template (usually all objects).
2. Select *Plot Template|Save Template*.
3. Type a template name in the dialog. Click [OK].

Notes:

The template is saved in the folder specified in Settings|Drawing Items – "Plot Layout Path". If the name is the same as an existing template it will be overwritten.

If the template does not contain an active area object then a default one is created whose area is defined by the extents of all the selected objects.

See also:

Using Plot Layouts	*Section 2.8.2.1*
Editing Plot Templates	*Section 2.9.8*

5.16 User Tools

The *User Tools* menu item allows menu items to be added to IRRICAD for commonly used external programs (for example, the Windows Calculator).

5.16.1 Customize

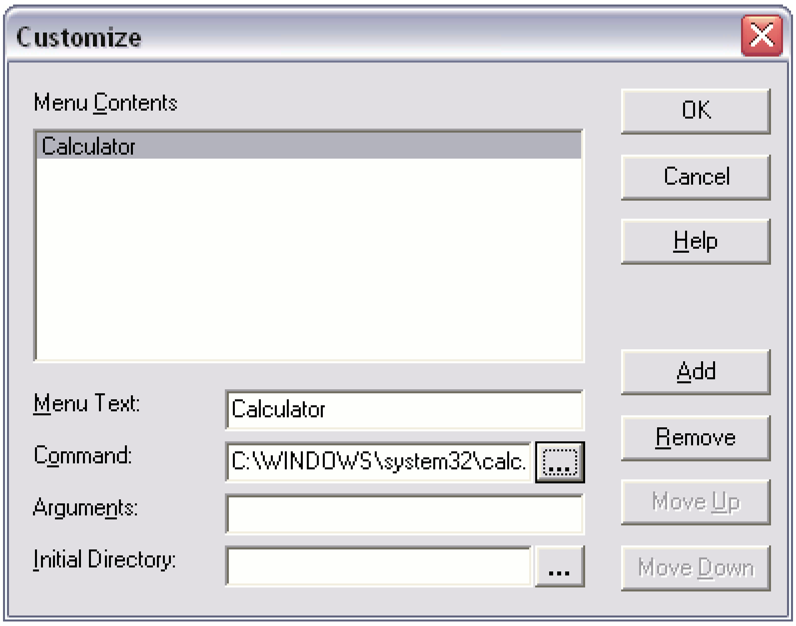


Figure 5-207

New entries may be added using the following method.

1. Select the *Customize* item from the *User Tools* menu.
2. Click the [Add] button.
3. Give the menu item a name in the "Menu Text" field.
4. Type or browse to (with the […] button) the executable file of the required program. For example, the windows calculator is normally located in C:\Windows\System32\Calc.exe.
5. Add any required command line arguments and set the initial working folder (directory). Normally the user will not need to add anything into these fields.

6. Click the [OK] button.

To delete an item simply select it in the “Contents” area and click the [Delete] button. The order of items can be altered with the [Move Up] and [Move Down] buttons.

5.17 HELP

This menu allows the user to access the on-line Help and information about this version of IRRICAD

5.17.1 RELEASE NOTES

This option allows the user to access a help file that contains information on the changes for the previous version to this version and the use thereof.

The *Release Notes* follow the same layout as the *Help Topics*. (See Help Topics, Section 5.17.2).

5.17.2 HELP TOPICS

Help|Help Topics opens the manual on-line help. It is the same manual as the hard copy and is laid out in the same way. The user will notice 6 main sections:

- Overview
- User Manual
- Database Editor Manual
- Tutorials
- Tool & Command Reference
- Technical Reference

The help file can be loaded as WinHelp or HTML Help.

5.17.2.1 HTML HELP

This window can be resized as required. Click the maximize button (middle button at the top right of the dialog window) or move the cursor to any edge until the cursor becomes a two-headed arrow and drag the dialog to the required size. The right hand side of the dialog adjusts the text to fit the right hand window.

At the top of the help dialog are icons: Hide, Back, Print, Options.

Hide / Show

If the left hand side of the help dialog, containing the contents, index and search option is visible, clicking Hide will hide the left hand side. If the left hand side is hidden, clicking Show will show the left hand side of the dialog.

Contents

If this tab is selected, the manual's content page is displayed. Each heading with a '+' sign can be opened to reveal its sub-headings. The sub-headings can be hidden by clicking on the '-' sign.

Clicking any heading will take the user directly to that section of the manual. The text is displayed on the right hand side of the help window.

Index

Use the Index tab to select an indexed keyword. These words have been selected to aid the user in finding topics. Select a topic and click the Display button.

Search

Use Search to find a topic. Search lists all the places the word is found in the on-line help.

To use Search:

1. Type in the word the user wishes to find. Make the word as specific as possible e.g., type X to find the meaning of this usage code for assemblies.
2. Click List Topics.
3. Select a topic from those listed.
4. Click [Display]. The selected topic will be displayed on the right hand side.

Back

Back takes the user back to the last topic accessed, whether the user has selected the topic by using Contents, Index or Search or used the yellow arrows at the end of each topic to navigate.

Click Back as many times as required - this function will move back through all the previous selections.

PRINT

Select Print to print any part of the on-line help. A print dialog will appear. Fill in the print dialog accordingly.

OPTIONS

Options include:

- Hide Tabs / Show Tabs (See above)
- Back (See above)
- Forward
- Home
- Stop
- Refresh
- Internet Options
- Print (See above)
- Search Highlight On / Off

Forward

Select *Options*|*Forward* if have used *Options*|*Back* and wish to return to the previous document.

Home

Select *Options*|*Home* if require to connect to our website www.IRRICAD.com

Stop

Select *Options*|*Stop* to stop searching for topics or loading a page.

Refresh

Select Refresh to reload the current HTML help page

Internet Options

Select *Options*|*Internet Options* to change the internet options.

Search Highlight On / Off

Toggle the search highlight on or off to highlight the keyword found in the text.

5.17.2.2 WinHelp

Contents

If this tab is selected, the contents of the manual are displayed. Each heading containing a sub-heading can be opened by double-clicking on the book icon to the left of the heading name. Double-clicking on the book icon can hide the sub-headings.

Clicking on any heading will take the user directly to the appropriate section of the manual. The text is displayed on the right hand side of the help window.

Index

Use the Index tab to select an indexed keyword. These words have been selected to aid in finding topics. Select a topic and click Display.

Find

Use Find to search for a topic. Find lists all the places the word is found in the on-line help.

5.17.3 IRRICAD On The Web

This link takes the user to the IRRICAD website (www.IRRICAD.com) using the default internet browser.

5.17.4 Support Forum

This link takes the user to the IRRICAD Users forum on the IRRICAD website.

To sign up to the Forum:

1. Scroll to below the posts and click on REGISTER
2. Fill in the Registration form
3. We will activate you as a member of the IRRICAD Forum.
4. Once your account is activated login and subscribe for all the topics you are interested in.

To subscribe to topics to receive notifications of posts:

1. Login to the Irricad forum
2. Click on the Topic Heading - e.g., Tip of the Week.

3. Scroll to the bottom of the page and find and click on the 'Subscribe Forum' link.
4. Subscribe to each forum as required e.g., Annoucements and Support FAQs.

5.17.5 SEND PROBLEM REPORT

Used to email a problem design to IRRICAD Support:-

1. Select *Help|Send Problem Report* and click [Yes] and then [OK] on the messages.

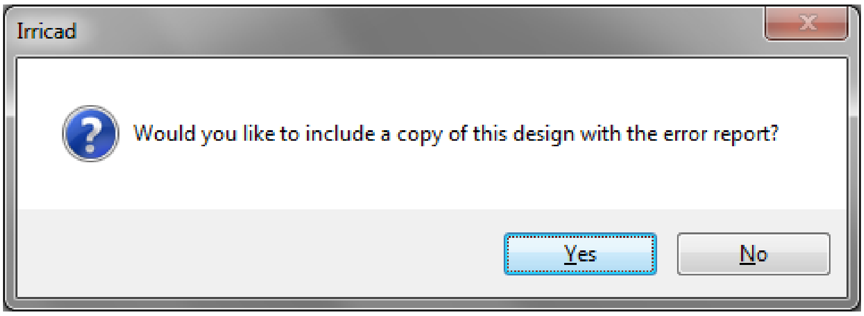


Figure 5-208

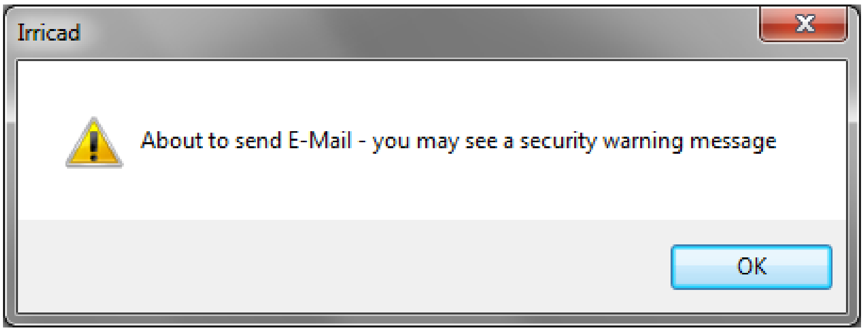


Figure 5-209

2. The process may take some time as IRRICAD creates the reports required to be sent and is attaching the design (if [Yes] was selected) to the error message. The email message with the attachments will display in the default email program.

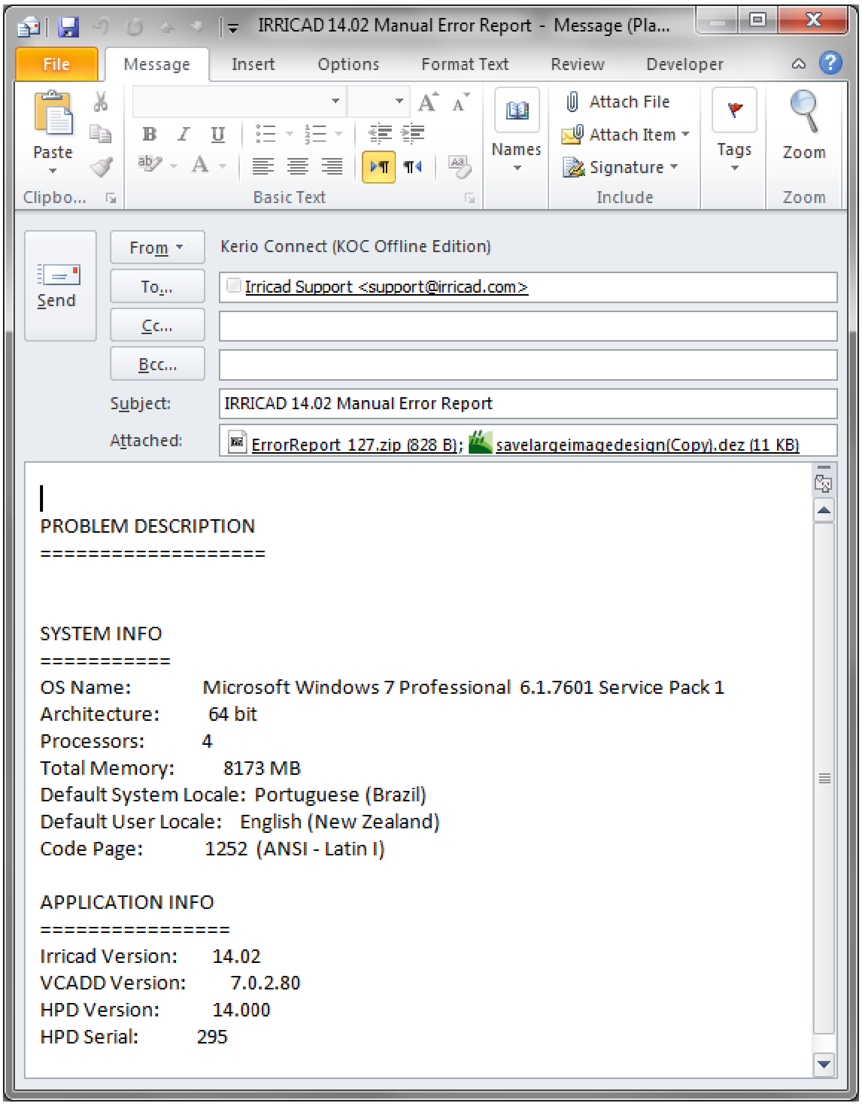


Figure 5-210

3. Add any information regarding the issue experienced.
4. Click [Send] to complete sending the report to IRRICAD Software.

<u>Note</u>: The design must be saved (i.e have a design name) before it can be sent using this method.

5.17.6 ABOUT IRRICAD

To find the version of IRRICAD:

1. Select *Help|About IRRICAD*.
2. The dialog tells the user the version of IRRICAD, the CAD version, the dongle version and the dongle Serial number.

6 Technical Reference

This reference guide contains the technical information and appendices.

6.1 Technical Support, Sales and Training Services

This chapter outlines the contact details for local distributor and technical support.

6.1.1 Contact Details

6.1.1.1 USA, Canada, Central & South America:

Nelson Irrigation Corporation

Mike Noftle or Graham Hutchinson
Route 4, Box 169
Airport Road
Walla Walla
WA 99362-6426
USA

Telephone: +1 509 524 7230
Facsimile: +1 509 525 7907
Email: irricad@nelsonirrigation.com

6.1.1.2 Australia:

Netafim Australia Pty Ltd.

Matt Forward or or Gennaro Vellotti
P.O. Box 3173, Melbourne St
Adelaide
Australia

Mobile: +61 407 501 527 or +61 419362845
Email: Matthew.Forward@netafim.com or Gennaro.Vellotti@netafim.com

6.1.1.3 Middle East:

Aiattec

Bassim Awad
Daheyet al Rasheed,
Al Za'tari St.
Amman
Jordan

Mobile: +962 799578854
Fax: +962 65159039
Email: support@aiattec.com

6.1.1.4 Europe, North Africa, Turkey and Israel

Netafim Ltd. Corporate Headquarters

Eliezer Gilary
Derech Hashalom 10,
Tel Aviv,
Israel 67892

Tel: +972 4 628 7595 or +972 4 628 7208
Fax: +972 4 628 7704
E-Mail: irricadsupport@netafim.com

6.1.1.5 Southern Africa

Danamix

Fredo van Zyl
10 Paul Kruger Street
Somerset West
Western Cape 7130
South Africa

Tel: +27 21 945 2919
Fax: +27 828 075 901
E-Mail: fredo@danamix.co.za

6.1.1.6 NEW ZEALAND & THE REST OF THE WORLD:

Lincoln Agritech Ltd

Jo Vivier or Phil Dewar
PO Box 69133
Lincoln
Christchurch 7640
Canterbury
New Zealand

Telephone: +64 3 325 3718
Fax: +64 3 325 3725
Email: Support@IRRICAD.com

6.2 APPENDIX A: IRRICAD LIMITS

Limits in IRRICAD are:	
Number of connections at a junction	4
Number of contour line segments / point spot heights	Unlimited (ABOS)
Number of database items which can be loaded to solve an IRRICAD internal connection	40
Number of different fittings that can be selected at a junction	40
Number of flagged pipe sizes available for mainlines	40
Number of flagged pipe sizes available for zones	40
Number of irrigation areas	50
Number of irrigation areas within another	20
Number of junctions in a mainline	12500
Number of junctions in a zone	12500
Number of on / off times per supply	10
Number of on / off times per zone	3
Number of pipes in a mainline	5000
Number of pipes in a zone	5000
Number of system duties	6000
Number of system flows per zone	10
Number of system flows in total	6000
Number of unique database items for costing	2000
Number of water supplies	20
Number of zones (fitting selection, reporting, plotting)	2000

6.3 APPENDIX B: DESIGN GENERATED FILES

Files generated by IRRICAD during the course of a design are saved within the dez file. Files generated by IRRICAD during the course of a design, their file extension and where they are created:

File Extension	IRRICAD Files	Where Created
.mdb	internal database file	*File|New / File|Save*
.des	design file	*File|New / File|Save*
.vcd	visual cadd file	*File|New / File|Save*
.stn	system flow file	*Design|Assign Zones to System Flows… / Design|Other Management Options*
.wsp	water supply file	*Design|Assign Zones to System Flows… / Design|Other Management Options*
.zne	zone file	*Design|Assign Zones to System Flows… / Design|Other Management Options*
.ztm	zone time file	*Design|Assign Zones to System Flows… / Design|Other Management Options*
.dzf	zone design configuration file	*Design|Zone Design Configuration*
.dzn	zone design file	*Design|Zone Design*
.dml	mainline design file	*Design|Mainline Design*
.cer	costing error file	*Design|Computer Selection of Fittings*

The single *.dez file can be uncompressed with any zip utility (e.g., 7-Zip, PKZip, WinZip). If extracting the design manually, the *.dbm file should be renamed *.mdb before opening the design in IRRICAD. Note internal databases should not be used as the component database for the design. Note the *.dez file contains a renamed internal database file (*.dbm) to facilitate emailing through spam and virus filters.

6.4 Appendix C: Hazen-Williams C Values

The Hazen-Williams C values listed below apply to hydraulically smooth pipes with flow velocities of 3.3ft/s (1m/s). Do *not* use these values for tapes or driplines with built-in emitters. Contact technical support for these values.

Pipe Diameter

Inches	MM	C Value
½	13	137.2
-	16	137.8
¾	19	138.8
1	25	140.0
1¼	32	141.2
1½	40	143.0
2	50	144.4
2½	65	146.0
3	80	147.2
4	100	148.0
5	125	148.6
6	155	149.0
8	190	149.3
9	225	149.5
12	300	150.0

6.5 APPENDIX D: DEFAULT DATABASE ORDER

The databases have an in-built ordering system that determines the order items are displayed in the Database editor and drop down list in IRRICAD. This is set out below to help with understanding the ordering of items in each component group. Items in each component group are ordered alphabetically or numerically in ascending order based upon each of the fields below in turn. For example, Controllers are ordered numerically by the [Order] field then alphabetically by [Description] and so on.

Note that the [order] field is an internal one that is not available in the IRRICAD Database Editor. It can, however, be accessed via Microsoft Access. By default, the order field for all items is the same and therefore has no effect. To give the order field another number to change the ordering, do so in the column labeled Order Number.

Group	**Default Ordering**
Controllers	[Order],
	[Description],
	[Number of Stations]
Couplers	[Order],
	[Major Connection Type],
	[Minor Connection Type],
	[Major Diameter],
	[Minor Diameter],
	[Description]
Crosses	[Order],
	[Major Connection Type],
	[Minor Connection Type],
	[Major Diameter],
	[Minor Diameter],
	[Description]
Elbows / Bends	[Order],
	[Major Connection Type],

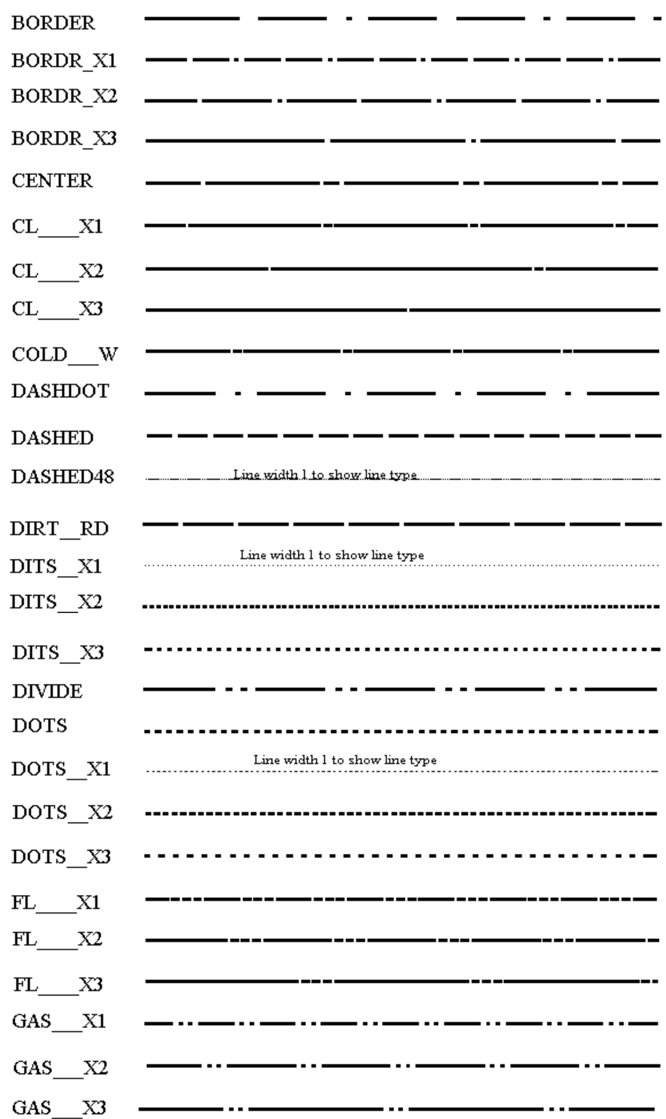
	[Minor Connection Type],
	[Major Diameter],
	[Bend Angle],
	[Minor Diameter],
	[Description]
LTOs	[Order],
	[Major Pipe Type],
	[Minor Connection Type],
	[Minimum Submain Diameter],
	[Lateral Diameter],
	[Description]
Lights	[Order],
	[Description],
	[Rating]
Misc. Items	[Order],
	[Description],
	[Size / Diameter 1],
	[Size / Diameter 2]
Nozzles	[Order],
	[Description],
	[Arc],
	[Constant]
Other Elec.	[Order],
	[Description],
	[Rating]
Other Hyd.	[Order],
	[Inlet Connection Type],
	[Outlet Connection Type],
	[Inlet Diameter],
	[Outlet Diameter],
	[Description]
Outlet Conn.	[Order],
	[Inlet Connection Type],

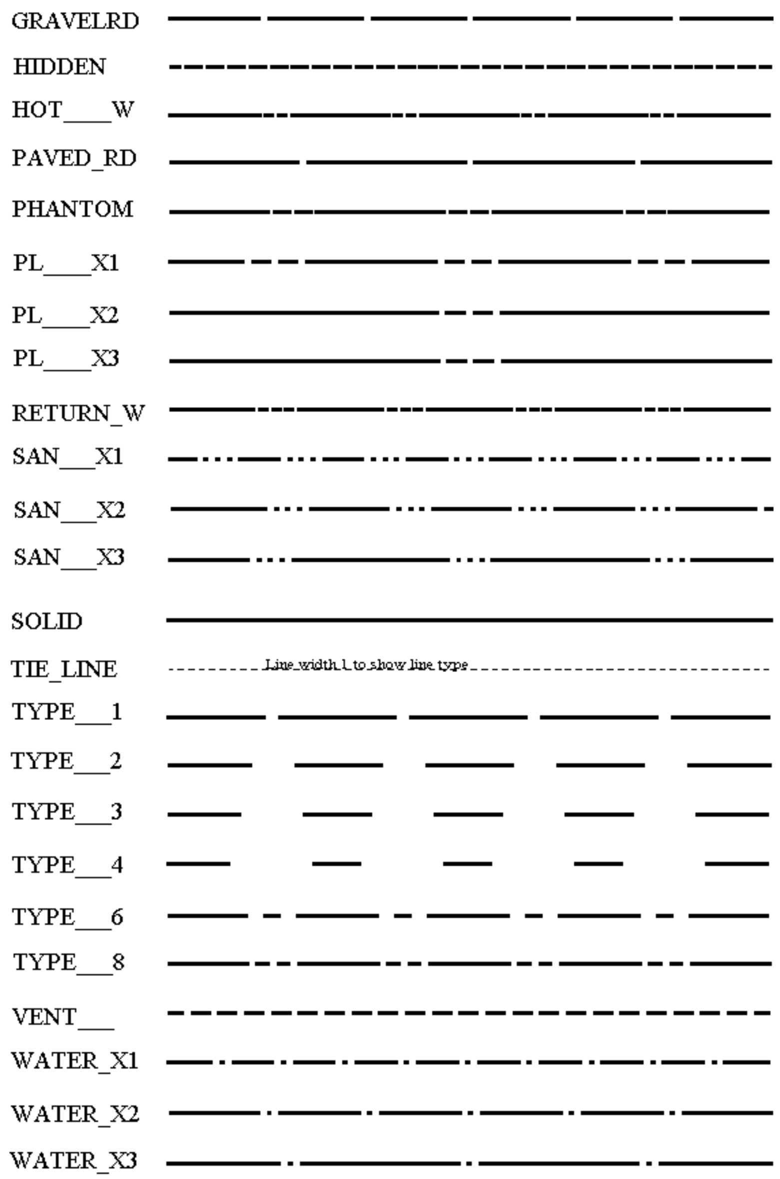
	[Outlet Connection Type],
	[Inlet Diameter],
	[Outlet Diameter],
	[Description]
Outlets	[Order],
	[Description],
	[Inlet Connection Type],
	[Inlet Diameter]
Pipes	[Order],
	[Pipe Type],
	[Nominal Diameter],
	[Allowable Pressure],
	[Description]
Pumps	[Order],
	[Inlet Connection Type],
	[Outlet Connection Type],
	[Inlet Diameter],
	[Outlet Diameter],
	[Description]
Tapes	[Order],
	[Description],
	[Nominal Diameter]
Tees	[Order],
	[Major Connection Type],
	[Minor Connection Type],
	[Major Diameter],
	[Minor Diameter],
	[Description]
Valves	[Order],
	[Inlet Connection Type],
	[Outlet Connection Type],
	[Inlet Diameter],
	[Outlet Diameter],
	[Description]

Wires	[Order],
	[Description],
	[Nominal Diameter]

6.6 Appendix E: Available Line Types

This chapter lists the available line types. These line types are available for geometric items, such as lines, rectangles, etc. and hydraulic items, such as pipes, tapes and wires.




GRAVELRD
HIDDEN
HOT____W
PAVED_RD
PHANTOM
PL____X1
PL____X2
PL____X3
RETURN_W
SAN___X1
SAN___X2
SAN___X3
SOLID
TIE_LINE
Line width 1 to show line type
TYPE___1
TYPE___2
TYPE___3
TYPE___4
TYPE___6
TYPE___8
VENT___
WATER_X1
WATER_X2
WATER_X3

6.7 Appendix F: Design Technical Information

This chapter outlines the design technical information relevant to the design process and pipe selection process.

6.7.1 Use of Elevations in Design

Where elevations have been entered as either contour lines or spot heights, IRRICAD interpolates between these to calculate elevations at all points in the design (excluding physical items such as landmarks and text).

The general method used is direct linear interpolation between contour lines with some triangulation / linear interpolation where spot heights are used. Where objects such as sprinklers or pipe junctions fall on contour lines, the height of these objects is set to the height of the contour. Where objects fall between contour lines or spot heights, linear interpolation is used to find the height of the object.

Where objects fall outside the contour lines, but are close to a contour line, the height of the object is set equal to the height of the closest contour line or spot height. If objects are placed outside the contour lines but not close to them, again the object height is set equal to the closest contour height and the user is warned by a message displayed on the screen that this has happened.

If a small number of spot heights or contours are used to define elevations, then provided objects are placed within these heights or contours, elevations will usually be calculated for the objects. A warning message will be displayed if there are insufficient contours or spot heights and elevations for some points may be set to zero.

It is the user's responsibility to ensure that sufficient contour lines or spot heights have been entered to allow an accurate interpolation to be made.

> Note: *Elevations for pipes are only calculated and reported at pipe junctions.*

If long straight pipelines are being designed, particularly if they are undulating, the designer *must* ensure that sufficient permanent junctions are incorporated to characterize the changes in elevation. This can be achieved by connecting a suitable fitting into the pipeline at the appropriate points. Elevations and pressures will then be calculated for these points.

It is suggested that a pressure point fitting be added to the Other Hydraulics component group in the database for this purpose. Give the fitting a distinctive symbol, zero cost and some non-standard connection type. After the design is finalized this component can be deleted before the final plans and reports are prepared (delete the item from the design and re-run *Design|Computer Selection of Fittings* but do not repeat Design).

The counter visible on the status bar during interpolation of elevations gives an indication of the number of objects that have had elevations interpolated in the design.

6.7.2 Zero Flow Pipes

A number of situations can arise during pipe diameter selection that results in pipes with zero flow in them.

Typical examples are:

- In zones where a pipe or pipes have no outlets on their downstream end, i.e. dead end pipes or pipes with miscellaneous hydraulic items on their ends.
- In looped systems, some pipes, because of the symmetry of the system, may effectively be redundant and have zero flow or very small flow.
- Where a small group of valves are selected to represent a worst case situation, it is likely that some mainline pipes will not have flow in them during mainline design, particularly in systems that contain a number of side branches

Because of the methods used to calculate pipe size, IRRICAD cannot size zero-flow pipes. IRRICAD checks for these situations and identifies these pipes on the screen as yellow pipes. The message NO PIPE SELECTED also appears on the plan. This pipe has a diameter of 0.04" (1mm) and is so described in the reports.

<u>Note</u>: IRRICAD is only able to detect situations where there is zero flow in the pipe. In all other situations pipe sizing or analysis is based solely on the schedule the designer has entered in Management.

Diameters can be given to these pipes by manually sizing the pipes, or by entering an operating schedule in Management, which will result in flow in the pipes.

6.7.3 VALVE PRESSURE CALCULATION

The method used to calculate the pressure on the downstream side of zone control valves varies according to the type of outlets in the zone.

For zones containing outlets or spraylines, the valve pressure is set so that the sum of the squares of the pressure difference between the average actual outlet pressures and the average specified nominal pressures for the outlets is minimized. This ensures that the outlet pressures are as close as possible to the required nominal pressures.

For zones containing pressure regulated tapes, the valve pressure is calculated so as to provide at least the user specified minimum required submain pressure at all points on the submain.

For zones containing unregulated tape inlet pressures, a nominal tape pressure is calculated as the average of the minimum and maximum allowable inlet pressures according to the tolerance specified in the database for the tape. This nominal tape pressure is then used in the same way as for a zone not containing tapes.

If the zone contains both regulated and unregulated tapes, the highest value resulting form the calculation of the regulated and unregulated cases is used.

6.7.4 PIPE DIAMETER SELECTION

If the designer has selected Computer Sizing when positioning pipes or laterals, IRRICAD will calculate the diameters for these pipes.

With computer sizing, any pipes which have their Computer Sized check box checked will have their diameters calculated or recalculated regardless of whether or not they have been previously sized.

If a particular size is required for a pipe, then that pipe must be manually specified or having been previously computer sized have the automatic "Computer Sized" check box unchecked. This is achieved via the *Change* tool (See Making Changes to the Design or Drawing, Section 2.4.4).

If *Analyse* or *Detailed Analysis* is selected and pipes exist that have not been previously sized either manually or by IRRICAD, an error message will appear indicating this.

For diameter selection of spraylines, each connected sprayline is converted within IRRICAD into two pipes (with diameters specified as computer selected rather than of fixed diameter) and a single outlet. This is done in such a way that the hydraulics of the two pipes and single outlet represent the hydraulics of the original lateral.

Using these simulated pipes and outlets, all pipes are sized according to the sizing method selected (LP or Velocity). The system is analyzed to provide the start and end pressures for the laterals. The laterals are then sized using one, two or three diameters (as specified in *Design|Zone Design Configuration*) using specially developed lateral sizing techniques. Each of these new laterals is converted to pipes and outlets for final analysis and reporting.

If a zone or block has a central submain and has laterals in three sizes each size of the submain, internally within IRRICAD there will be six pipes and three outlets each side of the submain. In terms of the limits on the number of pipes used for analysis, each of these pipes is treated as an individual pipe. This means, for example, that a block with 50 laterals, three sizes each side of the submain, will be treated as a zone with 650 pipes and 300 outlets. Similarly, a block with 50 laterals in one diameter fed from one end will be treated as a zone with 150 pipes and 50 outlets.

Driplines or tapes are treated differently so that a 50 lateral tape block with a central submain will be treated as a zone with 150 pipes and 100 outlets.

6.7.5 HIGHLY LOOPED MAINLINES

Due to memory constraints, there is a limit to the size of network analysis that can be analyzed using IRRICAD. For a branched system (no loops) with a single water supply, the limit for the number of pipes in the network will be described in IRRICAD Limits in Appendix A: IRRICAD Limits (Section 6.2). If loops or multiple water supplies are present, the number of pipes that can be handled within the limits of analysis is reduced. The more loops the fewer pipes that can be accepted. For this reason, highly looped systems may not be able to be analysed, even though the total number of pipes in the system does not exceed the stated limits.

If highly looped networks, which exceed the design limits, are to be analyzed, it is necessary to reduce, firstly, the number of loops and, secondly, the number of pipes in the system until analysis can be run. Taking out non-critical connecting pipes in loops and replacing secondary branched sections with demand points are possible ways to do this.

6.8 APPENDIX G: FITTING SELECTION DETAILS

This chapter explains the how and why of computer selection of fittings. Understanding these rules means it is possible to make IRRICAD select the types of fittings required in specific types of designs.

The number, the diameter and the type of pipes in any junction, and the angle at which those pipes enter the junction determine which fittings are required to make up that junction.

6.8.1 TWO PIPE JUNCTIONS

Two-pipe junctions can be broadly divided into two groups:

- Straight connections
- Connections with a change in angle

6.8.1.1 STRAIGHT CONNECTIONS

IRRICAD looks at the matching codes and diameters of the components that are required to be straight connected and searches the current database for one fitting which will make the connection so that the matching codes of the component and each end of the coupling are compatible. The pipe code must be the same, the gender must change, and the connection type must be the same. The diameters for each component in the joint must also be equal.

For example, consider the following:

Two pipes are to be joined, one 3" (80mm), one 4" (100mm). Both are PVC with a slip fit (glued).

Codes for the pipe are: PVC M S (4" / 100mm)
PVC M S (3" / 80mm)

The Pipe Fitting Matching table (*Design|Pipe Fitting Matching Table*) lists PVC fittings as being able to be connected to PVC pipe.

A suitable fitting (reducing socket) to join the above pipes could be:

Major diameter: 4" code PVC F S
Minor diameter: 3" code PVC F S

as a 4" PVC M S pipe fits into a 4" PVC F S end of fitting and a 3" PVC M S pipe fits into a 3" PVC F S end of fitting.

If a fitting cannot be found which directly solves the connection, IRRICAD tries two or three fittings to make the connection.

Where more than one solution to the junction can be found, IRRICAD chooses the arrangement that is cheapest.

6.8.1.2 Bent Connections

Bends can change diameter within a junction.

To join two pipes (or a pipe and component) meeting at an angle, IRRICAD first tries to fit a bend to the angle with a major and minor diameter equal to each of the pipe diameters in turn. If two bends can be found, the cheapest is chosen.

If a bend has been selected, the connection between the bend and each pipe (or other component) is treated as straight coupling.

If a single bend of either diameter cannot be found, IRRICAD tries two or three bends to make up the junction. The cheapest option is chosen. As with a single bend, the connection between any two components within the junction is treated as a straight connection.

Notes: *With any straight connection, a maximum of three fittings can be used.*

With any bent connection, a maximum of three elbows can be used.

This means for a bent two-pipe junction, up to 15 separate elements can be used to make up the junction.

During the selection of bends, gender is not taken in to account when making up the angles.

Having selected the bends required to satisfy an angle, the straight connection routines account for any gender changes or diameter changes within the junction.

6.8.2 THREE-PIPE JUNCTIONS

All three-pipe junctions use a tee (or saddle) and associated fittings to resolve the junction.

The method for selecting tees is:

1. Orient the tee in the most suitable position
2. Select the diameter of the tee
3. Add any bends if required
4. Resolve the straight connections within the junction

6.8.2.1 TEE ORIENTATION

Before any tee selections can be carried out, the orientation of the tee with respect to pipes in the junction is determined.

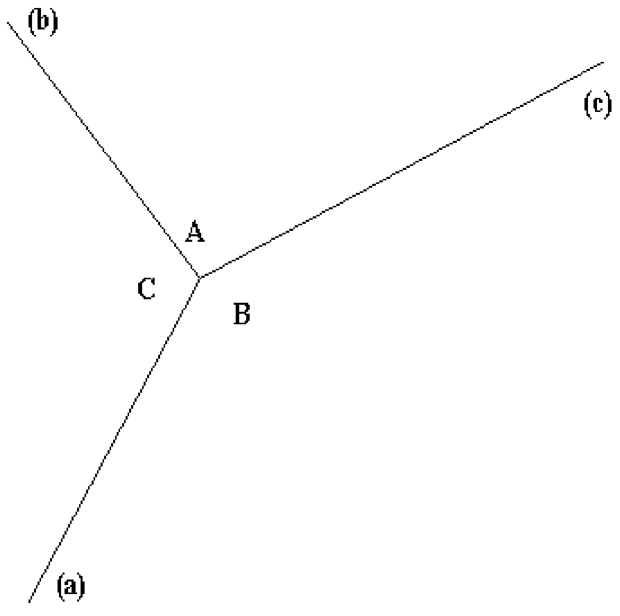


Figure 6-1

Major Axis

The major axis of the junction and hence the tee orientation is determined as follows:

IRRICAD determines the angles between the pipes entering the junction (Angles A, B, C above).

The largest angle determines the two pipes that could form the major axis. The remaining pipe forms the minor axis.

E.g.:

- Angle B is the largest, so the major axis will be aligned with either pipe (a) or pipe (c).
- If Angle A equals 90º, the major axis is aligned with pipe (c).
- If Angle C equals 90º, the major axis is aligned with pipe (a).
- If neither Angle A nor Angle C is 90º, the major axis is aligned with the shorter of pipes (a) and (c).

The reason for this is that it is more difficult to bend short pipes to accommodate angle changes than to bend long pipes.

6.8.2.2 Diameter Selection

Diameter selection is as follows:

1. All diameters equal

A plain tee of equivalent diameter is selected.

2. Major axis diameters equal, minor axis diameters different

Either a reducing tee, increasing tee or, if these are not available, a plain tee with diameter equal to the major axis diameters will be selected.

3. One major diameter and one minor diameter equal

A plain tee of major diameter is selected.

4. All pipe diameters different

The largest diameter in the junction sets the major axis diameter of the tee. If a reducing tee can be found to suit the reduction in minor axis diameter, it will be selected in preference to a plain tee of largest diameter.

If a tee diameter cannot be found to satisfy the above conditions, the costing reports will state that a solution to the junction cannot be found.

6.8.2.3 Additional Bends

The routines used for solving bends in two pipe junctions are now used to fit any bends.

At least one of the three branches of the tee will already be aligned with one pipe. If necessary, up to three bends can be used to resolve angles on either of the two remaining branches of the junction.

6.8.2.4 Straight Connections

Any straight connections (couplings) remaining after the tee has been chosen and bends added are now resolved to complete the junction.

Gender and connection types are matched and diameter reductions made if necessary.

6.8.3 Four-Pipe Junctions

The solution of fittings for four-pipe junctions depends on the entry angles of the pipes into the junction.

IRRICAD counts up the occurrences of near 90º angles in the junction to enable a decision to be made whether to use crosses or two tees.

If the number of near 90º entry angles is greater than two, then the remaining angle is also near 90º. A cross can be selected for this situation.

If there are any adjacent 90º entry angles, a cross can also be selected.

If either of the above two conditions does not hold, then two tees will be selected.

6.8.3.1 Crosses

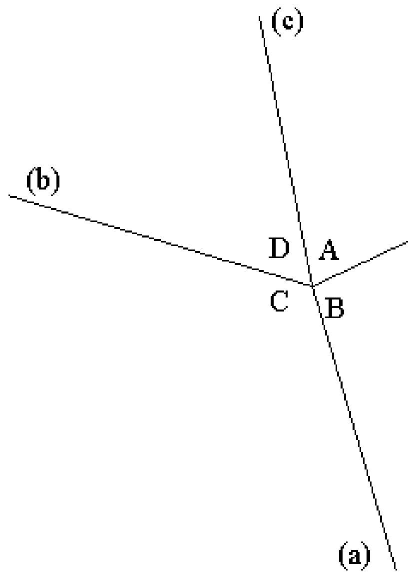


Figure 6-2

In the above example, two adjacent angles (A and B) are approximately 90º. A cross can be selected for this junction.

To determine the diameter of the cross, IRRICAD first finds the maximum diameter of pipes (a) and (c), and of (b) and (d).

A reducing cross of diameter equal to the maximum diameters of each axis can be selected. If a reducing cross is not available, a plain cross is selected with diameter equal to the maximum of the four-pipe diameters.

If a cross cannot be found, then two tees will be used in the junction.

Having selected a suitable cross, any remaining bends and diameter changes are resolved with the two-pipe junction routines.

6.8.3.2 Two Tees

When using two tees to solve a four-pipe junction, the following procedure is used.

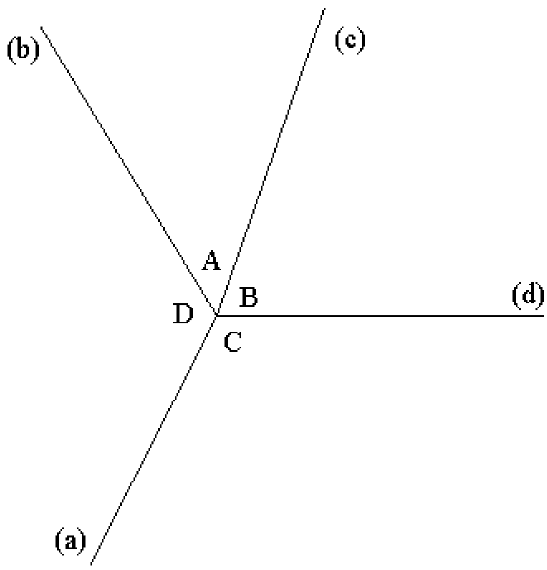


Figure 6-3

The junction is categorized into one of three possible groups, according to the following conditions:

- One of the angles is approximately 180º
- Two of the angles opposite each other are approximately 90º
- The junction does not fall into the above two groups

Group 1

If an angle is near 180º (for example, Angle D above), the major axis of the two tees as aligned with the average direction of the two pipes forming the near 180º bend (pipes (a) and (b) above).

Having positioned the major axis of the two tees, the three-pipe junction routines are used to resolve what are effectively two three-pipe junctions. The connection between the two tees is resolved with the straight coupler routines.

Group 2

If any two opposite angles are approximately 90º (i.e. in the above example if Angle C and Angle A were approximately 90º), one tee is aligned so that its major axis is in the same direction as pipe (b) with minor axis pipe (c). The other tee is aligned with pipe (d) with minor axis pipe (a).

Having fixed the major and minor axis for the two tees, the three-pipe junction routines are used to resolve two three-pipe junctions:

- Junction 1 major axis along pipe (b)
  minor axis of pipe (c) in general direction
- Junction 2 major axis along pipe (d)
  minor axis in general direction of pipe (a)

Two-pipe junction routines select the necessary bends and finally solve the diameter reductions, gender and connecting types.

The connection between the two tees is resolved as follows:

- The connecting side of one of the tees is assumed to be of male gender rather than female. This implies that a short section of pipe is fitted into the tee.
- Bends are then chosen to satisfy the angle between two tees.
- Finally, the straight coupler routines connect the bends to the two tees.

It is possible to get extra fittings in the junction when gender changes in the bend.

Group 3

If the junction does not fall into the above two categories, then angles A and B, and angles B and C are summed.

The total that is closest to 180º defines the two pipes that form the major axes of the two tees.

The major axes of the two tees are aligned with these two pipes.

The process to solve the junction is then the same as that used in Group 2.

6.8.4 FIVE-PIPE JUNCTION

Because a check during the drawing / input stage of a design prevents users from creating junctions that contain more than four pipes, there is no requirement for IRRICAD to resolve junctions containing five or more pipes.

6.8.5 ANGLE TOLERANCE

A tolerance is placed on angles to allow bends whose angle is close to the angle required for a junction to be used.

The angle tolerance is entered in *Design|Pipe Fitting Matching Table*. This tolerance can be set for each pipe type.

A bend can be selected for a junction if the required angle lies within the bend plus or minus the angle tolerance.

If pipe type differs in a two-pipe junction, IRRICAD uses the average of the tolerance set for each pipe as the allowable tolerance.

Angle tolerance can have quite an effect on the number of bends selected in a junction. Care therefore must be taken to ensure realistic tolerance values are entered in the Pipe Fitting Matching Table.

6.8.6 FITTINGS FOR VALVE-UNDER-HEAD SYSTEMS

Care must be taken in those special cases where a separate control valve and outlet are positioned together to form a valve-under-head system.

When the fitting selection routines encounter a control valve they assume the valve is part of a normal zone configuration and choose the fittings accordingly. For a valve-under-head system this results in the correct selection as long as the outlet is placed within a straight section of pipe. For outlets at the end of a pipe or located at the change of direction the appropriate bend to place the valve and outlet in the vertical position will not be selected.

Two solutions are possible. The first is to create an assembly using the appropriate control valve plus the necessary bend and fittings. This assembly is then selected for use at the appropriate locations in the design. Alternatively the required additional fittings can be added after fitting selection by using the [Show Fittings] button on a hydraulic dialog.

6.9 APPENDIX H: FORM OF THE EQUATIONS

This appendix lists the formula used in pressure / flow calculations.

The actual forms of the equations for the four types of components are described below. The units shown are those output by the *Curve Fit* utility (see Section 3.5.1) and used internally by IRRICAD in its calculations.

Pumps: $H = AQ^2 + BQ + C$

H – pump pressure (meters)
Q – pump flow (litres/sec)
A, B, C – constants

Outlet Flow: $Q = K\,H^n$

Q – outlet flow rate (litres/hour)
H – outlet pressure (meters)
K – constant
n – index or exponent

Outlet Radius: $R = K\,H^n$

R – wetted radius of outlet (meters)
H – outlet pressure (meters)
K – constant
n – index or exponent

Valves: $H = K\,Q^n + C$

H – pressure loss through valve (meters)
Q – valve flow (cubic meters/hour)
K – headloss equation constant
n – headloss equation index
C – intercept or start up head

6.10 APPENDIX I: KEYWORDS FOR LABELS AND PLOT TEMPLATES

6.10.1 LABEL KEYWORDS

Automatic labelling uses pre-programmed keywords to know which information to extract and place on the screen as text. These keywords are available in the dropdown list in the Label creator (*Settings|Labels*). For an explanation of what each keyword represents please see the table below:-

General Keywords	**Use**
#DEPTH#	Depth of object
#DEPTHUNIT#	Unit of Depth as per *Irricad Options|Units*
#DESC#	Description field from the database
#DIA1#	First diameter field from database (nominal for pipes /tapes, inlet, major etc.)
#DIA2#	Second diameter field from database (actual for pipes/tapes, outlet, minor etc.)
#DIAUNIT#	Current unit selected for diameters (mm, inch etc.)
#ELEV#	Elevation of item, applies to point items and contours only
#ELEVUNIT#	Current unit of elevation
#FITTINGS#	Lists the fittings selected for junctions, outlets, valves and misc. hydraulic items. The expansion of assemblies is controlled in a similar way to BOM/Costing reports. If the assembly usage code is Y or X then the assembly will be expanded, if “A” only the assembly description will be displayed.
#FITTINGSNOTAB#	As above, but in a non-tabbed format when left justification is used.
#FLUSHID#	The manifold ID. Label Tapes or Misc Hydraulic items with the assigned flushing manifold number. For physical manifolds, numbers are positive, e.g., 1,2,3, etc. For

	virtual manifolds, numbers are negative, e.g., -1, -2,-3, etc.
#HY_ELVCHG#	Elevation change in elevation units
#HY_ELVPCHG#	Elevation change in pressure units
#HY_FLOW#	Flow for zones items, control vlaves and mainline outlets
#HY_HL#	Head loss for zone items and mainline outlets. Show outlet connector loss when used on outlets
#HY_MAX_F#	Maximum flow out of all system flows
#HY_MAX_HL#	Maximum head loss out of all system flows
#HY_MAX_P#	Maximum pressure out of all system flows
#HY_MAX_PABS#	Maximum absolute pressure out of all system flows
#HY_MAX_STATP#	Maximum static pressure, from all systems flows, at mainline outlets or valves
#HY_MAX_V#	Maximum velocity out of all system flows
#HY_MIN_F#	Minimum flow out of all system flows
#HY_MIN_HL#	Minimum head loss out of all system flows
#HY_MIN_P#	Minimum pressure out of all system flows
#HY_MIN_PABS#	Minimum absolute pressure out of all system flows
#HY_MIN_STATP#	Minimum static pressure, from all systems flows, at mainline outlets or valves
#HY_MIN_V#	Minimum velocity out of all system flows
#HY_PRESS#	Pressure for Zone items. For Control valves this shows the required upstream pressure
#HY_PABS#	Absolute Pressure – gauge pressure + elevation for zone items. For Control valves this shows the required upstream absolute pressure
#HYN_MAX_F#	System flow # with maximum flow
#HYN_MAX_HL#	System flow # with maximum head loss
#HYN_MAX_P#	System flow # with maximum pressure
#HYN_MAX_STATP#	System flow # with maximum static pressure at mainline outlets or valves
#HYN_MAX_V#	System flow # with maximum velocity
#HYN_MIN_F#	System flow # with minimum flow
#HYN_MIN_HL#	System flow # with minimum head loss
#HYN_MIN_P#	System flow # with minimum pressure
#HYN_MIN_STATP#	System flow # with minimum static pressure at

	mainline outlets or valves
#HYN_MIN_V#	System flow # with minimum velocity
#LABEL#	Label field from database (for primary item)
#LENGTH#	2D length of item, applies only to pipes, tapes, wires
#LENGTH3D#	3D length of item, applies only to pipes, tapes, wires
#LENGTH;0.5#	Length (to nearest 0.5)
#LENUNIT#	Current unit of length
#NAME#	Zone or Water Supply name
#NOZDESC#	Nozzle description, applies to connected spraylines only
#NOZLABEL#	Nozzle label, applies to connected spraylines only
#NUMTREE#	The number of trees in a *Irricad Tools|Tree Block*.
#OUTDESC#	Outlet description, applies to connected spraylines only
#OUTLABEL#	Outlet label, applies to connected spraylines only
#OUTSPACE#	Outlet spacing in spraylines, sprayline blocks and Spray Irrigation Blocks
#POS_X1#	Start X Coordinate of any item
#POS_Y1#	Start Y Coordinate of any item
#POS_Z1#	Start Z Coordinate of any item
#POS_X2#	End X Coordinate – for pipes, tapes, spraylines, and wires
#POS_Y2#	End Y Coordinate – for pipes, tapes, spraylines, and wires
#POS_Z2#	End Z Coordinate – for pipes, tapes, spraylines, and wires
#PRESSUNIT#	Current pressure unit
#RISDESC#	Riser description, applies to connected spraylines only
#RISLABEL#	Riser label, applies to connected spraylines only
#ROLLS#	2D pipe lengths as a number of rolls based on the roll length of the pipe type in the Pipe Fitting Matching Table
#ROLLS3D#	3D pipe lengths as a number of rolls based on the roll length of the pipe type in the Pipe

	Fitting Matching Table
#ROLLS;1#	Rolls (to nearest 1)
#SCOPE#	Object Scope – Design + BOM, Design Only or BOM Only
#SHIFT#	Lists the system flows that the zone operates in
#TREEROWSPACE#	The spacing between tree rows in a *Irricad Tools|Tree Block*.
#TREESPACE#	The spacing between trees along a row in a *Irricad Tools|Tree Block*.
#TYPE#	Pipe type, applies to pipes and tapes only
#UID#	Internal unique ID for item
#USER#	Displays the entire contents of the User Attribute string.
#VELUNIT#	Velocity unit

Irrigation Block Entity Labels

Block Entity Keywords	**Use**
#ACTFLOW#	The flow for the block as calculated during the design process. If the design is incomplete, then the nominal flow is displayed
#APPLICATIONRATE#	Block application rate (intensity) - depth per hour. Based on the irrigated area.
#AREA#	Total plan area within block boundary
#AREAUNIT#	Current area unit
#DESC#	When used in a block displays the description of the Tape
#FLOWUNIT#	Current large (sys flow/zone) flow unit
#FLOW_VAR#	Block outlet flow variation (%) as per the Zone Design Summary report
#FLOWPERAREA#	The flow per unit area for the block
#GRPLATS#	Number of Laterals per Group
#GRPSPACE#	Group Spacing
#H2OQUANT#	Water requirements either volume or depth
#IRRAREA#	Normally the total length of laterals (2D) * lateral spacing unless "Crop Width" is other than 1
#LATSPACE#	Lateral spacing

#MAXEMITFLOW#	The maximum emitter flow in the block.
#MAXEMITPRESS#	The maximum emitter pressure in the block, from design
#MAXINTENS#	Maximum allowable intensity
#MAXLATHL#	Maximum lateral frictional headloss in the block
#MAXLATHLABS#	Maximum lateral absolute headloss (greatest pressure change) in the block
#MEANPRESS#	The mean tape inlet pressure in the block
#MINEMITFLOW#	The minimum emitter flow in the block.
#MINEMITPRESS#	The minimum emitter pressure in the block, from design
#NOMFLOW#	Block flow based on nominal SDR from database
#MINLATHL#	Minimum lateral frictional headloss in the block
#MINLATHLABS#	Minimum lateral absolute headloss (smallest pressure change) in the block
#NOMPRESS#	Nominal Inlet pressure of Tape laterals
#NUMEMIT#	Number of emitters in block
#NUMLAT#	Number of lateral segments
#NUMROW#	Number rows or laterals
#OUTDESC#	Outlet description for Spray Irrigation Blocks
#OUTLABEL#	Outlet label (from database) for Spray Irrigation Blocks
#PRESS_VAR#	Block outlet pressure variation (%) as per the Zone Design Summary report
#ROWSPACE#	The row spacing in the Block
#SUBMAINHL#	The frictional headloss in the block submain, from the valve to the last lateral. If the submain is branched then the headloss reported is that of the branch having the largest headloss
#TOTLATLEN#	Total 3D length of laterals (calculated with slope method)
#VALVEPRESS#	The calculated downstream pressure for the control valve attached to the block entity.

Note: that labels can also be created for individual laterals and sub-main segments that are part of a block.

User Attributes Key Words

To have the User Attributes displayed as labels on the plan, use the keywords listed below.

User Attributes Keywords	**Use**
#USER#	Displays the entire contents of the user attribute string.
#USER*n*#	Displays line *n* from the user attribute string (*n* is an integer).
#USER*<tag>*#	Displays tagged information from the user attribute string. Data should be tagged with XML style tags e.g., *<mytag>My data goes here</mytag>*. *tag* may be any string that excludes the characters <,>, and #.

How to use the Hydraulic Keywords

Keyword	Description	Mainline	Zone	Lateral	Control Valve	Outlets	Junction	Pipe	Comments
HY_ELVCHG	Elevation change.	Y	Y	Y				Y	Applies to both Zone and mainline pipes, connected spraylines and tapes. Will be 0.0 for any poin items.
HY_ELVPCHG	As above except in pressure units (e.g., kPa, psi etc.)	Y	Y	Y				Y	Applies to both Zone and mainline pipes,

									connected spraylines and tapes. Will be 0.0 for any poin items.
HY_FLOW	Flow for zone pipes, outlets, tapes, spraylines (inflow for tapes and spraylines)		Y	Y	Y	Y	y	Y	Doesn't really apply to mainline items although wi give flow fo control valves and outlets. Minimum or last flow is set for othe mainline items.
HY_HL	Headloss (friction only for pipes, tapes, Spraylines) for zone items.	*	Y	Y	Y	Y		Y	For outlets (mainline as well) this is the outlet connector loss.
HY_MAX_F	Maximum flow (i.e for all system flows) for mainline items	Y	y	y	Y	Y		Y	If used for Zone items this simply equates to HY_FLOW. Will show the "Total zone flow" for Control Valves and Mainline outlets.
HY_MAX_HL	Maximum (i.e for all system flows) headloss (friction only for pipes) for	Y	y	y	Y	Y		Y	For outlets this is the outlet connector

	mainline items.								loss. If used for Zone items this simply equates to HY_HL.
HY_MAX_P	Maximum (i.e for all system flows) gauge pressure for mainline items.	Y	y	y	Y	Y	Y	Y	For control valves this gives the resultant upstream pressure. For pipes both ends are considered. For point Zone items (not control valves) equates to HY_PRESS
HY_MAX_V	Maximum (i.e for all system flows) velocity for mainline pipes.	Y	y	y				Y	Will also work for zone pipes, tapes and spraylines (inlet velocity for tapes and spraylines)
HY_MIN_F	Minimum flow (i.e for all system flows) for mainline items	Y	y	y	Y	Y		Y	If used for Zone items this simply equates to HY_FLOW. Will show the "Total zone flow" for Control Valves and Mainline outlets.

HY_MIN_HL	Minimum (i.e for all system flows) headloss (friction only for pipes) for mainline items in current pressure units.	Y	y	y	Y	Y		Y	For outlets this is the outlet connector loss. If usec for Zone items this simply equates to HY_HL.
HY_MIN_P	Minimum (i.e for all system flows) gauge pressure for mainline items.	Y	y	y	Y	Y	Y	Y	For control valves this gives the resultant upstream pressure. For pipes both ends are considered. For point Zone items (not control valves) equates to HY_PRESS
HY_MIN_V	Minimum (i.e for all system flows) velocity for mainline pipes.	Y	y	y				Y	Will also work for zone pipes, tapes and spraylines (inlet velocity for tapes and spraylines)
HY_PRESS	Pressure for zone items. For control valves this shows the required upstream pressure		Y		Y	Y	Y		Doesn't really apply to other mainline items although wi get the minimum

									value if used.
HY_MAX_PABS	Maximum (i.e for all system flows) absolute pressure (gauge pressure + elevation) for mainline items.	Y	y	y	Y	Y	Y		For zone items this equates to HY_PABS
HY_MIN_PABS	Minimum (i.e for all system flows) absolute pressure (gauge pressure + elevation) for mainline items.	Y	y	y	Y	Y	Y		For zone items this equates to HY_PABS
HY_PABS	Absolute pressure (gauge pressure + elevation) for zone items. For control valves this shows the required upstream absolute pressure		Y		Y	Y	Y		Doesn't really apply to other mainline items although wi get the minimum value if used.
HYN_MAX_F	Number of the system flow in which the maximum flow occurs.	Y						Y	Doesn't apply to zone items will always be "1" if used.
HYN_MAX_HL	Number of the system flow in which the maximum headloss occurs.	Y						Y	Doesn't apply to zone items will always be "1" if used.
HYN_MAX_P	Number of the system flow in which the maximum pressure occurs.	Y					Y		Doesn't apply to zone items will always be "1" if

									used.
HYN_MAX_V	Number of the system flow in which the maximum velocity occurs.	Y						Y	Doesn't apply to zone items will always be "1" if used.
HYN_MIN_F	Number of the system flow in which the minimum flow occurs.	Y						Y	Doesn't apply to zone items will always be "1" if used.
HYN_MIN_HL	Number of the system flow in which the minimum headloss occurs.	Y						Y	Doesn't apply to zone items will always be "1" if used.
HYN_MIN_P	Number of the system flow in which the minimum pressure occurs.	Y					Y		Doesn't apply to zone items will always be "1" if used.
HYN_MIN_V	Number of the system flow in which the minimum velocity occurs.	Y						Y	Doesn't apply to zone items will always be "1" if used.
VALVEPRESS	For **Control Valves** and **Irrigation Blocks** only, displays the required/set **downstream** valve pressure.		Y		Y				

6.10.2 PLOT TEMPLATE

Template keywords can be entered and saved in the template by editing via the *Template|Edit Template* function.

Plot Template Keywords	**Use**
#FLAG# } #CONA# }	Company name - from *Settings|Company* - Company Formal Name
#NUMB#	Design name (.des file name)
#SCLE#	Plan scale (number only)
#SCAL#	Full US / Metric scale
#XDTE# } #DATE# }	Design date – from *Settings|Design Details* - Headings Date. Date is created when design is started
#CDAT#	Current date
# LDAT#	The current date in the Windows long date format.
#DESG# } #DESR# }	Designer – from *Settings|Miscellaneous* - Designer
#TITL#	Design title / site – from *Settings|Design Details* - Headings Site
#CLNT# } #CLNA# }	Client name – from *Settings|Client* - Client Name
#NOTE#	Design notes – from *Settings|Design Details* - Headings Notes / Comments
#BRCI#	Branch city – from *Settings|Company* - Branch City
#COAD#	Company address – from *Settings|Company* - Company Address
#COPH#	Company phone – from *Settings|Company* - Company Phone
#COFA#	Company fax – from *Settings|Company* - Company Fax
#JOAD#	Job address – from *Settings|Design Details* – Miscellaneous Job Address
#QNUM#	Quote number – from *Settings|Design Details* – Miscellaneous Quote Number
#DDES#	Design Details Description
#CLSN#	Client Details Short Name
#CLAD#	Client Details Address

#CLHP#	Client Details Home Phone
#CLPH#	Client Details Work Phone
#CLFA#	Client Details Fax
#CLCO#	Client Details Code (3 chars only)
#EDATE#	End Date
#SDATE#	Start Date
#ADATE#	Acceptance date
#REPCO#	Rep Code
#REPNM#	Rep Name
#LHRS#	Labor Hours
#MILE#	Mileage
#ICOST#	Installation Cost
#SIGNT#	Signitary
#SIGTL#	Signitary Title
#LCOST#	Labor Cost
#MCOST#	Mileage Cost
#TAXR#	Tax Rate
#COSN#	Company Short Name
#COLN#	Company Full Name
#BRCO#	Branch Code
#BRNM#	Branch Name
#BRPH#	Branch Phone
#BRFX#	Branch Fax
#BRAP#	Branch After Hours Phone
#BRCT#	Branch Contact

Redundant Keywords:

Redundant Keywords	Use
#COA1# } #COA2# } #COA3# }	Company address
#NOT1# } #NOT2# } #NOT3# } #NOT4# } #NOT5# }	Design notes
#DNUM#	Drawing number
#JOA1# } #JOA2# } #JOA3# }	Job address

6.11 APPENDIX J: INSTALLATION PROCEDURE FOR NETWORK OPERATION

Requirements

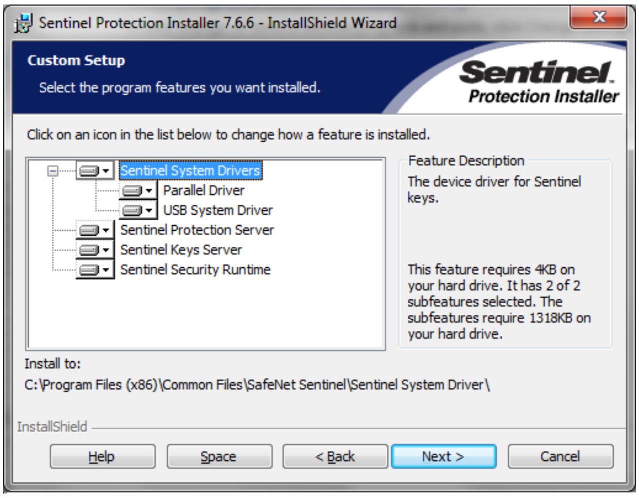
- Windows Network of computers.
- USB network version of the IRRICAD dongle.
- Access to www.IRRICAD.com to download the installation and patches, or a current installation CD.
- An internet connection for the duration of the installation process.

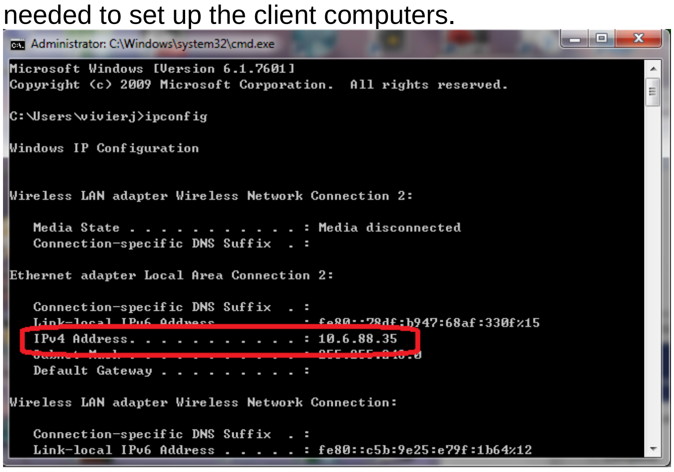
Install IRRICAD on the client computers

- Log in as Administrator and open an internet browser (for example Internet Explorer, or FireFox) and browse to an external website. This step is required for successful registration of the CAD Engine.
- Insert the IRRICAD CD or download the required installation and patch files to your hard disk or flash drive from http://www.irricad.com/irricadpro/irricad-software-upgrades.
- Run the installation process.
- After installation, run any available upgrade patches.

Install the dongle driver on the server or computer that the dongle is attached to

- Connect the USB IRRICAD dongle to the server or computer on the network.
- Download the latest Sentinel Protection Installer from http://www.irricad.com/irricad/download/Drivers/Rainbow/ and save to the hard disk or flash drive. Alternatively insert the IRRICAD CD and CANCEL out of the automatic installation process. Explore the CD to find the driver for the dongle. The file name and path should be as follows, the version number may change over time:- \Install\Sentinel Protection Installer 7.6.7.exe
- Run the Sentinel Protection Installer from the CD or where saved on the hard disk or flash drive.
- Select the option for Custom Install and ensure the USB System Driver and the Sentinel Protection Server are selected.

* 

* Click [No] on the important note about Windows Firewalls on the next screen when asked to modify these setting now.
* When the installation is complete, go to the command prompt by typing cmd in to the search programs and folders field and press the Enter key on the keyboard. Type ipconfig and press Enter to get the IP address of the server / computer. The IP address may be presented as "IPv4 Address". Write this down, it will be needed to set up the client computers.
* 

Direct the client computers to look at the server for the dongle.

Windows 7:-

* Click on Start then right click on Computer

- Click on Advanced system settings, the Advanced tab, then Environment variables
- Locate the variable NSP_HOST
- Edit the variable so the value is the IP address of the server.

Windows 8:

- Swipe to select Settings | PC Info.
- Click on Advanced system settings, the Advanced tab, then Environment Variables.
- Locate the variable NSP_HOST.
- Edit the variable so the value is the IP address of the server presenter's computer.

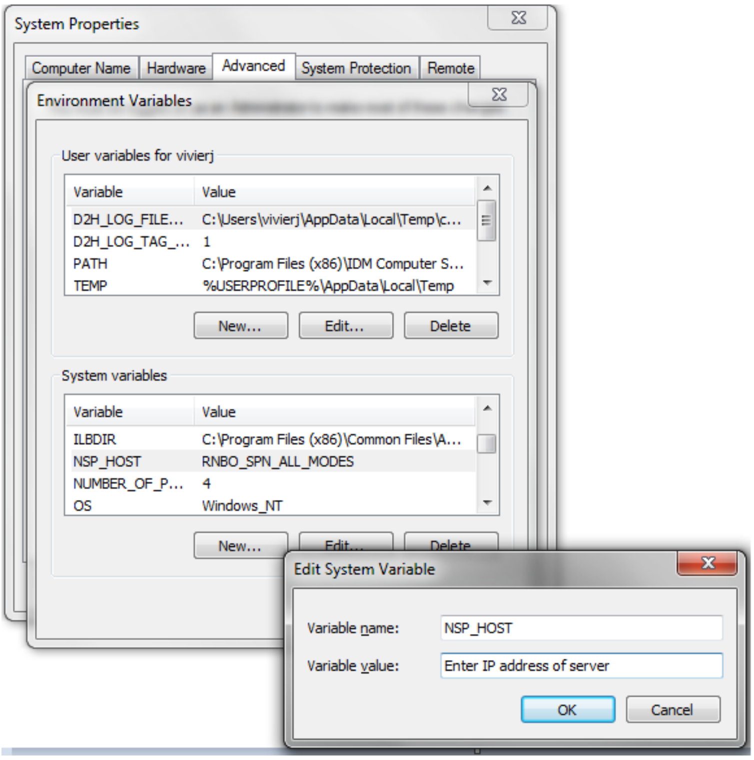


Figure 6-4

Create exceptions to the firewall on all computers

It is necessary to create exceptions to the Windows Firewall for the Sentinel driver. The firewall exceptions can be accessed via:

Windows 7:

- Go to Control Panel | System and Security | Windows Firewall
- Click on “Allow a program through Windows Firewall”.

Windows 8:

- Swipe and select Settings | Control Panel | System and Security | Windows Firewall
- Click on “Allow an app or feature program through Windows Firewall”.

On the computers that have IRRICAD installed check the Exceptions as shown in the image below for IRRICAD and the IRRICAD Database Editor.

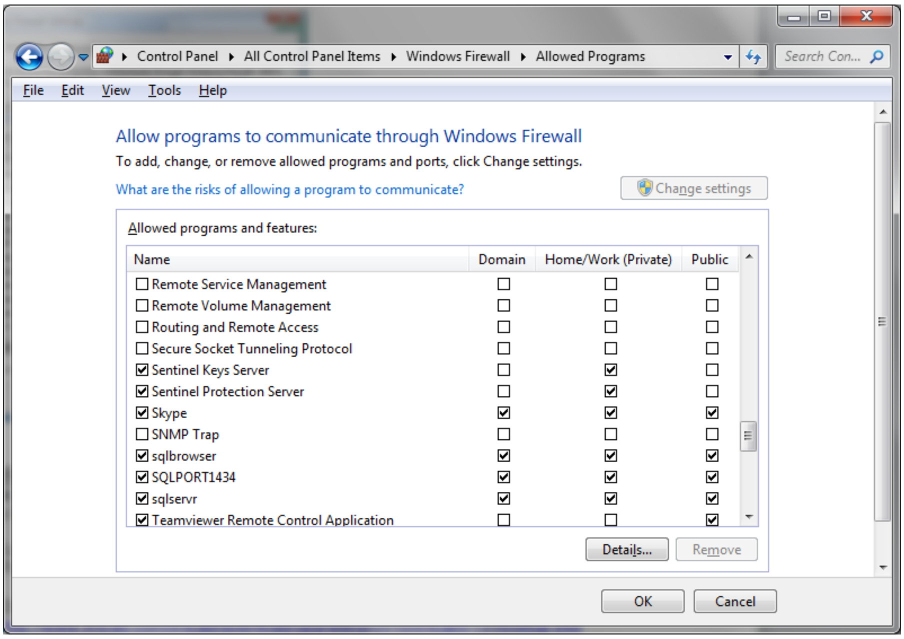


Figure 6-5

Run IRRICAD on a client computer

Test the installation by opening IRRICAD on several client computers. Note that each IRRICAD network dongle has a user limit coded into the dongle.

6.12 APPENDIX K: ABOS METHOD SETTINGS

Registry Parameters

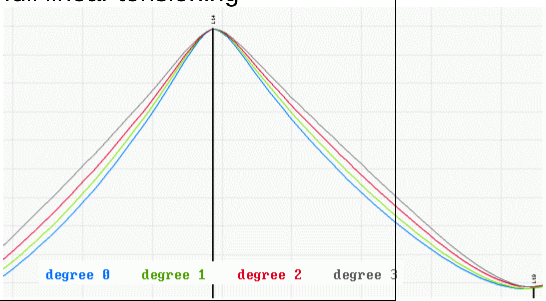
These are available in the registry to tweak the ABOS method.

HKEY_CURRENT_USER\Software\Lincoln Agritech Ltd\Irricad\SurgeParam			
Key	Values	Default	Description
FileName	string	surgein	These provide the base name for the input files to surgef.exe. The files can be found in the Irricad directory:- surgein.dta – a text file defining the xyz input points for the interpolation: 30.62016 72.07022 50.00000 1 86.27451 64.85408 49.00000 2 14.89968 15.61788 48.00000 3 81.31555 14.91108 47.00000 4 51.17419 33.84633 46.00000 5
Suffix	character	a	
Boundary	Y / N /C	N	A bounding envelope of points has (Y) / has not (N) been provided. If C is used, the boundary will be created as a convex envelope of input points. Up to 100 polyline boundaries can be defined in the surgein.HR file. surgein.HR is a text file that should be placed in the Irricad directory, each boundary is defined by an integer number

			of points, *n*, on the first line, followed by *n* lines of xy float data e.g.: 5 42.03890 59.33450 68.42004 52.51179 58.71664 21.58217 33.70004 26.73711 42.03890 59.33450 5 75.69760 57.66673 67.35873 14.75947 24.60309 20.21763 35.97427 66.00559 75.69760 57.66673
Boundary Scale	float	1.1	If a convex hull is defined above ('C'), this parameter defines how much the boundary is expanded outside the bounding points
Faults	Y / N	N	A set of discontinuities (faults) has (Y) / has not (N) been provided. Faults are lines that represent vertical discontinuities in the data (e.g., cliffs). Up to 1000 can be defined in the file surgein.ZL, a text file that should be placed in the Irricad directory. Each fault line is defined by two xy points on each line of the file: 39.76467 65.55075 35.51942 56.15057 35.51942 56.15057 35.51942 45.53746 35.51942 45.53746 38.24851 35.83406 38.24851 35.83406 45.82930 28.70812 45.82930 28.70812 54.92624 24.46287 54.92624 24.46287 67.05550 23.40156

AddPts	Y / N	N	A set of additional points has (Y) / has not (N) been provided. Additional points can be defined in the file surgein.DBa, a text file that should be placed in the Irricad directory. Each point is defined by xyz data on each line followed by the point number (following on from the point number in surgein.dta): 68.57166 59.94096 45.00000 ##6 74.78790 45.99231 45.00000 ##7 73.87821 31.74043 45.00000 ##8
Polylines	Y / N	N	A set of additional polylines has (Y) / has not (N) been provided. Surface features can be explicitly defined as polylines. There can be up to 300 spatial polylines containing up to 10000 points. Each endpoint of the polyline segment can have undefined value (1E29) or defined value (less than 1E29). There must be at least two defined values for each polyline - the remaining values are computed as soon as the digitization mode is finished. The polylines can be defined in the file surgein.LNa, a text file that should be placed in the Irricad directory. The first line for each polyline defines the number of source and internal points. Each subsequent line defines the xyz data for the Polyline:

			6 50 42.03890 62.36681 45.00000 39.30982 56.45380 45.00000 38.85497 48.26655 45.00000 39.30982 41.89868 46.00000 40.21951 36.44052 47.00000 42.94859 30.37589 48.00000 4 2 66.60065 62.06358 48.00000 75.09114 50.69240 48.00000 72.96851 40.68576 48.00000 66.14581 31.13397 48.00000
BasicPts	Y / N	Y	The input data is (Y) / is not (N) a set of basic points, defined in the surgein.gta file.
Filter	0-9999	0	The filter reduces the number of input points by averaging points that are closer to each other than the grid spacing. If the horizontal distance between two points $[X_i,Y_i,Z_i]$ and $[X_j,Y_j,Z_j]$ is greater than $\max\{(x_{max} - x_{min}),(y_{max} - y_{min})\}$ / *filter*, then these two points are replaced by one point $[X_k,Y_k,Z_k]$ with average coordinates $X_k = (X_i + X_j) / 2$, $Y_k = (Y_i + Y_j) / 2$ and $Z_k = (Z_i + Z_j) / 2$ The default value of 0 only eliminates input point with identical coordinates.
GridEnlar gement	5-99	99	This parameter allows the grid to be enlarged by the specified number of columns and rows. This improves the shape of the surface near the boundary. The value of the parameter should be set to approximately (i+j)/10 (where i and j are grid sizes). The default value of 99 causes

			surgef to estimate this internally.
GridX	0 / 5-5555	0	The number of grid steps in the x direction can be explicitly set with this parameter. The default value of 0 causes surgef to calculate this internally.
GridY	0 / 5-5555	0	The number of grid steps in the y direction can be explicitly set with this parameter. The default value of 0 causes surgef to calculate this internally.
Tensioning	0-3	1	This parameter specifies the degree of linear tensioning performed during the interpolation. It controls the 'sharpness' of the resulting surface. no linear tensioning medium linear tensioning strong linear tensioning full linear tensioning 
FastConvergence	0 / 1	1	Fast convergence on (1) or off (0) (generally reduces the number of iteration steps by 20-50%, but produces a smoother surface)
Accuracy	0-99	0.0	The target accuracy as a percentage of the Z range.

Smoothness	0-999.99	0.5	The smoothness of the resulting surface. Typical values are: 0.00 - 0.30 for smooth interpolation 0.40 - 0.60 for normal interpolation (default value is 0.50) 0.70 - 1.50 for sharp interpolation. The sharp / smooth model can be improved at local extremes by extending the smoothing parameter. This parameter can have two formats: number 0.00 - 9.99, which is equivalent to the above number 100.00 - 999.99, where the first two digits divided by 10 determine so called shape factor, which has an influence on the shape of surface surrounding sharp local extremes. The smallest value 1.0 means, the shape will not be changed and any greater value (1.1-9.9) means, the local extreme will be sharper. The remaining digits have the original meaning. If the smoothing parameter has the first format, the shape factor has the default value 1.0
SmoothingCycles	0-999.99	0	The number of smoothing cycles to be performed. The default value of 0 causes surgef to calculate this internally.
BlankBoundary	Y / N	N	Controls whether the grid should be blanked (Y) outside

			any defined boundaries.
NPFile	Y / N	N	Surface values for a finite difference model grid (requires model grid input file)
ASCIIGrid	Y / N	N	Output the calculated grid as an XYZ ASCII file (surgein.GRa).
XYInFile	Filenam e		Input file name specifying XY data. The format of the input file rows must be: X Y [any-text]
XYZOutFil e	filename		Output filename specifying XYZ data, as calculated by interpolating from the grid. XY data corresponds to the input as per XYInFile. The format of the output file rows is: X Y Z [any-text]

6.13 Screen Messages

This chapter looks at common reasons for problems, and explains the error and warning messages which appear on the screen.

6.13.1 Introduction

During the operation of IRRICAD it is possible that mistakes will be made or problems arise that cause warning messages to be displayed on the screen. Because of space limitations it is often not practical to display a detailed description of the problem, nor of the best course of action to remedy the situation. This section has been prepared to answer both of these questions.

Messages are displayed in a window that appears in the center of the screen. Figure AG1 shows a typical example.

Figure 6-6

For example the message in Figure 6-6, IDE_MAN_308: IDE applies to all screen messages and is therefore ignored, MAN indicates that the message has occurred in the management section; 308 is the message number. To seek help with the message look up MAN 308 in Error Messages, Section 6.13.3 in alphabetical order and then numerical order. The word in the top right corner is an internal name indicating the program module where the error occurred (this is no interest to the user but it is useful to the technical support person if help is sought. The actual message is in the center of the window. A button or two buttons informs the user as to the options available for continuing. These are usually [Yes], [No] or [OK] .

In some cases an additional error number might be displayed for example 6414 File not found in the body of the message. This is a program language error statement, rather than an IRRICAD message, and is of value to the support programmer only. The IRRICAD message number is still displayed at the top of the message.

> Note: *If a problem is encountered which cannot be resolved and support for contacted for help, please quote the message number and the program language error number if both occur.*

Problems can occur for many reasons but can roughly be classified into two groups:

- Those relating to opening, reading or writing to the various files that are used by IRRICAD.
- Those that are caused by performing tasks out of sequence or exceeding the limitations or capacity of the program itself.

Because difficulties with file operations are numerous in number and have very similar causes and solutions a special section is included to deal with these. This is followed by the main list of messages, their probable cause and suggested solution. For ease of use all the files handling messages are included in the main numerical list but the reader is referred to the appropriate part of the file handling section where this is appropriate.

6.13.2 IRRICAD FILE HANDLING MESSAGES

IRRICAD uses and generates a large number of files during the normal course of its operation. These files can be grouped into four categories:

- IRRICAD Program Files - The actual program files.
- IRRICAD Design Files - Files generated during the course of a particular design.
- IRRICAD Database Files - These contain details of all fittings, sprinklers etc. that IRRICAD can use.
- IRRICAD System Files - A small group of files used by the program to store definitions, menu text, graphic items etc.

The IRRICAD program resides in a number of files, all of which must be present for the program to run successfully. If IRRICAD is having trouble running, take note of any error messages that occur and contact the local technical support or Lincoln Agritech Ltd.

The files that are generated by IRRICAD during the course of a design, their file extension, and the location in IRRICAD where they are created are:-

File Type	File Extension	Created by:
Costing Error File	.CER	Fittings Selection
IRRICAD file	.DES	Running IRRICAD
Mainline Design File	.DML	*Design|Mainline*
Zone Design File	.DZN	*Design|Zone*
Internal Database File	.MDB	Running IRRICAD
System Flow File	.STN	Management / Water Supply
Visual CADD Objects File	.VCD	Running IRRICAD
Water Supply File	.WSP	*Mainline|Water Supply*
Zone File	.ZNE	Placing Zone items
Zone Time File	.ZTM	Management / Water Supply

The messages associated with these files include:

6.13.2.1 Difficulty Opening…File

Error numbers: 300, 320, 330, 335, 341, 418, 447, 500, 1112, 1124

The most likely causes of this message are:

- An attempt has been made to run a section of IRRICAD that requires the use of a file that has not yet been created. Return to the section of IRRICAD where the file is created and re-run the appropriate part of the program.
- The generated file is not present therefore re-run the appropriate part of the program.
- A sharing violation may be occurring where another process has got the file. Shut down all programs and restart the computer.
- If the file is present in the Irricad\Designs directory but the Difficulty Opening File message still occurs there is the possibility that the file has become corrupted in some way.

Delete the offending file and re-run the appropriate and subsequent sections of IRRICAD to generate a completely new version of the file.

- The files are Read Only or the temporary files created in the \Temp folder are Read Only. Change the properties of all files so they are no longer Read Only.
- There is not enough virtual memory available to allow the file to be used. If insufficient memory is available close all other programs, or increase the amount of Virtual memory available for use.

If none of the above options solve the problem take careful note of the warning error message, save the design files and contact the service agent or Lincoln Agritech Ltd.

6.13.2.2 DIFFICULTY READING…FILE

Message numbers: 301, 321, 331, 336, 342, 419, 448, 501, 1111, 1125

File reading problems can be caused by:

- The generated file is not present therefore re-run the appropriate part of the program.
- An attempt has been made to run a section of IRRICAD that requires the use of a file that has not yet been created. Return to the section of IRRICAD where the file is created and re-run the appropriate part of the program.
- If the file is present in the Irricad\Designs directory but the Difficulty Reading File message still occurs there is the possibility that the file has become corrupted in some way. Delete the offending file and re-run the appropriate and subsequent sections of IRRICAD to generate a completely new version of the file.
- There is a hardware fault. This is very unlikely and should be considered only after all other possibilities have been exhausted. Contact the service agent or Lincoln Agritech Ltd.

6.13.2.3 DIFFICULTY WRITING TO…FILE

Message numbers: 302, 322, 332, 337, 343, 420, 449, 502, 1117, 1126

The likely cause of this problem includes:

- The hard disk is full; that is, there is no more room to continue writing information to the hard disk. Delete unwanted files or transfer files to floppy disk.
- There is a hardware fault i.e. a faulty disk drive or a device not properly connected.
- The file has been made Read Only. Find the file in the Irricad\Designs directory and check the properties of the file by right clicking on it and selecting Properties. Make sure the Read Only check box is not checked.
- If the file is on a network drive and the network connection has been broken.

6.13.3 ERROR MESSAGES

CAD 2 : Cad error

Appears if a CAD error occurs with CAD error checking enabled (*Settings|Miscellaneous*).

CAD error checking is normally only enabled to help locate a problem in IRRICAD. Contact the local technical support.

CAD 3 : Cad initialization failed

The CAD engine in IRRICAD failed to initialize. Exit IRRICAD and restart. If the problem persists contact the local technical support.

CAD 4 : Problem in internal symbol table.

Vcadd file (header only) has been corrupted in some way. Save the design and reopen, if the message continues contact your technical support.

CAD 5 : Vcadd Dll missing - reinstall Irricad

One of the Vcadd dll files is either missing or cannot be loaded into memory. Restart. If this fails try Repair or Re-install IRRICAD.

CHECK LOCATION: Check %1, at =>%2

A problem has been identified at the recorded location. . Click the coordinates link to locate the junction and use [Show Fittings] to view the error.

CONVERT 2 : Cannot find assembly item

While converting an assembly from DOS IRRICAD databases, IRRICAD has failed to find one of its components. IRRICAD will attempt to make a new component in the Miscellaneous component group of the new database but check the item using the database editor.

CONVERT 3 : Old IRRICAD 5 format file must be converted to IRRICAD 6 format before Windows IRRICAD can convert it

Conversion can only handle IRRICAD Version 6 designs and symbol files. Convert Version 5 files to Version 6 before converting to IRRICAD Pro.

COORDS: At x,y = %1 x,y = %2

A problem has been identified at the recorded pipe or wire. Click the coordinates link to locate the item and use [Show Fittings] to view the error.

CST 219 : Second depth must be larger than first - please re-enter

Where editing the Riser Selection Rules (Design menu) Depth 1 must always be the smaller of the two depths and Depth 2 the larger.

CST 1100 : Nothing connected to object

An object is not connected to any other object. Either delete the object if it is not required or connect something to it.

CST 1101 : An item is not connected to the pipe system

A warning that a pipe or object has nothing connected to it at that particular location so fittings cannot be selected at that point.

CST 1102 : Number of items required to connect this object exceeds maximum limit

IRRICAD has a limit for the items, which can be selected to join objects at a junction (See Appendix A: IRRICAD Limits, Section 6.2). If this limit is exceeded it suggests that the user has attempted to connect several very dissimilar components and / or the database does not contain an appropriate selection of fittings for the type of components being used in the design. Check also that the connection types and diameters for the components concerned are correctly entered in the database.

CST 1103 : Fitting type for item does not exist

IRRICAD is trying to find a connection type to connect a junction to a junction. Normally these connections are removed as redundant junctions. If not, the error may occur. Check the output to see if the object is a valid one. If not, ignore the message.

CST 1104 : Unable to find required item in databases

Since an item was selected for use in the design, information pertaining to that item has been changed or deleted. Use *Tools|Change* to reselect the item.

CST 1105 : Non zone or mainline item connected to system

This error should only occur if for some reason IRRICAD has lost track of the correct connectivity among the components. Run Repair (*File|Repair*).

CST 1106 : More than two items connected to inline object

This error should only occur if for some reason IRRICAD has lost track of the correct connectivity among the components. Run Repair (*File|Repair*).

CST 1107 : More than the maximum number of fittings could be chosen

More than the number of possible fittings (see Appendix A: IRRICAD Limits, Section 6.2) to be used on a particular two pipe or two component connection within a band between the component diameters could be selected from the Coupler component group of the database. The first x items (where x is the limit) will be used. If likely items are further down the database, take the usage flag from some of the earlier items.

CST 1108 : No of database items exceeds limit, design too big to cost

The costing section of IRRICAD can deal with a maximum number of unique database items up to the limit set in Appendix A: IRRICAD Limits, Section 6.2 for any one design. If this limit is reached the design is too large to be costed. It may be possible to reduce the complexity of the design or break it into smaller sections for costing purposes.

CST 1109 : The maximum number of water supplies has been exceeded

A maximum number of water supplies are specified for any one design. Reduce the number used to the limit or less (Appendix A: IRRICAD Limits, Section 6.2).

CST 1110 : The maximum number of control valves has been exceeded

A maximum number of control valves, or zones, can be used in any one design (see Appendix A: IRRICAD Limits, Section 6.2).

CST 1111-1117 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

CST 1119 : Can only edit fittings (non-hydraulic items)

This message occurs if a user attempts to delete the original item in "Edit Fittings" in a *Change* dialog. Only fittings can be removed from the Fittings list. The hydraulic item cannot be changed in this dialog.

CST 1121 : Not all fittings loaded into memory, costing may be slowed

At the beginning of costing IRRICAD attempts to load the fittings data into memory to speed up this part of the program. If there is insufficient room to do this the costing process may take longer than normal.

CST 1122 : Two point objects connected. Unable to solve junction

This message indicates that more than one point object, e.g., misc. hydraulic item, outlet, etc has been placed at the same position. This usually results from an error when connecting items in the design. Because the two items are at the same location it is impossible to detect visually. Run Repair (*File|Repair*). If this fails to fix the problem, determine which zone the problem occurs in by watching the zone number displayed on the status bar while design is taking place. It is then a matter of examining each point object in turn until a location is found where two objects exist. Using selection cycling delete one and re-run design.

CST 1123 : Pipe to be computer sized has not been sized

Computer Selection of Fittings has been selected before Design has been completed and one or more computer sized pipes has been entered in the design. Fittings cannot be selected for junctions that involve pipes that have not been sized.

CST 1124-1126 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

CST 1127 : Invalid Connection, report may be incomplete - please run repair

An invalid connection exists in the design. Run *File|Repair*. If this does not resolve the issue, please contact the local support of Lincoln Agritech Ltd

DBS 1 : Internal database item not found in external database

Since an item was selected for use in the design, information pertaining to that item has been changed or deleted in the IRRICAD database. Click [OK] and select the changed item or an item to replace it from the list.

DBS 2 : Internal database item key changed

This message should not occur! Somehow the internal database has become corrupted. Contact the local technical support.

DBS 3 : Invalid database name

The file selected for conversion is not a valid DOS IRRICAD database. Repeat the command (*File|Convert|Database*) and select a DOS IRRICAD or IRRICAD database.

DBS 4 : Database could not be created

An IRRICAD database or design file could not be created. Take careful note of the reason given which should give some indication what action to take. Common reasons are disk full and sharing violation. If the disk is full make some space available by deleting some files. Exit IRRICAD and restart.

DBS 5 : Database exception error

Some problem has occurred with the IRRICAD database. Take careful note of the reason given and contact the local technical support if the problem is unable to be fixed.

DBS 6 : No items, or none enabled, in database

The database does not contain any items of the type required, or no items in the component group have been enabled. Run IRRICAD databases and change the usage flag to Y (or L, Z, M in the case of pipes or tapes).

DBS 7 : Assembly of itself detected. Please fix database

An assembly contains itself in the database. This can happen if the assembly has the same name and code as an item in database, usually the item is was created from. Find the assembly in question and remove the item of itself in the database by selecting the item in the assembly and deleting it. Rename the Assembly so that it differs from it main item and re-select the required item to be added to the assembly.

DBS 8 : Cannot open database for use because it is read only. Please check all files for the current design

The database is read only or it is being accessed on a CD. Copy from the CD on to the computer, or right-click on the file itself and uncheck the "Read Only" attribute. This applies to both the external database (i.e. working database) and internal database (i.e. the database with that design name).

DBS 9: No items in assembly – check database

This can only occur in old databases. Delete the empty assembly or add items to it via the Database Editor.

DBS 153 : Invalid supplier code entered

This error can occur when using the **Multiplier** "Default Pricing Type" (*Design Parameters|Economic Parameters*) and the "Supplier Code" for an item cannot be found in the table in the external database when trying to calculate the price. The external Database does not match the one used to create a design.

DBS 160 : No items in current assembly

The assembly cannot be saved without any items added to it. Select items to add to the assembly by clicking the [Add to Assembly] button after highlighting an item in the Database Editor.

DBS 166 : More than one different outlet in assembly

An outlet assembly can only contain one outlet. Remove any extra outlets in the Database Editor.

DBS 187 : Cannot find item in database

A pipe, outlet, valve or outlet connector has been used in the design and then subsequently modified or deleted from the database. IRRICAD can no longer find the object later in the design process. Re-run Design before opening reports.

Be very careful when modifying any of the databases to avoid deleting items which may later be wanted.

DBS 188 : Too many pipes enabled for use - only the first 40 loaded

The number of pipes with L, Z or M flags, i.e., pipes available for use is greater than that allowed.

IRRICAD will continue to run but the pipes listed in the database beyond the limit for the appropriate pipe type will not be used. To be sure that all valid pipes are considered in the design, reduce the number of pipes with L, Z or M codes to the limit allowed. See Appendix A: IRRICAD Limits, Section 6.2 for limits

DES 230 : Unable to rename file

If this message appears exit the program and check for a file called nnn.dzt in the \Irricad\Designs folder (where nnn is the name of the design currently being worked on). If this exists delete it and return to the program. If the problem is still present exit the program and delete the nnn.dzn file as well as the nnn.dzt file. Return to the program and repeat the design step. Note that all zones will need to be designed as all previous design information has now been deleted.

DES 300-302 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

DES 320-322 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

DES 324 : Data not entered for all irrigation areas

Water requirements or maximum precipitation rate data has not been entered for one or more irrigation areas.

DES 333 : More than max. number outlets on a branch within a zone

The pipe network for the zone cannot be interpreted due to its complexity.

The solution to this problem is to rearrange the pipe network layout for the zone so that the limit in any one branch within the zone is not exceeded. See Appendix A: IRRICAD Limits, Section 6.2.

DES 334 : Too many unique junctions and outlets in a zone

The number of different sprinklers / nozzle types used in a zone is such that the maximum number of unique junctions and outlets is exceeded.

Change the layout of the zone to reduce this number. See Appendix A: IRRICAD Limits, Section 6.2.

DES 400-402 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

DES 403 : Two outlets or outlet and valve connected at same position

An outlet has been directly connected to another outlet without a pipe connecting them. Although this is possible to do when drawing the design, it is regarded as an error in Design.

An outlet has been directly connected to a valve that is already connected to a zone pipe. Again this is possible to do when drawing the design; it is treated as an error in Design.

Delete the outlet. If the outlet is required at a position close to another outlet or valve, make sure that a small length of pipe is placed between the two items.

An outlet may be directly connected to a valve (as in a valve-in-head sprinkler, or a valve-under-head sprinkler) but objects other than mainline pipes cannot be connected to the valve.

DES 404 : The maximum number of pipe connections has been exceeded

The number of items in the zone has exceeded the limit. Reduce the number of items. If using spraylines enable the "Connected" option.

DES 405 : Two pipes connected without junction

This should not normally occur. Run Repair (*File|Repair*).

DES 406 : Two spraylines connected without junction

This should not normally occur. Run Repair (*File|Repair*).

DES 407 : Two control valves connected at the same position

A control valve has been directly connected to another control valve without an intermediate-connecting pipe.

Delete one of the valves, reposition it away from the remaining valve, and if required place a connecting mainline pipe between the two valves.

DES 408 : Invalid item detected in mainline

The mainline program has found an item that cannot be included in the analysis.

Run Repair (*File|Repair*).

If this does not solve the problem, the only solution is to delete and re-insert sections of the mainline until the error is removed. If the error persists save the design and contact the local agent or Lincoln Agritech Ltd.

DES 409 : Attempt to find location of non-point object

IRRICAD has tried to find the position of an object that does not have a point location.

Run Repair (*File|Repair*).

In some cases re-running management (Assigning Zone to System Flows…), particularly when more than one water supply is present, may solve this issue.

If this does not solve the problem, the only solution is to delete and re-insert sections of the design until the error is removed. If the error persists save the design and contact the local agent or Lincoln Agritech Ltd.

DES 410 : The maximum number of junctions has been exceeded

The number of junctions in the mainline exceeds the limit (see Appendix A: IRRICAD Limits, Section 6.2). Re-arrange the system so there are fewer junctions. If this restriction is a frequent limitation to the users's normal design work please contact the local agent or Lincoln Agritech Ltd.

DES 411 : Water supply pressure not specified in water supply data

The mainline analysis program cannot find a water supply pressure to use as a reference.

Select *Tools|Change* and highlight each water supply separately, checking to see supply has a pressure entered.

DES 412 : No water supply specified

A main water supply has not been entered. Enter at least one water supply. Mainline design cannot be completed without first defining a water supply.

DES 413 : Two water supplies directly connected in series

Two water supplies have been entered in series with a pipe connecting them directly together.

It is necessary to modify the situation so that an item other than a direct pipe linkage is present between the supplies, i.e. connect the second water supply via a tee on the mainline.

DES 414 : Zone Management has not been completed

Either zones have not been entered in the design or some zones have been turned off for processing in *Design|Zone Design Configuration* and their information has been lost. Ensure that that at least one zone has been entered (Mainline Outlets or Control Valves), turn all zones on for processing, complete zone management data entry (*Assign Zones…* or *Zone Operating Times*) and proceed to *Zone Design*.

DES 415 : Water supply data has changed - re-run Management / Design

This problem is most likely to occur if a design has been completed (or partially completed) and then some feature of the water supply (position, name, data etc) has been changed. It is necessary to re-run management (*Assign Zones…* or *Zone Operating Times*) before continuing with the design in this case.

If the problem persists delete the .management files associated with the design via *Design|Clear Management* abnd re-run management as described above.

DES 416 : Zone design has not been completed

Mainline design is being attempted before zone design has been successfully completed.

Make sure that zone design has been successfully completed before attempting mainline design.

DES 417 : No water supplies entered in Design Input

A water supply has not been entered. Enter at least one water supply (*Mainline|Water Supply*).

DES 418-420 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

DES 421 : Nozzle pressure outside specified operating range

The pressure at one or more outlets within a zone is outside the allowable pressure range for the outlet as defined in the database.

View *Reports|Zone Design Reports|Zone Design Full* to identify the location of outlets outside the range and the actual operating pressures of the outlets. If the pressure at these outlets is unacceptable, return to the IRRICAD screen to rectify the problem.

DES 422 : Zone design or analysis has not been completed

Zone design or zone analysis has not been completed because a problem has arisen during the pipe sizing process or analysis sections. Where pipe sizing is based on maximum allowable velocity, this error sometimes occurs because the maximum allowable velocity criteria cannot be achieved with the pipes enabled in the database.

The solution is to:

- Add larger pipes to the database
- Increase the allowable maximum velocity in Design|Design Parameters|Hydraulic Parameters
- Rearrange or reduce the size of the zone on the screen

DES 423 : Zone operating times not entered

Some zones have not had operating times entered for them in management. Return to *Design|Zone Operating Times* and enter the required information.

DES 424 : Insufficient pressure available for control valves

The pressure specified at the water supply is insufficient to provide the required pressure at the zone control valves with the current mainline pipe sizes.

Suggested solutions are:

- Reduce the required pressure at critical control valves
- Increase mainline pipe sizes to reduce the pressure loss to the valves
- Increase the water supply pressure

DES 425 : Water supply pressures / operating times not entered

When two or more water supplies are being used operating times and pressures for all water supplies must be entered. Return to *Design|Other Management|Water Supply Times* and enter operating times for all water supplies, or use Change on each water supply symbol to enter pressures for all water supplies.

DES 426 : Mainline analysis cannot be completed

The network analysis routines have not converged to a specific accuracy during zone analysis or mainline analysis.

Check the design reports to ensure that the resulting flows are acceptable (if strange flows are reported this indicates the analysis was not converging).

If the flows are reasonable but further accuracy is required, try increasing the maximum number of iterations in *Design|Design Parameters|Analysis Parameters*. If the system is not converging towards a solution, change the configuration of the pipe network slightly and re-run. If problems are still experienced contact the local agent or Lincoln Agritech Ltd.

DES 427 : No pipe size specified for analysis

Either zone analysis or mainline analysis has been selected while one or more pipes have not been sized, either by computer select or manually specified.

Select computer sizing, or manually specify unsized pipes using the change tool.

DES 428 : Max velocity criteria exceeded with available pipe sizes

The pipe sizes available from the database cannot meet the maximum velocity criteria specified for the design. The solution is to:

- Add larger pipes to the database

- Increase the allowable maximum velocity in *Design|Design Parameters|Hydraulic Parameters*
- Rearrange or reduce the size of the zone on the screen

DES 430 - 431 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

DES 432 : Control valve flow is outside valve specification

The flow through a control valve is outside the range specified by the minimum and maximum flow rate limits set in the database.

DES 433 : No outlets entered for a zone

A control valve has been entered but there are no outlets connected to it. Because this zone has no flow it cannot be designed. Add the missing outlets or delete the control valve.

DES 434 : Warnings issued during design process

During the actual design processes (zone and mainline design, etc) warning messages may occur if, for example, a valve or pipe pressure is outside its specified range etc. These messages only appear briefly and if the user is not watching the screen for the entire time they may be missed. This message will appear at the end of the relevant designs etc if any warnings have been issued. The user is advised to check the *View Errors* report and then the appropriate design reports to determine the exact nature of the problem.

DES 435 : Pipe pressure greater than maximum allowable pressure

Additional information listing the number of pipes and the zone number where the over pressure occurred will follow this message.

The cause of this problem is that the pressure calculated for a particular size pipe exceeds the maximum allowable pressure specified for that pipe in the database. It will be necessary to either select or enable pipe types of a higher pressure rating or modify the design to reduce the actual pipe pressures.

During sizing or analysis of very complex looped systems that contain more than one water supply point, three of these messages in particular may occur.

DES 436 : More than 2 pipes connected to Misc. hydraulic item

A Miscellaneous Hydraulic item is considered to have only two connection points, an inlet and an outlet. It cannot be used at a three-pipe junction. If a junction is required, shift the connection point a short distance from the hydraulic item.

DES 437 : Duplicate pipe detected in network

Two separate pipes have been used to connect the same pair of junctions. Run Repair (*File|Repair*). If the problem is still present it will be necessary, using selection cycling, to examine each pipe in turn until two are found in the same place. Delete one of the pipes.

DES 438 : Suitable pipes unavailable to size sprayline(s)

The range of pipe sizes enabled (or entered) as spraylines (Usage code L) is insufficient to allow one or more spraylines to be sized. Add more sprayline pipes to the database or enable more if they have already been entered.

DES 440 : Pipe velocity greater than maximum allowable velocity

One or more pipe sizes determined by the LP method or manually selected have resulted in flow velocities exceeding the limits specified in *Design|Design Parameters|Hydraulic Parameters*. The pipes in which this occurs and the actual velocities can be obtained from either the *Zone Design Full* or *Mainline Design Full* reports. If the high velocities are of concern it may be necessary for the designer to fix some of the critical pipe sizes in the design and then re-run pipe sizing to obtain the remaining sizes, or increase the pipe diameter when manually selected. Note that this action is likely to lead to some of the pressure limits not being met or failure of the LP method to find a solution.

DES 441 : LP pipe sizing failed - unbounded objective function

DES 442 : LP pipe sizing failed because of the constraints given

In general terms these messages indicate that the designer has set some constraints on the design in terms of flows and / or pressures which are impossible to meet. It is impossible to cover all the possibilities but likely problems include:

- specifying some pipe diameters which are too small or too big
- incorporating some high headloss Miscellaneous Hydraulic items
- not having a sufficient range of pipe sizes enabled in the database
- velocities too low, etc.

DES 443 : Upstream pressure is less than required downstream pressure

During the selection of candidate diameters used to set up the LP problem, a reverse hydraulic gradient was detected. This is most likely due to the designer specifying some hydraulic conditions (in terms of pressures and / or flows) which are impossible to meet. Things to look for include setting the maximum water supply pressure (or valve pressure) which is lower than the required outlet pressure (accounting for the variable flow variation), or placing outlets with widely different pressure requirements on the same lateral pipe, etc.

DES 444 : Difficulty opening temporary zone design file

DES 445 : Difficulty reading temporary zone design file

DES 446 : Difficulty renaming design file to temporary design file

Should any of these messages occur run *Design|Clear Management* and run management (*Assign Zone to System Flows*… options) and zone design again.

One cause of this message can also be that not all the zones are on for processing and IRRICAD has lost the previous information from the zones that are currently not being processed. Turn all zones on for processing in *Design|Zone Design Configuration* and re-run Zone Design.

DES 447-449 : Refer toIRRICAD File Handling Messages (Section 6.13.2)

DES 450-469 :

This group of messages relates to the program used to analyze zone and mainline pipe systems. Trouble shooting in this area is very difficult but in the unlikely event of problems arising the following steps are suggested:

- Check there is nothing unusual about the water supplies, especially for messages 451 and 452. Delete and re-enter the water supplies and re-enter the water supply data in *Design|Other Management|Water Supply Times* if more than one is present. Re-run Management (*Zone Operating Times* or *Assign Zones…*).
- Check for impossible design situations. These include:

The water supply is not connected to the mainline
One or more zone control valves are not connected to the mainline
The zone control valves are not all directly connected to the water supply through the mainline system, i.e. two distinct sections of mainline exist.

DES 451 : Root node out of range

This is usually caused by an error in specifying water supply pressures, particularly with multiple supplies. As a first step, check the water supply data has been entered correctly by using Change on each water supply symbol. Re-run Management (*Zone Operating Times* or *Assign Zones…*) and then *Design*. If the problem persists delete one or more of the water supplies. Successively re-position them, give them a different name to prevent possible confusion with previous supplies, and re-run Management (*Zone Operating Times* or *Assign Zones…*) and *Design* after the addition of each water supply.

If the error occurs during zone design, rerun management. This error can also be caused by loops of pipe in the zone.

This error can occur also when a flush valve has been manually placed on the flushing manifold where a tape end also connects.

DES 452 : Reference node out of range

This means that the pipe system cannot be analyzed because the limits set within IRRICAD have been exceeded. The number of loops rather than the number of pipes in the network primarily determine whether the limits will be exceeded. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 453 : Out of array space for pipes

This means that the pipe system cannot be analyzed because the limits set within IRRICAD have been exceeded. The number of loops rather than the number of pipes in the network primarily determine whether the limits will be exceeded. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply.

Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 454 : Out of space in 1st permutation vector

This means that the pipe system cannot be analyzed because the limits set within IRRICAD have been exceeded. The number of loops rather than the number of pipes in the network primarily determine whether the limits will be exceeded. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 455 : Difficulty solving linear system

This means that the pipe system cannot be analyzed because the limits set within IRRICAD have been exceeded. The number of loops rather than the number of pipes in the network primarily determine whether the limits will be exceeded. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 456 : Too many elements for Ra

This means that the pipe system cannot be analyzed because the limits set within IRRICAD have been exceeded. The number of loops rather than the number of pipes in the network primarily determine whether the limits will be exceeded. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 457 : Too many elements for Rb

This means that the pipe system cannot be analyzed because the limits set within IRRICAD have been exceeded. The number of loops rather than the number of pipes in the network primarily determine whether the limits will be exceeded. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 458 : Matrix element lies outside of F & G

Zone control valves not connected to a water supply usually causes this message. To check run *Design|Check Outlet Connectivity*. This will identify any problems of this nature. If all valves are connected to at least one water supply, try changing the configuration of the system, or manually specifying some pipe sizes.

If any of the above messages occur and the reason for the problem cannot be found, save the design and contact the local agent or Lincoln Agritech Ltd.

DES 459 : No elements in row of F

Zone control valves not connected to a water supply usually causes this message. To check run *Design|Check Outlet Connectivity*. This will identify any problems of this nature. If all valves are connected to at least one water supply, try changing the configuration of the system, or manually specifying some pipe sizes. Check the management to ensure the valves are connected to the water supply specified to operate that system flow.

If any of the above messages occur and the reason for the problem cannot be found, save the design and contact the local agent or Lincoln Agritech Ltd.

DES 460 : Some elements of matrix A lost !

Re-run Management before re-trying *Design*. If problem persists, please contact the local agent or Lincoln Agritech Ltd.

DES 461 : Insufficient storage in EXT1 matrix

If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 462 : Storage for C exceeded in F & G

If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 463 : Invalid reference node: using ref. head = 0.0

Re-run Management before re-trying *Design*. If problem persists, please contact the local agent or Lincoln Agritech Ltd.

DES 464 : Different number of elements in C transpose

Re-run Management before re-trying *Design*. If problem persists, please contact the local agent or Lincoln Agritech Ltd.

DES 465 : Insufficient storage available for EXT2 - refer to manual

If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 466 : NETSOLV ended with fatal error - refer to manual

Re-run Management before re-trying *Design*. If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included. If problem persists, please contact the local agent or Lincoln Agritech Ltd.

DES 467 : Error in connectivity matrix - refer to manual

Re-run Management before re-trying *Design*. If problem persists, please contact the local agent or Lincoln Agritech Ltd.

DES 468 : No reference node specified, using main supply

Re-run Management before re-trying *Design*. If problem persists, please contact the local agent or Lincoln Agritech Ltd.

DES 469 : Circular queue is full

If the above messages occur, change the configuration of the system by removing pipes to reduce the number of loops until the system can be analyzed. Also consider reducing the number of water supply points in the system to a single supply. Successively add water supplies or loops until the limit is again reached. Trial and error will be required to determine which loops or water supplies can be included.

DES 470 : Couldn't find pipe in design file

If this message appears it is likely that the design files have become corrupted. Exit from IRRICAD and delete the mainline or zone design file in the \Irricad\Designs folder (nnn.dml or nnn.dzn), return to IRRICAD and re-run design again (where nnn = the current design name).

DES 471 : Storage available for MAXY exceeded - refer to Manual

The size of MAXY depends on the complexity of the design configuration, which is the number of pipes in the design and the number of closed loops. Unfortunately there is not simple rule which can be used to determine this value beforehand as it is virtually design specific. Reduce the number of pipes or loops in the design and try again.

If the user is analyzing a flushing main (see How to Simulate Tapes Using Spraylines, Section 2.9.2), combine multiple spraylines into one to reduce the number of loops (see Modeling Multiple Driplines as a Single Line, Section 2.9.4).

DES 472 : Network imbalance in pressure or flow - refer to Manual

The system is too complex for IRRICAD to handle. Try reducing the number of loops, the number of water supplies and / or the number of pipes in the network.

In some instances the network imbalance is minimal and can be ignored. Check the *Design Full* report. Decreasing the "Mainline analysis factor” in *Design|Design Parameters* – Analysis Parameters can remove these differences.

DES 473 : Valve / WS pressure not specified for detailed analysis

In order to use the Detailed Analysis options a Valve pressure must be specified for each zone control valve for zone design (*Design|Zone Design Configuration*) and a water supply pressure must be specified for each water supply for mainline design (use change on the water supply symbol).

DES 475 : Pipe has zero diameter or HW constant - please check

A pipe has been entered or edited in the database so that the pipe actual diameter or the Hazen-Williams Pipe Roughness C factor has been entered as 0. Run the Database Editor and rectify for the pipe used in the design.

DES 476 : Maximum number of iterations exceeded, detailed analysis

Detailed analysis uses an iteration method to determine actual flows and pressures. This message indicates one of two things:

The calculations were not completed to the accuracy required. Try increasing the number of maximum iterations or increasing the “Detailed Analysis Flow Close Fraction” in *Design|Design Parameters|Analysis Parameters*.

The network analysis routines have not converged to a specific accuracy. If strange flows are reported in the *Design Reports* this indicates the analysis was not converging towards a solution. Change the configuration of the pipe network slightly and re-run. If problems are still experienced contact the local agent or Lincoln Agritech Ltd.

DES 479 : Two contours coincide. Using average elevation

Two contour lines or spot heights cross or are at the same position. The average of the two heights will be used.

DES 480 : No elevation for point, setting to 0.0 - refer to manual

An elevation for a point in the design could not be determined. Check that contour lines and spot heights have been entered correctly and span the entire deign. The user may have to enter more contours.

Re-interpolate Elevations (in the *Design* menu) to try to solve the problem.

DES 481 : Insufficient contour or height info to calculate elevation

A warning to say that an item is either outside of all the contour lines and spot heights or that it is too far away from the contours line or point, its elevation may be set to zero. If this occurs, add more contour lines, estimated if necessary, until no elevations are set to zero.

DES 482 : Re-interpolate elevations if pipe slope lengths required

The design is using elevations but a particular pipe has been found with no associated elevation data. This could arise if extra pipes and / or height data have been added to a design and the re-interpolate option has not been used. Run *Design|Re-interpolate Elevations*.

DES 483 : Water supply flow exceeded. Rezone or increase WS flow

The flow required by the system as designed exceeds that available from the water supply. Either increase the water supply flow (if possible) or re-arrange the zone layout to reduce the system flow.

DES 484 : Too many contour line segments. Some contours ignored

A maximum of 4000 line segments may be used to define contour lines. If more than this number is entered there will be some loss of elevation information over part of the design area.

DES 485 : System flow (zone valve or outlet) not connected to Mainline

Either a zone valve or a VIH outlet is not connected to the mainline system but is listed in the Management option (Zone Operating Times or Assign Zones…). Make the necessary connection in the system or go into Management (*Zone Operating Times* or *Assign Zones…*) and reduce the number of system flows accordingly.

This message may also occur if one of the water supplies is not connected to the system. Check the water supply connections.

DES 486 : Tape inlet pressure outside required range

The minimum submain pressure specified for a pressure-regulated tape or dripline has not been met.

Check pipe reports to determine the extent of the variation. If LP has been used for the design, the differences should only be small (due to the selection of the smaller of the two possible diameters for a given pipe segment. If the velocity method has been used and the error is large it will be necessary to adjust the zone pipe velocity in *Design|Design Parameters|Hydraulic Parameters*.

DES 487 : Branches or bends in tapes or driplines are not allowed

Tape designs can only be done on single, straight tapes that do not have any other pipes or outlets attached to them.

Make the necessary changes to the tape identified (note that only one end of the tape will be listed, the problem however may be anywhere along this tape).

DES 488 : Tape pressure outside the specified operating range

The pressure in one or more tapes is outside the allowable pressure range specified in the database. (This message refers to the tape operating pressure not the absolute pressure limit of the tape).

DES 489 : Tape pressure range cannot be met for conditions given

The combination of tape length and elevation changes is such that the allowable pressure range specified for the tape in the database is exceeded. Check that the input data is correct and that the specified tape pressure range is realistic. If the user wants to see how far out of range the pressures are likely to be, use the Velocity option to design the zone.

DES 490 : Valve pressure set < = specified minimum submain pressure

A pressure compensated tape has been used in a zone and the minimum submain pressure set. The zone valve pressure has then been set at a value less than this minimum pressure. The zone valve pressure must be greater than the minimum submain pressure.

DES 491 : Two different minimum submain pressures have been specified

Two tapes with pressure controlled inlets have been used in a given zone and minimum submain pressure for each is different. The minimum submain pressure for PC tapes must be the same throughout a zone.

DES 492 : Pump flow rate outside specification limits

The flow through one or more of the pumps in the design is outside the range for the pump as specified in the database. Check the validity of the pump selection for the actual flows in the design.

DES 493 : Pump head near zero, check pump choice & water supply head

During the network analysis, the flow through a pump is such that the required pump head is close to zero. The network analysis may fail under these conditions. Check the pump selected has the right characteristics for the expected duty, and that the water supply pressure is correctly specified.

DES 494 : Only five pumps are permitted in any looped system

A maximum of 5 pumps is allowed in a looped system. If more than 5 pumps are encountered, the above message is given, and *Design* terminated.

DES 495 : Available heads across PRV not enough for proper regulation

There is insufficient head across one or more PRVs to ensure their proper operation, i.e. the required downstream pressure cannot be achieved. Check pressure settings for any upstream PRVs and the valve or water supply pressure (if set).

DES 496 : DO NOT use PRVs in loops or with multiple water supplies

Make sure PRVs are not placed in the looped section of a design. If used in loops, the design will either fail or the results will be incorrect. PRVs may be used in designs containing loops, but only in branching sections.

DES 498 : Negative pressure in pipes detected - PLEASE CHECK REPORTS

One or more node pressures have been found which are below zero. The pipes with negative pressures are indicated with a '-' in the RHS column of the zone or mainline pipe report. Increase the zone valve pressure (*Design|Zone Design Configuration*) or water supply pressure by an amount equal to the most negative pressure and re-analyze to ensure all node pressures are positive.

<u>Note</u>: that pressures may be negative on the suction side of pumps. This is acceptable provided the negative pressure does not exceed 19-23ft (6-7m).

DES 499 : Tapes must not be connected directly to control valves

Tapes must not be connected directly to control valves. Make sure that there is a piece of zone pipe between any control valve and a tape or dripline.

DES 500-502 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

DES 550 : Maximum number of pipes exceeded for Demo version

The Demo version has a limitation in the number of pipes that can be used in a design. Delete pipes or decrease the number of spraylines in the design and try Design again.

DES 551 : Constraint counts don't match in input data to LP solver

DES 552 : Negative values appear in LHS of array passed to LP solver

Both these messages indicate that the data passed to the Linear Program solver has been corrupted in some way. Re-running *Design* may overcome the problem, but if it still occurs please save your design and contact the local agent or Lincoln Agritech Ltd. The user should be able to complete the design using the *Velocity* option.

DES 553 : Maximum number of iterations for LP exceeded

For the particular design configuration the Linear Program solver is not converging towards a solution. It will be necessary to either use the Velocity option or to change the design layout in some way. If this problem does occur please save the design details and contact the local agent or Lincoln Agritech Ltd.

DES 554 : Only use LP with single water supplies and branched systems

At present the LP pipe-sizing method in use can only handle branched (i.e. no loops in the pipe network) systems with single water supplies.

For multiple water supplies or looped systems use the Velocity option.

DES 555 : Your system is too big to use LP pipe sizing

Available memory limits the size of the design problem that can be solved using the LP method. It is difficult to give guidance on the size of the system that can be handled because it is dependent on a number of factors relating to the configuration, number of pipe sizes enabled, etc. Note that spraylines contribute far less to the size of the problem compared to a similar number of discrete pipes and outlets. Another option is to increase the amount of Virtual Memory available on the machine.

DES 556 : Large enough pipe not enabled - LP may not achieve solution

Prior to performing the LP analysis, IRRICAD selects a range of candidate diameters. During this process the program wanted to choose a diameter larger than the largest pipe enabled in the database. If the user continue it is likely that the program will find a solution. There is a possibility, however, that the LP solver will fail. If this occurs, enable (or add) a larger pipe size in the database and re-run *Design*.

DES 557 : Iterations exceeded - tape probably too long - flow set to 0

This message can mean that the tape runs are too long. Decrease the length of the tapes and re-run design.

DES 558 : Headloss too high:- fixed pipe sizes or PRV etc, too small

A fixed diameter pipe (either user specified, or fixed due to pipes flagged in the database if computer selected), or a Miscellaneous Hydraulic item (e.g., PRV) has a pressure loss which is too high to allow the required maximum or minimum heads at the outlets to be met. If manually fixed, increase the diameter of the pipe at the indicated location. If computer sized, make larger pipes available in the database.

DES 559 : User selected pipe diameter too large - headloss too low

A fixed diameter pipe (either user specified, or fixed due to pipes flagged in the database if computer selected), or a Miscellaneous Hydraulic item (e.g., PRV) has a pressure loss which is too low to allow the required maximum or minimum heads at the outlets to be met. If manually fixed, reduce the diameter of the pipe at the location given or change the pipe to computer selected.

DES 560 : Zero pipe diameter detected during velocity check

This message should rarely occur as it indicates that one of the design files has become corrupt. Please save the design to floppy disk and call the local agent or Lincoln Agritech Ltd.

DES 561 : No pipe sizes have been enabled for:-

During *Design*, IRRICAD is trying to size pipes of the indicated type (zone, sprayline or mainline) but no pipes of this type have been enabled in the database. Run the Database Editor and in the Pipe tab, make sure pipes of the appropriate type are flagged for use.

DES 562 : Solution not found - fixed pipe sizes too big in path:-

This message indicates the LP analysis was unable to find a design solution that meets both the pressure requirements at the outlets and the pipe velocity limits set in *Design|Design Parameters|Hydraulic Parameters*, using the pipe sizes available. The analysis indicates that a likely reason is that some of the pipes in the path indicated by the coordinates given have been fixed in diameter and are too large. This could be because small enough pipes (of the correct usage) have not been enabled in the database, or the user has selected a pipe in the design that is too big, or because the pipe size has been limited by the velocity specified in *Design|Design Parameters|Hydraulic Parameters*. Check for any manually specified pipe sizes first. If there are none or they are suitable, check the Database and make sure an appropriate range of sizes have been flagged as available with the correct usage flag.

If the design still fails with this message try increasing (temporarily) the velocity limit in *Design|Design Parameters|Hydraulic Parameters* until the zone or mainline section will design. Check the *Zone Design Full* report to see what actual velocities resulted and if necessary return to the IRRICAD screen and fix the diameters of the offending pipes manually and then run *Analyse* to determine the effects of these changes on the pressure distribution.

DES 563 : Solution not found - fixed pipe sizes too small in path:-

This message indicates the LP analysis was unable to find a design solution that meets both the pressure requirements at the outlets and the pipe velocity limits set in *Design|Design Parameters|Hydraulic Parameters*, using the pipe sizes available. The analysis indicates that a likely reason is that some of the pipes in the path indicated by the coordinates given have been fixed in diameter and are too small. This could be because large enough pipes (of the correct usage) have not been enabled in the database, or the user has selected a pipe in the design that is too small. Check the Database and enable some larger pipes with the appropriate usage flag.

DES 564 : Invalid outlet data, Pmax less than Pmin, re-select outlet

IRRICAD has detected inconsistent data for the minimum and maximum allowable pressures for a nozzle. This could be an error in the database or some other problem. Check the pressures of the nozzle for the outlet, and if OK, go back to the IRRICAD screen and re-select the outlet.

DES 565 : Not enough memory for LP sizing

Close all other programs that are currently running and / or increase Virtual memory.

DES 566 : Insufficient contour or height info to calculate elevation for some points. Please check the error log

The elevation information does not span the hydraulic items or the elevation data is not rectangular. Check the hydraulic items are spanned by the elevation information. The location of these points will be reported in the error log.

DES 567: Could not set the elevation for items. THIS MAY CAUSE SEVERE ERRORS IN PRESSURE AND FLOW CALCULATIONS. Please check the error log for details.

This warning will occur if there is insufficient elevation data, typically due to the elevation data not covering the extents of the hydraulic design. Either add more elevation data or check the elevation assigned to the items to ensure that a reasonable elevation has been assigned.

DES 600 : Make sure Pumps are NOT placed within loops - PLEASE CHECK

A warning to say that the presence of both pumps and loops in the system has been detected. If pumps are included within a looped system, the analysis will fail or the results will be in error. Make sure pumps are placed only in the branched sections of a design.

DES 601 : Design incomplete. Please fix problems before proceeding

The IRRICAD design module has failed to complete design. Note the reasons given and fix the problems. If the problem persists contact your technical support.

DES 602 : Pressure too low to operate PRV. No adjustments made

The water supply pressure is not high enough to maintain at least one PRV in the zone at a pressure sufficient to operate correctly. Increase the water supply pressure or change or adjust the PRV. When this problem occurs, the pressures throughout the zone are not adjusted.

DES 603 : No zones with flow found in any system flows. Possibly re-run management

Run *Design|Check Outlet Connectivity* and then re-run Management before running Design.

DES 604 : Warning no Water Supply specified for System Flow

Occurs when more than one water supply is present but no water supply has been selected for a system flow. Go back into Management and assign the water supplies to the appropriate system flows.

DES 605 : Could not interpolate elevations. Please check error log file

Currently not used.

DES_606: Valve pressure not specified for flushing analysis.

In order to analyze under flushing conditions set the valve pressure for the zone in *Zone Design Configuration* "D/S Valve Pressure" column.

DES_607: Zone was marked for flushing but this was ignored for a Design run.

The zones have been marked for flushing in the *Zone Design Configuration*. However flushing analysis cannot be undertaken when designing the system, the flushing flag has been ignored.

DES_608: Tape end velocity insufficeint.

Based on the set valve pressure and assumed back pressure the end velocity is below the required velocity.

DIG 1 : Tablet X and Y scales are not the same, tablet not enabled

Use Control panel Tablet settings to set the x and y scales the same or contact your technical support.

DIG 2 : Unable to open default tablet context, tablet not enabled

Turn off your computer and restart. Check the digitizer is working.

Contact your technical support.

DIG 3 : Unable to open tablet context, tablet not enabled

Turn off your computer and restart. Check the digitizer is working.

Contact your technical support.

DIG 4 : No tablet scale entered, use Scale or Reference first

Tablet mode has been selected before a scale has been entered. Select *Settings|Digitizer|Scale* or *Settings|Digitizer|Reference*.

DIG 5 : Entered scale different from calculated scale

When referencing a plan using the digitizer IRRICAD calculates a scale from the reference point coordinates. This message will appear if this calculated scale is more than 5% different from the plan scale already entered. Carefully check the plan scale is correctly entered, that the coordinates of the reference points have been correctly calculated and entered, and that the appropriate reference points have been correctly digitized.

DIG 6 : Tablet points identical, tablet not enabled

The two coordinates entered in the reference dialog box are the same. IRRICAD requires the two points to be different to calculate a scale. Enter two different points.

DIG 7 : Unable to retrieve tablet device information, tablet not enabled

Turn off your computer and restart. Check the digitizer is working.

Contact technical support.

END CAP ERROR: Problem completing end cap selection

IRRICAD could not find any end caps enabled in the database. To solve the fitting selection at the end of the laterasl/pipes eneter or enable an end cap in the Coupler component group.

FILE 1 : File could not be opened

FILE 2 : File could not be closed

FILE 3 : File could not be read

FILE 4 : File could not be written

FILE 5 : File record could not be found: Seek failed

Refer to IRRICAD File Handling Messages (**Section** 6.13.2).

FILE 29 : Error trying to set file pointer

When the design was saved in to a.dez file something occurred during the zipping process. This could be in relation to a hard-disk error. The file may be able to be repaired, contact the local support team.

FILE 35 : File is not a IRRICAD design

The selected file is not an IRRICAD design file. Repeat the command (*File|Open*) and select an IRRICAD design file.

FILE 38 : Please note: AutoSaving unavailable for backup design please use File|Save As

AutoSave uses the reserved file name ~IRRICAD~Backup.dez where IRRICAD is the name of your design. The current design name is this so AutoSave cannot run. Manually save the design using *File|Save As* and save the design under a new name.

FILE 39 : AutoSave Error

AutoSave has failed to save the design. Manually save the design using *File|Save*.

FILE 40 : Cannot find IRRICAD component database

IRRICAD cannot find the component database. This can happen if the database has been shifted to another folder or computer. Click [OK] and select the required database or another one to replace it.

FILE 41 : Please check all settings and objects as IRRICAD had difficulty reading the design file

IRRICAD has had problems reading the design file. Some objects may be missing or invalid. Some settings may have changed. Check settings using the *Settings* menu and *Design|Design Parameters*. If the user has problems with objects in the design, try running repair.

File 42: There was a problem creating the design archive, the file may not be valid. Please try again. If the error persists, try saving to DES format.

The DEZ file cannot be created. Check the latest patch for your version has been installed from http://www.irricad.com/irricadpro/irricad-software-upgrades.

The DEZ is a zip archive file containing the designs files. If there is a problem saving to the DEZ it may that it is open in another program. Close other programs and try again. Alternatively, when saving overwrite the file extension with DES.

If the problem persists please contact your IRRICAD Support Team.

File 43: There was a problem extracting files from the archive. Please try again.

The DEZ file cannot be opened. Check the latest patch for your version has been installed from http://www.irricad.com/irricadpro/irricad-software-upgrades.

The DEZ is a zip archive file containing the designs files. If there is a problem opening the DEZ it may that it is open in another program. Close other programs and try again.

If the problem persists please contact your IRRICAD Support Team.

FILE OPEN ERR : Failed to open file

IRRICAD was unable to open the error log file errorlog.txt.

FILE VERSION : Attempting to open an Irricad v%.2 file in Irricad %.2 Irricad must be patched or updated to read this file

A design from a higher version cannot be opened in the current version. Upgrade or contact the person who sent the design. The person who sent the file should export to the older version before sending the file.

FIT 1 : Too many fittings added - only the first 40 kept

More than 40 unique items have been added in the [Show Fittings] part of *Change* dialog.

FIT 1119 : Can only edit fittings (non-hydraulic items)

When in [Show Fittings] section of a hydraulic dialog the user cannot edit any component (such as a sprinkler for example) which would affect the hydraulic performance of the design (i.e. affect pressure or flow)

FLOW IMBALANCE: Flow imbalance of %1

If this flow imbalance is small it can be ignored. However, if the imbalance is large a change must be made to the system such as network configuration, different pressures in the water supplies, or different pumps.

GEO BADUTM: Some entities in this design do not have valid UTM coordinates. They will not be exported.

Though geographical information has been located this information is not in an expected format and has not been exported.

GEOLOCATE : GEOGRAPHICAL INFORMATION FOUND

IRRICAD found GEOTIFF information. For additional help see Import Image, Section 5.3.7.

GEO_MULTIPLE_ZONES : Input spans multiple UTM zones. Results may be inconsistent

When importing a KML file, Irricad checks that the north-east and south-west corners of the import are in the same UTM zone. Unless it is close to a UTM boundary this is quite unlikely. In any case, the UTM zone that is actually used is the UTM zone for the centre point of the import. Warning Only.

GEO_NOUTM : UTM Zone is not defined. Export cannot continue. Please set UTM Zone and try again

Set the UTM zone in *Settings|Grid / Origin / GIS* prior to exporting the plan.

GEOPLACE : Would you like Irricad to position this image?

IRRICAD will place the TIFF image at the position and scale described in the geographical information. To allow IRRICAD to do so click OK.

GEOPLACE_ERR : Coordinates could not be converted to UTM. See the error log for more information. Please position the image manually

Though geographical information has been located this information is not in an expected format and has not been converted to UTM. The image can still be imported and positioned manually.

GEO UTM ERR: UTM Error

The KML import data conflicts with the current UTM zone. Either adjust the import file before importing or set a new UTM zone via *Settings|Miscellaneous*.

GEO UTM ZERR: NOTE: UTM Zone conflicts with existing zone: %d %s

When a UTM zone has been set or specified via IRR_SHOWSETTINGS – *Misc* tab (*Miscellaneous*) this messge will occur when importing a file that specfies a different UTM zone. Either adjust the import file before importing or set a new UTM zone via IRR_SHOWSETTINGS – Misc tab (*Miscellaneous*).

HEAD IMBALANCE: Head imbalance of %1

If this head imbalance is small it can be ignored. However, if the imbalance is large a change must be made to the system such as network configuration, different pressures in the water supplies, or different pumps.

HTML HELP : Unable to create HTML style help, reverting to Windows help

Either IRRICAD cannot find the IRRICAD Html file or it cannot find the HTML help viewer (Internet Explorer 3.01 or later). IRRICAD Help will be displayed using the standard Windows help.

IDS FAILED LOAD PRINT : Failed to load print values into the print dialog

This is unlikely to occur. If it does, exit IRRICAD and restart. If it persists contact your technical support.

IDS INVALID INPUT : Invalid input

The value entered in the dialog is invalid. Take note of the reason given and click [OK] to return to the dialog and correct the problem.

IDS IRRICAD RUNNING : IRRICAD is already running

The user is trying to start IRRICAD when it is already running. Only one instance at a time can be running.

IDS NO OBJECT PLACED : No object placed

IRRICAD was unable to connect or place the hydraulic object. Probably the user was trying to connect two objects of the same type or to place one object directly on top of another.

IDS NO SPLASH SCREEN : Failed to create splash screen

IRRICAD has a problem displaying its splash screen.

INLETS ABOVE MAX: %1 tape inlets in %2 above max pressure

The inlet pressure entered is above the allowable inlet pressure. Enter a smaller number.

INLETS BELOW MIN: %1 tape inlets in %2 below min pressure

The inlet pressure entered is below the allowable inlet pressure. Enter a larger number.

INP 215 : Unable to calculate flow for sprayline / tape, try again

The lasso defining a Show Flow area must not cut a sprayline into more than one section unless it includes a sprayline end. Redefine the boundary and try again.

INP 1030 : More than 4 connections at one position

Only four connections should be present at one position. Run *File|Repair*. If this does not resolve the issue, contact local support or Lincoln Agritech Ltd.

INP 1032 : Can't continue pipe as 4 items already connected

After connecting a pipe to a junction which already has three objects connected to it, this last pipe cannot be continued as a further pipe leaving the junction would create five objects at that junction.

As the maximum number of objects connected at a junction is four, the pipe being connected to the junction is discontinued at the junction.

INP 1033 : Delete mainline or zone pipe before deleting valve

A valve within a pipeline has, on its upstream side a mainline pipe, and on its downstream side, a zone pipe.

If the valve were deleted, a mainline pipe would be connected directly to a zone pipe that is an invalid connection in IRRICAD.

IRRICAD, because of this, requires the user to delete either the upstream mainline pipe or the downstream zone pipe before the valve can be deleted. Error 1033 warns the user that this must be done.

INP 1034 : This action is not recommended. If you are sure you wish to proceed, please click OK."

The calculated contours are about to change to real contours. This action is not recommended however, if the original spot heights have been removed click [OK] to proceed.

INP 1035: This action will permanently disconnect this entity from the associated tree block.

Exploding the tree block will mean that each item is an individual symbol and they cannot be re-arranged via the Tree Block dialog

INP 1055 : An outlet assembly cannot be used in an outlet assembly

The outlet assembly contains another outlet assembly. This usually suggests the database may be corrupt as in theory this cannot happen in the Database Editor.

INP 1701 : Can't position lateral boundaries

Under normal circumstances the user should not encounter this message. If this message does occur please save the design and contact the local agent or Lincoln Agritech Ltd.

INP 1702 : Too many boundary lines crossed

This message may occur when automatically laying out laterals in block which have re-entrant boundaries. In this case some laterals will have to stop and then re-start on the other side of the re-entrant part of the boundary. The maximum number of such crossings is limited to four. (This would occur for example in a block shaped like a capital E with laterals running vertical).

INP 1703 : Odd number of lateral boundaries crossed

In some circumstances a lateral may just contact a boundary line at one point, i.e. it appears to cross only one boundary. In this case the lateral concerned will not be drawn and the above message displayed. Either place the missing lateral manually or make a small adjustment to the position of the boundary.

INP 1704 : Couldn't position specified number of laterals

For the given spacing the specified number of laterals would not fit within the block boundaries. Check for incorrectly entered (or calculated) spacing and lateral numbers.

INP 1705 : Block indented - cannot position submain

Due to the shape of the block the submain cannot be positioned in the required position e.g., if the user make a block entity with an 'indent' so that some laterals are 'split' and then tell it to put the submain on the end it isn't possible. Try changing the position of the submain in the Irrigation Block dialog.

INP 1706 : Block indented - cannot create manifolds

Due to the shape of the block the manifold cannot be positioned in the required position e.g., if the user make a block entity with an 'indent' so that some laterals are 'split' and then tell it to put the manifold on the end it isn't possible. Try changing the position of the manifold in the Irrigation Block dialog.

INP 1707: A system flow number exceeds the maximum number of system flows

IRRICAD is limited to 6000 system flows and the naming of the system flows in use must be less than 6001.

INP 1708: A range of system flow numbers is incorrectly specified. Ensure the min-max format is followed.

When entering ranges make sure the smaller numberal is first. The format of ranges for graphical management is similar to **1-10, 15-20**, the format fr the tabular management is **-1** in column B, **-10** in column C, **-15** in column D and **-20** in column E.

INP 1709: Could not parse system flow number. Please check formatting.

Use only commas and/or dashes to indicate individual system flows or ranges of system flows.

INP 1710: Too many system flows specified. You may specify up to 18 single system flows, or 9 system flow ranges.

Each zone can only be assigned to 18 different system flows, or 9 system flow ranges.

INP 1900 : Cannot correctly space selected sprinkler along area edge

The selected sprinkler cannot be spaced along an area edge using the constraints that the spacing must lie between the specified minimum and maximum percentages of the wetted diameter. The edge concerned appears immediately following this message. If the spacing used is of concern the user will have to select another sprinkler type or change the nozzle / pressure combination.

INP 1901 : Required nozzle arc not found for selected sprinkler

The shape of the irrigated area is such that nozzle arcs are required that are not listed in the database for the particular sprinkler selected.

INP 1903 : Too many edges in area to split

INP 1904 : Fill stack full

Both these messages indicate that the irrigation area the user has designated is too complex in shape for automatic head placement to work. The solution is to subdivide the area into smaller sections; two will usually be sufficient.

INP 1951 : No water supply found - Flow check not done

If no water supply has been entered the check made when connecting outlets together cannot be made. This message warns this is the case.

INP 1975 : Too many zones

The number of zones has exceeded the hard limit for number of zones.

INP 1976: Mismatch of zones

INP 1977: Zone not found

These two messages indicate that a zone name has ben changed however Management is out of date. Re-run Management.

INP 1979 : Only one water supply allowed

Only one water supply can be used for any given design. Remove the extra water supplies.

INP 1980: Maximum precipitation rate for zone exceeded

The precitation rate for the rrigated are exceeds the allowable max. precipitation specified in the *Area* lasso.

INP 1981 : Invalid Input

This tool cannot be used on that type of item. The Show Allowable Submain tool cannot be used on an unconnected spray irrigation block.

INP 1982: Calculated zone run time exceeds one day - setting to zero

To apply the required amount of water to the area the zone must run for more than 23 hrs 59 minutes. Change the amount required, for example if required amount is for the week change to per day or per two days. Alternatively change the outlets to apply a higher volume of water.

INPT 1 : This value is below the recommended minimum

A value entered in a dialog is below the recommended minimum. Click [OK] to accept the value and continue or cancel to return to the dialog and correct the value.

INPT 2 : This value is above the recommended maximum

A value entered in a dialog is below the recommended maximum. Click [OK] to accept the value and continue or cancel to return to the dialog and correct the value.

INPT 3 : Nozzle pressure out of range

The user has tried to select a nozzle pressure that is outside the minimum and maximum limits set for that nozzle in the database. Either change your selected pressure, or change the pressure limits for the nozzle in the database.

INPT 4 : Select row(s) to remove

In a dialog with a table select the rows to delete before clicking the Delete or Remove button or pressing the Delete key.

INPT 5 : Select file containing symbol definition

IRRICAD is trying to load a drawing, database or template symbol but cannot find the symbol file in the default path (folder) specified in Settings. Click [OK] then select the required file from the appropriate folder.

INPT 7 : Intensity changed. Selected nozzle may no longer be appropriate

Due the editing the wetted radius arc of a variable nozzle the angle has changed by more than 150º. This means the intensity has changed and the nozzle associated with this arc may no longer be appropriate.

INPT 8 : Arc change is inconsistent with nozzle-arc combination selected

Since the nozzle type is **Fixed** the arc change is cosmetic i.e. the arc is drawn at the new angle on the screen but the underlying hydraulic characteristics have not changed.

To change to another fixed nozzle-arc combination select the outlet with the Change tool and edit the nozzle in the outlet dialog.

INPT 9 : Cannot use this copy tool on these objects

Linear, *Radial* and *Array* copy can only be used on geometric and unconnected hydraulic objects. Use the *Multiple Copy* tool for connected hydraulic objects.

INPT 10 : Too many items selected

Too many symbols or DXF contour layers have been selected at one time. A maximum of 256 symbols will be unloaded or contour layers imported. Repeat the procedure for the rest of the items.

INPT 11 : Cannot unload symbol definition because the design contains instances of it

A symbol definition can only be unloaded if the design does not contain any instances of it. Delete all instances of the symbol before unloading it.

INPT 12 : Select objects to make symbol, legend or template from before invoking tool

The Create Symbol, Make Legend and Save Template tools require selected objects to act on. Select the required objects then select the appropriate tool.

INPT 13 : Cannot explode hydraulic objects

Only geometric objects, i.e. objects with no hydraulic significance, can be exploded using the Explode tool.

INPT 14 : Cannot convert this type of object to an elevation

Only geometric objects that are points, symbols, lines, polylines and curves can be converted to elevations. An object other than these has been selected.

INPT 15 : This object is already an elevation!

A spot height or contour has been selected for the Convert to Elevations tool. It cannot be converted as it is already an elevation.

INPT 16 : Cannot resize hydraulic objects

Only geometric objects, i.e. objects with no hydraulic significance, can be resized using the Resize tool.

To resize pipes, tapes and spraylines delete them and place new ones in the design at the new length.

To resize outlets and other point hydraulic objects (including water supplies and junctions) change the base database symbol size and check the Update Database Symbol Size check box in *Settings|Miscellaneous*.

Junction, water supply and spot height sizes can be changed in *Settings|Irrigation Items* but existing ones will have to be deleted and re-entered for the new size to take effect.

INPT 17 : Select objects before invoking tool

The *Spraylines To Tapes*, *Tapes To Spraylines*, *Change Type*, *Move Fills To Back*, *Make Active Area* tools require objects to be selected before acting. Select required objects then select the appropriate tool.

INPT 19 : Hydraulic object placed not connected

The hydraulic object being moved has been placed rather than connected to another hydraulic object. This is usually due to trying to connect to another object of the same type e.g., Outlet to outlet, or to some other invalid connection.

INPT 20 : Legends must have a fill rectangle, placeholder text and line or symbol

Legend symbols consist of a fill rectangle, placeholder text and line (pipe legend) or symbol (sprinkler / valve legend). One or more of these entities is missing from the selected objects so a legend symbol cannot be created.

INPT 21 : A symbol with this name is already loaded

The name entered for a symbol is the same as an existing name and there are instances of that symbol in the design. Either delete the existing symbols in the design or give the symbol definition being created / saved a different name.

INPT 23 : Cannot break hydraulic objects

Only geometric objects, i.e. objects with no hydraulic significance, can be broken using the Break tool.

INPT 24 : Too many points in boundary. Maximum of 91 allowed

Design has a restriction that irrigation areas must not have more than 91 points. Re-enter the area using longer line segments and therefore fewer points.

INPT 25 : Cannot place selected sprinkler in area. Radius too small

Drippers and outlets with very small wetted radii or flow cannot be used for Autohead placement.

INPT 26 : Only one item may be selected for Move Point

Deselect all items and only select one item for *Move Point*.

INPT 27 : Please use move tool to move ends of hydraulic entities

Only use Move to move junctions or hydraulic entities.

INPT 28 : Unable to use this tool for Bitmap images

Images cannot be changed or altered. If more than one image is selected when *Adjust Image* is actioned, this message will also occur. In this case, deselect and then select one image boundary to adjust.

INPT 29 : Extraneous objects found while creating the legend. They will be ignored when drawing the plot layout.

Happens if the user is creating/editing a plot layout/legend and the user has selected something odd e.g., a curve. Only a warning.

INPT 30 : Roll length is not a multiple of the rounding. In some circumstances the number of rolls reported in BOM reports may greater than required

Check the *Pipe Fitting Matching Table* in the *Design* menu and check that the Roll Length is a multiple of the rounding entered.

INPT 32 : Selection contains hydraulic objects therefore not replaced by symbol

This warning occurs if the user has "Replace with Symbol" checked

INPT 33 : Internal Database Symbol not loaded

To fix this error, run *Repair*, then *Save* the design and close IRRICAD. Re-open the design for the symbols to be reloaded.

INPT 34 : Two actions use the same wheel/key combination, please change one

The same wheel/key action cannot be set to more than one zoom/scroll action. Change one of the actions so they are all different.

INPT 35 : Block Laterals cannot be deleted independently

In an Irrigation Entity, the block laterals cannot be modified independently. To remove an outside lateral move the Area lasso using *Move Point*.

INPT 36 : Block items cannot be Moved/Rotated independently of Block

In an Irrigation Entity, the block laterals cannot be modified independently. To move or rotate, select the entire block to do so.

INPT 37 : Tool can only be used with a single item selected

Deselect all items and select the one required item.

INPT 38 : Subdivision Tool only operates on Block Entities

Only Spray Irrigation Block or Tape Irrigation Block can be subdivided by the Subdivision tool.

INPT 39 : Slices too small for group option. Laterals in sub blocks may be displaced

Happens when subdividing a 'grouped' block and the slices are too small to contain a "Group". Make the slices larger to include at least one "Group".

INPT 41 : Unable to Create Block from Selected Entities

Either the user is trying to create a block from something that has less that 3 vertices (i.e. a single line) or from a hydraulic entity that isn't allowed (i.e. another block).

INPT 43 : Block laterals cannot be converted independently

Select the entire Irrigation Block before converting *Tapes to Spraylines* or *Spraylines to Tapes*. The user can't try and change only some of the laterals in a block entity.

INPT 44 : Unable to use this tool for OLE items

Some tools cannot be used for OLE items such as copy, rotate, move point etc.

INPT 45 : Function not available for non "ITER" tapes.

The tape the user has selected for a *Hydraulic Gradeline* or for a *Zone Design Summary Uniformity* report does not have "Iteration" data in the database. Find the updated data for the tape and check the "Iteration" check box.

INPT 46 : Cannot find item in Design Files

Re-run Management and *Design* so the Tape information can be found.

INPT 47 : Could not find connected junctions. Pipe may be looped

This warning occurs because the Hydraulic Gradeline cannot be created. Check for extra junctions and short pieces of pipes (*Select Window* and *Object Info* will indicate how many items are actually within the selection. Delete any extra ones).

INPT 48 : Corrupted Block Entity - Unable to subdivide

This error would happen in subdivision if lateral spacing in less than 0.001 meters – essentially would mean that the block entity has been corrupted. Try recreating the laterals or delete and re-enter it.

INPT 49 : Tool may only be used on pipes, tapes and spraylines

Warning when using *Hydraulic Gradeline* tool. Select only pipes, tapes or spraylines.

INPT 50 : At least one lateral has no free end. Cannot create manifolds

Warning when trying to create manifolds or recreate the block. Manually select and delete the manual manifold first and then create the new manifold in the *Irrigation Block* dialog.

INPT 51 : Invalid number of manifolds specified

The user has specified more manifolds to be created than there are laterals present. Please specify a smaller number of manifolds.

INPT 52 : Invalid number of assemblies specified

The user has specified more assemblies than there are laterals. Please specify a smaller number of assemblies.

INPT 53 : No submain found, cannot create manifolds

A submain must be created in order to create manifolds. Select a "Position" for the "Submain Properties" in the Block tab.

INPT 54 : At least one lateral is not connected to the submain. Cannot create manifolds

Edit the outside Area or change the submain position to ensure that all laterals connect to the submain before manifolds can be created.

INPT 55 : No mainline pipes selected

No mainline pipes selected when using the Hydraulic Grade Line. If selecting submain and lateral pipe, a mainline pipe must be selected also.

INPT81: Unable to populate selected entity

This type of object cannot be converted to an *Autohead* boundary.

INPUT82: Warning, coordinate range too large please correct and then run Compress

The span of the drawing is too large. Delete the items beyond the extents of the plan and run Compress.

INPT84: Unable to convert to Spraylines when the offset is larger than emitter spacing

When the offset is larger than 1.1 times the emitter spacing the tapes cannot be converted to spraylines. Change the offset value to be 1.1 times or less than the outlet spacing.

LOOPS AND PRVS: Loops and PRVs detected

If a design contains loops and PRVs this message will always occur. Please check that PRVs are located on the branches only and not within the loop.

MAN 1: Database not entered for %1 zones/water supplies

Management is incomplete. Re-run Management.

MAN 3: On time after off time

Change the on/off times in the management tables so that the off time occurs chronologically after the on time.

MAN 4: Operating time exceeds cycle

MAN 5: Total operating time exceeds cycle

These messages will occur if the number of system flows exceeds the number of hours within the nominated cycle time. Either decrease the run time by reducing the automatic 1 hour, or increase the cycle time days in *Design Parameters|Economic Parameters* . Each day allows for 24 system flows at the default run time of 1 hour each.

MAN 6: Row %1 in table of system flows

There is an error in the system flow table. Only whole digits may be entered.

MAN 300-302 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

MAN 303 : Operating cycle time not entered

The operating cycle time for the design has not been entered in *Design|Design Parameters|Economic Parameters*. Enter a cycle time in days.

MAN 306 : Invalid time(s) entered

The operating times for the water supply or the zones are either outside of the management cycle time (see *Design|Design Parameters|Economic Parameters*) or the times entered are outside of the standard conventions used (0-23 for hours, 0-59 for minutes).

MAN 308 : No water supplies have been entered

This error will appear in Mainline Design if no Water Supplies have been entered at all. A water supply for the design has not been entered into your design. If data for a water supply is to be entered or mainline design attempted, a water supply must be entered.

MAN 309 : The maximum number of water supplies has been exceeded

More than the maximum number of water supplies (10) has been entered. The user will have to reduce the number to the limit or less.

MAN 310 : Difficulty opening/reading/writing water supply file

The .wsp file for the design is missing, has not been created or there was a problem reading from the file. Re-run Management. (or if that fails delete the temporary design files then rerun management).

MAN 326 : The maximum number of irrigation areas has been exceeded

The number of irrigation areas entered exceeds the limit (1000). Please delete the excess areas before continuing.

MAN 329: Control valve not connected to water supply

Look for junctions at the water supply or control valve(s); if junctions are visible then the object is not connected to the pipe. Alternatively, look for a break in the pipeline between the water supply and unconnected valve(s).

MAN 330-332 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

MAN 335-337 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

MAN 338 : More than one control valve connected to a zone

Each zone can have one control valve only. If more than one valve is connected to a zone the excess valves must be deleted, or more zones created.

MAN 339 : Mainline item in zone - refer to manual

An item normally associated with a mainline (e.g., pipe, headworks, valve-in-head sprinkler) is connected to a zone downstream of the zone control valve. As this cannot normally occur it suggests that design files have been corrupted.

Clear management (*Design|Clear Management*) and then run a management option. If this does not help run Repair (*File|Repair*).

MAN 340 : Data not entered for all zones / system flows

On and off times have not been entered for all of the zones listed in the *Zone Operating Times* or the *Assign Zones to System Flows…* data entry screen.

Times for all zones must be entered to continue through mainline design.

MAN 341-343 : Refer to IRRICAD File Handling Messages (Section **6.13.2**)

MAN 344 : The maximum number of system flows has been exceeded

The total number of system flows for the zones is greater than the limit. It will be necessary to reduce the number of on / off time combinations by perhaps timing some zones to operate at exactly the same time as other zones.

MAN 345 : Zone flow exceeds water supply maximum flow

The flow required for a zone is greater than the maximum water supply flow available (as specified when the user entered the water supply). As the system cannot operate under this condition, reducing the number of outlets in the zone must reduce the flow requirement of the zone.

MAN 346: Problem finding valve from design file. Please re-run management.

Re-run Management.

MAN 347 : No zones have been entered in design input

No zone control valves have been entered in to your design. Zones are defined by the name given to the zone control valves.

MAN 348 : System flow exceeds water supply maximum flow

The system flow resulting from the zone management (Zone Operating Times) exceeds the maximum flow available from all water supplies.

The operating times for the zones must be rescheduled so that the resulting flow required is less than the maximum flow available.

MAN 349 : System flow exceeds WS design flow, press Yes to accept, No to quit.

The system flow resulting from the zone management (Zone Operating Times) exceeds the maximum flow available from all water supplies.

The operating times for the zones must be rescheduled so that the resulting flow required is less than the maximum flow available.

MAN 350 : The same zone name has been used twice

Two or more zones have been given the same name.

Change the zone name given to the duplicate zone control valve (use the Change tool).

MAN 351 : Zone item in mainline - refer to manual

An object normally included as part of a zone has become part of the mainline system. IRRICAD has been structured to prevent this from happening. If it does, run Repair (*File|Repair*).

MAN 352 : The maximum number of mainline items has been exceeded

More than the maximum number of outlet types (valves, valve-in-heads etc) have been used in the mainline. Try to reduce the number of unique items to remove this error. If the problem occurs frequently, contact your servicing agent or Lincoln Agritech Ltd.

MAN 353 : Outlet not connected to a zone valve

A warning during the connectivity check that an outlet is not connected to a valve. If outlets are to be included in zones they must be connected to valves, either directly or through a pipe network.

MAN 355 : Times for system duties overlap

When specifying the system duty on / off times (Assign System Flows…) it is necessary to ensure that one set of duty times does not overlap with another.

MAN 356 : Zones are not permitted to span irrigation areas

When defining irrigation areas it is important to ensure that the area encompasses only complete zones. An area boundary must not divide a zone into two sections.

MAN 357 : Irrigation area not closed

An irrigation area must be completely closed. Make sure that the end of the boundary line forming the area is joined to the start point (use *Right-click|Close* when drawing the last boundary line).

MAN 358 : Overlapping irrigation areas not allowed

The boundary of one irrigation area must not cross the boundary of any other irrigation area.

MAN 359 : The Number of irrigation areas within another exceeds the limit

Irrigation areas can be defined which completely enclose other irrigation areas. The maximum number of areas that can be enclosed by any other irrigation area is limited. Reduce the number of enclosed irrigation areas to this value.

MAN 360 : No water supply available for system flow

This message results from a mismatch between the times when a water supply is available and the zone operating times. The solution is to change either the water supply availability (in *Design|Other Management|Water Supply Times*) or the zone operating times (in *Design|Zone Operating Times*) to ensure that water is available during all zone operating times.

MAN 361 : Valve / Outlet / Sprayline not connected to water supply

A warning message that one of the items does not have a path back to the water supply. If this was intentional it is possible to proceed, but note that if a valve (or valve-in-head outlet) is not connected to the water supply the partial management option must be selected (Assign System Flows…) and the corresponding zone excluded from consideration (do not assign a system flow to this zone). Otherwise the design process will fail.

MAN 362 : Unable to find zone, please rerun management

This message will appear if design has been completed and then a zone deleted and an attempt made to re-run Design. Re-running Management (*Zone Operating Times* or *Assign System Flows…*) takes account of the deleted zone and Design will then run correctly.

MAN 363: Total zone operating time exceeds one day

If the cycle time days in *Design Parameters|Economic Parameters* is set to one day the total zone operating time cannot exceed 24 hours.

MAN 364 : Outlet cannot be connected directly to water supply

Outlets are part of a zone e.g., downstream of a control valve. There must be a control valve between an outlet and the water supply.

MAN 365 : All Outlets / Valves connected

After running *Design|Check Outlet Connectivity*, IRRICAD is telling the user that all hydraulic items in the design are connected.

MAN 366 : The maximum number of zones has been exceeded

IRRICAD has a limit for the number of zones that can be used a design (see Appendix A: IRRICAD Limits, Section 6.2).

MAN 367 : Outlets not connected to Zone Valve detected

This is the message from the connectivity check when outlets are not connected to a zone valve.

MAN 368 : Control Valves or Mainline Outlets not connected to Water supply detected

This is the message from the connectivity check when valves or mainline outlets are not connected to a water supply.

MAN 369 : Too many points in area - area discarded

If an Irrigation area (or block boundary) has more than 91 points, this area will not be used to calculate zone areas or used in zone time calculations.

MAN 370 : Area nesting exceeded - areas may be incorrect

When Irrigation areas (or block boundaries) are nested more than 10 deep the area will not be used to calculate zone areas or used in zone time calculations.

MRG 700 : Renamed entity

A warning when merging designs to let the user know that something with a name (e.g., Water Supply, Control Valve, Block, Area etc.) in the source design has the same name as an item in the destination design so it needs to be renamed.

MERGE 0 : A file cannot be merged with itself

Select a different design to merge into the open design.

MERGE 1 : Cannot open merge design file

Cannot open the source design file (.des) when merging. Check the file is not Read Only. Restart IRRICAD and try again. If this fails, restart your computer and try again.

MERGE 2 : Cannot open merge database

Cannot open the source internal mdb file when merging. This message will only appear in error log file. Check the file is not Read Only. Restart IRRICAD and try again. If this fails, restart your computer and try again.

MERGE 3 : Cannot open merge CAD file

Cannot open the source vcd file when merging. This message will only appear in error log file. Check the file is not Read Only. Restart IRRICAD and try again. If this fails, restart your computer and try again.

MERGE 4 : Possible label symbol conflict

In v10.0, label symbols are given a unique name and the probability of label name conflicts when merging two v10.0 designs is very, very small indeed. However, label symbol names in versions prior to v10.0 are more likely to conflict. If any 'old style' label symbol names are detected during the merge the user is warned of possible conflicts.

MERGE 6 : Designs merged. See errorlog.txt for details

Simply tells the user the merge has finished.

MISC 1 : Value out of range

The value entered in the dialog is out of range. Enter a value within the range given.

MISC 3 : Windows error

An operating system error, text following it will describe the problem. Contact your local IRRICAD Representative or Lincoln Agritech Ltd.

MISC 4 : Too many selected objects to display all information

Too many objects have been selected for object info. Information will only be displayed for a limited number of them. Reduce the number of objects selected to see all the information for them.

MISC 5 : This layer cannot be removed because it contains entities

A layer which contains entities cannot be deleted. Delete the items first or move them to another layer before deleting the layer.

MISC 6 : Internal UID's too large - export and re-import dxf/dwg file

Can happen very occasionally when importing DWG/DXF files. Can be the cause of problems later on (e.g., connectivity check failing when it shouldn't etc.) Solution is to re-import into a clean design then export and re-import.

MISC 7 : Too many reports not all items will be displayed in menus. Remove some FPC files from Reports folder

There is a limit of 100 for the number of reports (total from all menus i.e. management, zone / ML design, costing etc.). To fix it remove some unwanted report templates from the \reports folder and restart IRRICAD.

MISC 8 : No report templates found

Check that there are some report templates (.fpc files) in the \Reports sub-folder in the current Irricad Pro folder.

NO PIPES : No pipes

No pipes (of any type) enabled in pipe database. Enable pipe before continuing with LP sizing.

OOP 1 : Object could not be read

IRRICAD has encountered an object or setting it cannot read while opening a design. Check the version numbers given. A newer version design cannot be read with an older version of IRRICAD.

OOP 4 : Cannot get elevation of non point object

This means that some process (design, reporting, costing) tried to find the elevation of a non-point hydraulic object. Generally this would indicate some sort of file corruption. Re-run Management, delete design files, or run *Repair*. If this fails try restarting IRRICAD and your computer. If the problem persists contact your technical support.

OOP 7 : Invalid point number

IRRICAD has attempted to access a second point in a point object or a third point in a line object, for example. Generally this would indicate some sort of file corruption. Re-run Management, delete design files, or run *Repair*. If this fails try restarting IRRICAD and your computer. If the problem persists contact your technical support.

OOP 8 : Cannot get distance between non-point objects

This means that some process (design, reporting, costing) tried to find the 3D length between two point hydraulic objects. Generally this would indicate some sort of file corruption. Re-run Management, delete design files, or run *Repair*. If this fails try restarting IRRICAD and your computer. If the problem persists contact your technical support.

OOP 10 : UID indexing error - please delete entity created, close and or save design and run FILE REPAIR

When this message appears, please delete the entity created, save the design and run *Repair*.

PERM 164 : The user cannot select the current item

An attempt is being made to select the assembly being created as an item in the assembly.

PERM 166 : More than one different outlet in assembly

Two or more different outlets have been selected in an outlet assembly. Only one is permitted.

PERM 167 : Curve fitting unsuccessful

The curve fitting routine is not able to handle the data as entered. Check that the user has entered the data correctly. If this is correct make sure that the type of curve the user is trying to fit can approximate the data. See Curve Fit, Section 3.5.1.

PERM 168 : Cannot have negative or zero values for power curves

Negative data values cannot be used in the curve fitting utilities.

PERM 169 : Not enough points entered (Minimum 3)

At least three sets of data points must be entered (excluding the 0,0 points) for curve fitting to take place.

PERM 174 : This is low, please check your data

The r2 value is below 90%, which implies a bad fit. Recheck the data the user has entered.

PERM 179 : Duplicate pressure entered: Please check data

Two identical pressure values have been entered. This is not valid for the relationship the user is trying to generate.

PERM 192 : Same flow value entered twice: Please check data

Two identical flow rate values have been entered. This is not valid for the relationship the user is trying to generate.

PIPE TYPE ERROR: Could not find pipe type in default file

The database used for this design does not contact a pipe type table. Locate a component (external) database for use in this design.

PUMPS AND LOOPS: Pumps and loops detected in this zone or system flow

If a design contains loops and pumps this message will always occur. Please check that pumps are located on the branches only and not within the loop.

REP 500-502 : Refer to IRRICAD File Handling Messages (Section 6.13.2)

SENT NODRIVER : Sentinel Driver not found - reinstall

The sentinel driver has not been installed. With the IRRICAD installation CD in the CD_ROM drive, browse the CD for the Drivers folder. Open the folder and double-click on the Driver.bat file. This will install the sentinel driver. A computer restart may be required after the installation is completed. The driver can also be downloaded from http://www.irricad.com/irricad/download/Drivers/Rainbow/SentinelProtectionInstaller7.6.9.exe.

SENT NOTTHERE : Sentinel missing or faulty

The hardware protection device used to protect the IRRICAD program is not plugged into the computer parallel port, or has become damaged in some way. See the above message (SENT NODRIVER) to re-install. If a previous version of the driver has been installed to run IRRICAD this will need to be removed before installing the new driver. Check the correct installation for your dongle type has been used.

SENT WRONG VERSION: Incorrect Sentinel Version - Upgrade required. Contact your supplier

The user is trying to run a version more recent than the sentinel has been enabled for.

TEMPLATE NOT FOUND: Report template not found.

Ensure that the folder path for "Reports Path" is pointing to that folder that currently contains the report templates (.fpc files). The path can be changed in *Settings|Drawing Items*.

Tool Error: Seed Boundary was invalid. Make sure entities are a closed boundary and then try the seed tool again

This message can occur if the magnitude or span of coordinates in a design is large and an internal origin (Offset) and scale hasn't been, or cannot be, correctly set. Delete the items outside of the plan drawing and run *Compress*.

UTIL 1604 : Invalid group code in DXF file

UTIL 1605 : Invalid Y coordinate code in DXF file

In normal circumstances these conditions should not occur as they indicate that something is wrong with the DXF file the user is trying to use. If possible, obtain another copy of the file from the original source and try again.

UTIL 1606 : Maximum Number of Contour Segments Exceeded

Warning that happens when importing contours and there are more than 32,750 segments. Ignoring this may cause problems later on in design. The solution is to delete some unnecessary contours or re-import with "Contour Simplification" turned on or "Contour Simplification Factor" increased.

UTIL 1608 : Could not convert file. Please check error logs

The conversion to DXF of a .SHP or .CSV file has failed in some way. When Irricad imports contours from a .SHP or CSV file it first converts the file to a DXF in the background and this conversion will have failed. Check the *Reports|View Errors*.

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