Multiframe 8.63 — 29th April 2004 Release Note

This release note describes the Windows version 8.63 of Multiframe, Steel Designer and Section Maker. This release contains numerous enhancements to this range of software.

Contents

Multiframe

The following features have been modified or added to Multiframe in this release.

Changes since v8.6

Version 8.61

- **Unexpected dragging of members from a mouse click near the end of a member has been fixed.**
- **Two new options have been added to the Preferences dialog to disable dragging of nodes and/or members in 3D views of the model.**
- **Help files have been updated.**
- **Panning in 3D views now displays the correct panned image.**

Version 8.62

- **Zoom rectangle no longer leave trail on screen when dragging without the mouse button depressed.**
- **Two new options have been added to the Preferences dialog to disable snapping to member midpoints and the display of grid snap text tip.**
- **Ctrl+Tab now iterates through windows again.**
- **Clipping bars now draw correctly when dragged.**
- **Extra redraw of selection in when using selection rectangle has been eliminated.**
- **Grid icon in toolbar has been revised.**
- **Mismatched tolerance for snapping to joints has been corrected.**

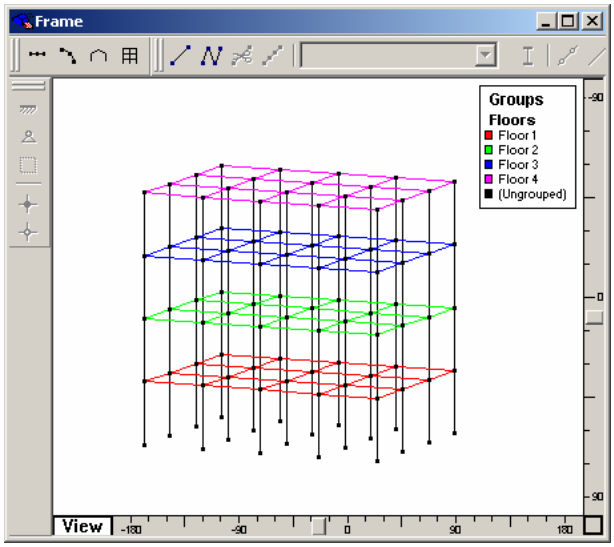
Version 8.63

- **Fixed a problem with mouse wheel zoom**
- **Corrected display of rendering in Plot window in some circumstances**
- **Combined load cases can now change design classification**
- **File associations for .mfd now work in al cases**

Grouping

Multiframe now allows the grouping of members by the user. Members can be grouped via the Add Group command in the Select menu. Groups may be deleted or edited and members may also be added or removed from an existing group via other commands in the Select menu.

Often it is convenient to group members in more than one way. For example, members may be grouped by floor or by a frame line in a building. To assist in this, Multiframe allows you to manage groups as group sets. In the example, separate group sets would be used to contain the groups defining floors and the groups defining frames. By default, a single group set is created when starting a new frame or opening an old file.



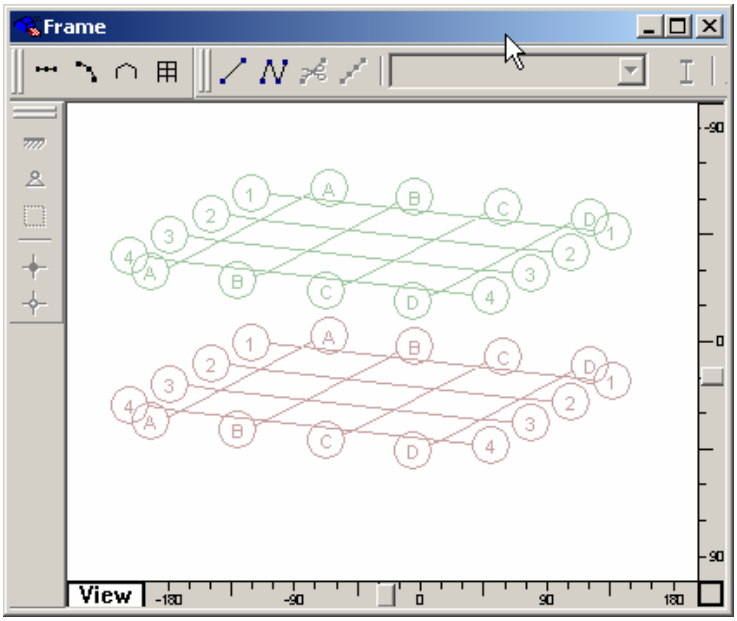
Only a single group set may be active within the user interface at one time. All commands for adding, editing and deleting groups will act on the groups in the current group set. The active or current group set is specified via the Current Group Set submenu in the Select menu or via the list in the new Groups toolbar.

The members belonging to each group in the set can be displayed by selecting to display members by group colour via the Symbols dialog. If a member belongs to more than one group it will be displayed in the colour of the first group to which it belongs. In general this can be avoided by the appropriate use of groups sets.

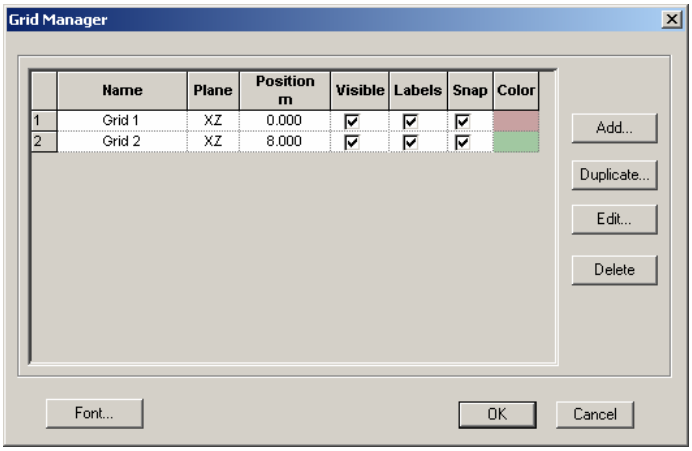
Drawing Grid and Structural Grids

The existing drawing grid used within Multiframe has been improved. Grid lines are now drawn as solid light grey lines and grid snap has been modified to only snap to the grid when the cursor is close to a grid point.

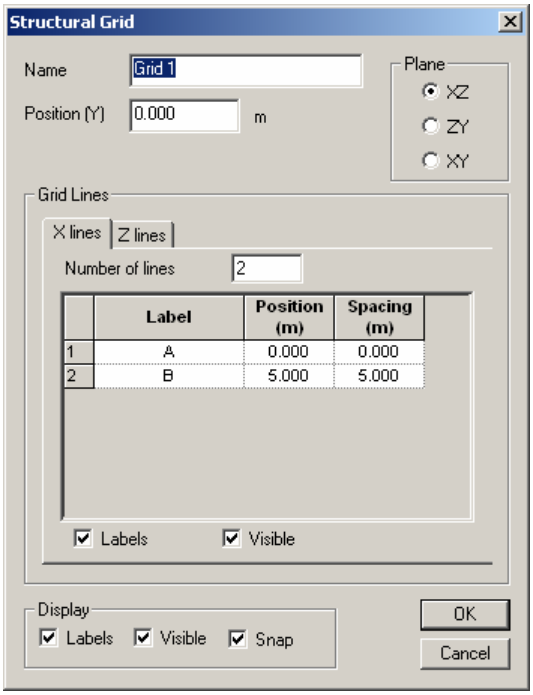
To compliment the drawing grid, the user can now define structural grids representing the grid lines of a building. Any number of these grids may be added to the model to represent floors or frame lines. As with the drawing grid, the structural grids provide a means of constraining drawing and dragging of items to specified locations in 3D space. This will make it easier to create a structure using a 3D view.



The definition of structural grids is controlled using the Grid Manager dialog that is displayed using the Structural Grids command from the View menu. This dialog is used to add, edit or delete grids from the current model. For each grid the user is able to specify the plane in which the grid lies, the position of the grid, the location and label of the grid lines and the colour used to draw the grid.

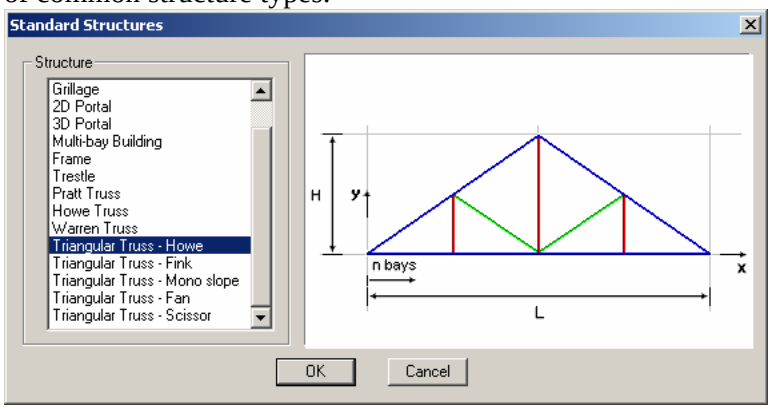


To modify a grid, click on the row corresponding to a grid and then click the Edit button. This will display a dialog allowing you to modify that grid.



Frame Generation

The generation of common structural forms has been significantly improved in this release and now include various forms of trusses, portal frames, grillages and frames. The Generate command from the Geometry menu now allows you to select from a range of common structure types.

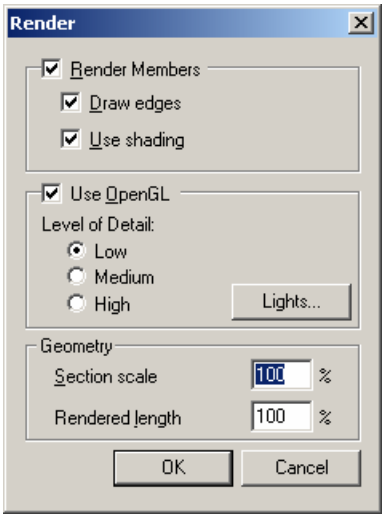


Generation of structures has also been improved to allow for supports and other features to be specified. For the generation of a rectangular frame, both secondary and tertiary beams can now be automatically created.

Rendering

OpenGL rendering has been enhanced to allow the user to select the level of detail to which section shapes are represented. Low level of detail will render section shapes as a number of flat plates with no representation of the web or flange thicknesses. Medium detail displays the true 3D outline of the section shape including thickness as modelled by a series of rectangular plates while a high level of detail models the true 3D outline of the section including the fillets, circular corners and rounded edges.

The level of detail is set via the remodelled Render dialog.



The OpenGL rendering has also been modified to use a full lighting model in which shading to the model is produced by lights located around the structure. An option for controlling the lighting is provided in the Rendering dialog. Lighting can also be controlled via a new Rendering toolbar that allows up to 4 lights to be toggled on or off.

Analysis and Plotting Performance

The speed of analysis has been significantly improved by optimising the order of member loads. For large frames, this has resulted in a reduction of analysis times of up to 75%. The same optimisation has also improved the time taken to display global diagrams of member actions. The generation of moment diagrams for some larger models has been reduced by more than a factor of 12.

Automation Interface

The Multiframe automation interface has been updated to support the features added to the program since the original version of the interface. Modifications to the library include

- **New library version – Version 1.1**
- **Added objects representing group sets and groups**
- **Support for new section shapes added since Multiframe version 8**
- **Support for new section properties added since Multiframe version 8**
- **Access to additional modal solver properties**
- **Access to participation factors via modal results**
- **Expose CopyWindow method of application object**
- **Support for new plot types added since Multiframe version 8**
- **Add UserData for Elements and Joints**

Please refer to the Multiframe Automation manual for full details on each of this items.

IMPORTANT – After upgrading to the new version of Multiframe it will be necessary to reset the reference to the Multiframe object library so that it uses the new version of the object library. This will need to be done in all scripts, macros and applications that access the Multiframe object library. Failing to do this will

result in unexpected errors when executing scripts that reference the Multiframe object library.

Accelerator Keys

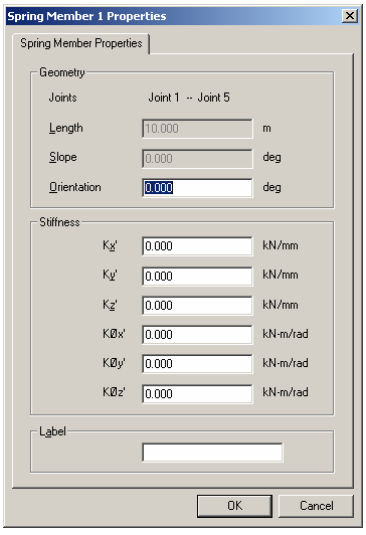
The following changes have been made to the accelerator keys;

- **Insert key replaces Ctrl+I to add a new member**
- **Ctrl+Insert adds a continuous member**
- **Home key performs a size to fit. This command can still be access via Ctrl+t**

Spring Members

An element for modelling an elastic connection between two joints has been added to Multiframe. A Spring Member is a special member that represents a spring connected between the two Joints. Unlike a normal beam/column member, there is no coupling of the actions along the members so the spring stiffness of the spring in each direction acts independently of the others.

A spring member is added to a model by drawing the member using the Add Spring Member command in the Geometry menu. The properties of the spring can be edited by double clicking on the member or by specifying the stiffness of the spring via the Spring Member Stiffness command in the Frame menu. All stiffness's are specified in the local coordinate system of the member.



No loads can be applied to spring members. After analysis, the computed actions in spring members are not plotted but can be viewed via the Spring Member Actions table in the Result Window.

Subdividing Intersecting Members

A new command has been added to subdivide intersecting members. The Geometry-> Intersect Members command will find the intersection of all selected members and subdivide the members at each intersection point. The location of intersections is computed in 3D space.

Select Menu

The View->Select submenu has been moved to the main menu. The new Select menu contains enhanced selection commands as well as new commands for managing groups.

Exchanging Selections between views

In some situations it is convenient to find members or joints by sorting tables in the Data or Results windows. In the past it has not been possible to select these items in any other window. To facilitate the selection of items in other windows, new commands have been added to set the selection in one view to be equal to, or extended to include, the selection in another view. The selection in the current view can be set equal to that in another by selecting that view from Select->From View submenu. The selection in the current view will be extended to include the selection in the other view if the shift key is held down when executing one of these commands.

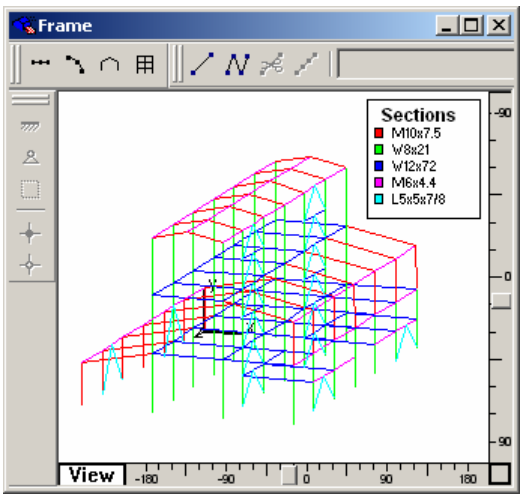
Joint Link Groups

The definition of joint link groups now stores a list of the elements selected when the group is created. If an element contained within a joint link group is subdivided, the new joints will automatically be added to the group.

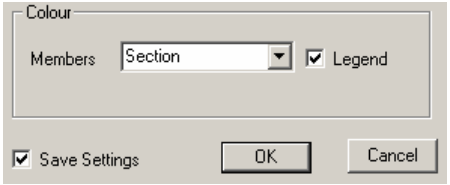
The joints and elements stored within a Joint Link group can now be selected via the Joint Link command in the Selection menu.

Legends and Colour

Drawing in the Frame window has been enhanced by the introduction of a number of options for choosing the colour used to draw each member displayed within the window and a legend to show the meaning of those colours.



You can turn on or change the colours using the Symbols command from the Display menu or by using the right popup menu associated with the legend.



The options are –

- **No Colour scheme – Members all drawn in black**
- **By Section – Each section used in the frame is allocated a different colour. Members are coloured according to their section.**
- **By Section Group – Each section group from which sections are used is drawn in a different colour. Member are coloured according to the group in which their section is located.**
- **By Shape – Members are drawn in a colour depending upon the shape of the section. Each section shape is automatically allocated a different colour.**
- **By Label – Each unique member label used within the frame is allocated a different colour. Members are colour according to their label.**
- **By Type – Each different type of member is drawn in a different colour.**
- **By Group – Members are drawn in the colour of the first group they belong to in the current group set.**

If you turn on the option to display the Legend, a colour legend will be drawn in the top right corner of the Frame window. You can double click on a name in the legend to select items of that type. You can double-click on a colour in the legend change that items colour.

A number of formatting options are also available via a popup menu displayed when right clicking the mouse on the legend.

Dragging Joints in 3D

Joints can now be dragged in a 3D view. Unless the joint is dragged over and snapped to another joint or structural grid point, it will move in a plane passing the drawing depth that is parallel to the two global axis that are most perpendicular to the direction from which the model is currently viewed. These axes can easily be identify as they are highlighted in a double thick line on the global axes icon.

While dragging working in the 3D view of the model, the crosshair are now displayed running parallel to the global axes so as to help align points in the model.

Reverse member axes

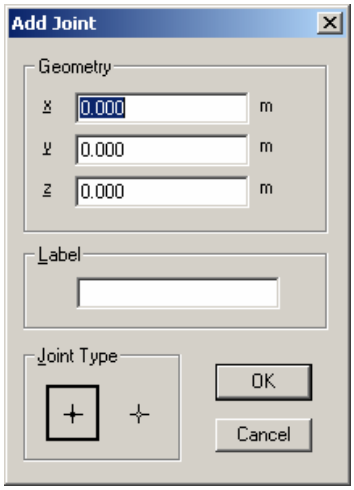
A new “Reverse Member Ends” command has been provided to reverse the joints that define the ends of a member. This has the effect of reversing the direction of the member axes. This menu item is located within the Advanced submenu of the Geometry menu.

Adding Multiple Point Loads

All the dialogs for adding point loads to a member now permit several locations to be specified in the distance field. Each location should be separated by a comma. For example you could enter L/3, L/2, 2*L/3 in the distance field to add 3 loads to a member. On exit from the dialog the new loads will be added at each of the specified locations.

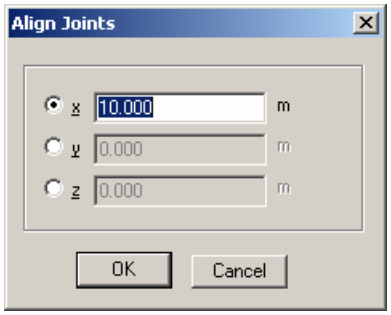
Add Joints

A new advanced geometry command has been created to enable the user to add a joint a specific position.



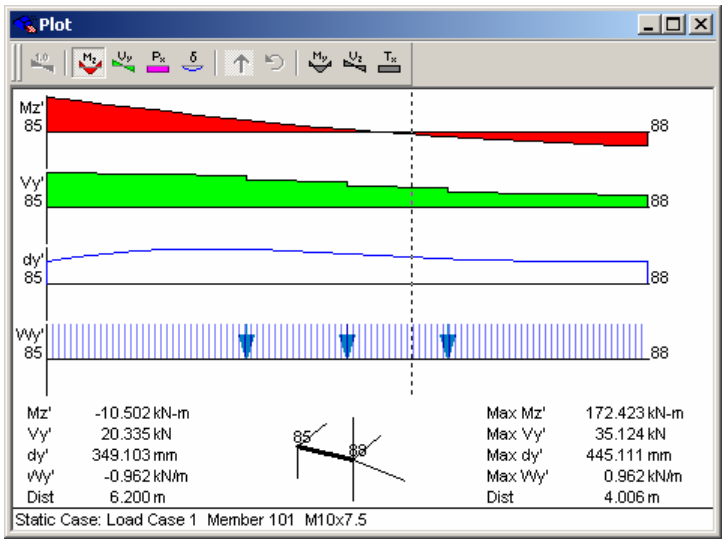
Align Joints

Another advanced geometry command has been added for aligning joints to a specified position. The Align Joints command will move all the selected joints such that one component of the joints positions will set equal to a specified value.



Load Plots

Local plots of loads about a member's major or minor axis can now be displayed in the Plot Window.



The variation of distributed loads along the member is plotted in terms of the member's local coordinate system. Superimposed on this diagram are the locations of point loads

applied to the member. For plots of loads along design members, the loads applied to joints internal to the member are also displayed. Note that the point loads are not drawn to scale and that only point loads with components applied parallel to the axis of the plot are displayed.

Member Plot View

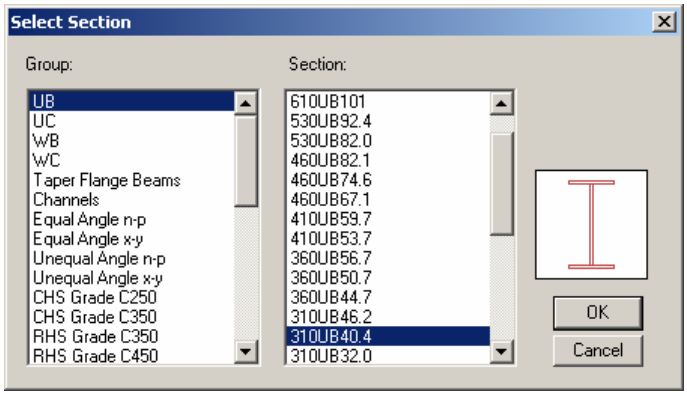
The local member plot view now displays the maximum actions along the member in the bottom right hand corner of the window. It also displays the position of the crosshair as measured from the right hand end of the member.

Double Angle and Angles shapes

Double angle and angle sections aligned about their principal axes are now supported within Multiframe as standard section shapes. For unequal angles, the angle between the principal axes and the geometric axes aligned with the legs of the angle needs to be included in the sections library data to ensure the angles are displayed correctly.

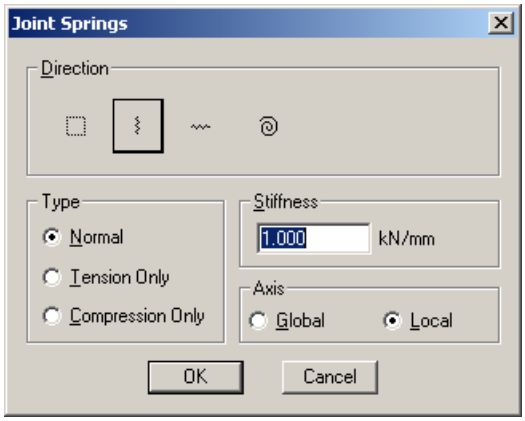
Preview of Section Shapes

The Section Type dialog in the Frame menu now displays a preview of each section shape when it is selected in the list of sections.



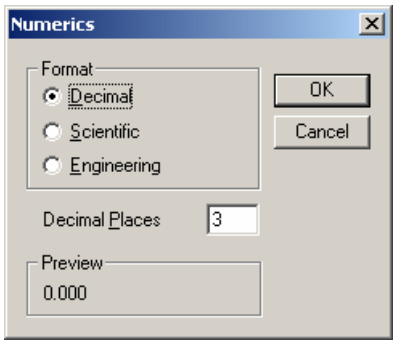
Tension/Compression Only springs

The functionality of joint springs has been extended and now allows for springs to be applied in terms of the global coordinate system or the local coordinate system of the joint to which they are attached. In addition, springs may also be specified as acting in tension or compression only. **This is a non-linear effect and will only be considered in a non-linear analysis in which tension/compression only effects are considered**.



Engineering Format

The format of real numbers can now be displayed in engineering format. This format displays the number in an exponential format but limits the exponents to be multiples of three.



Steel Designer

The following features have been modified or added to Steel Designer in this release.

BS5950

Steel Designer now supports design of rolled and welded sections to the British Standard BS5950 “Part 1- Structural use of steelwork in buildings”. Full details of this code are contained within the Steel Designer manual.

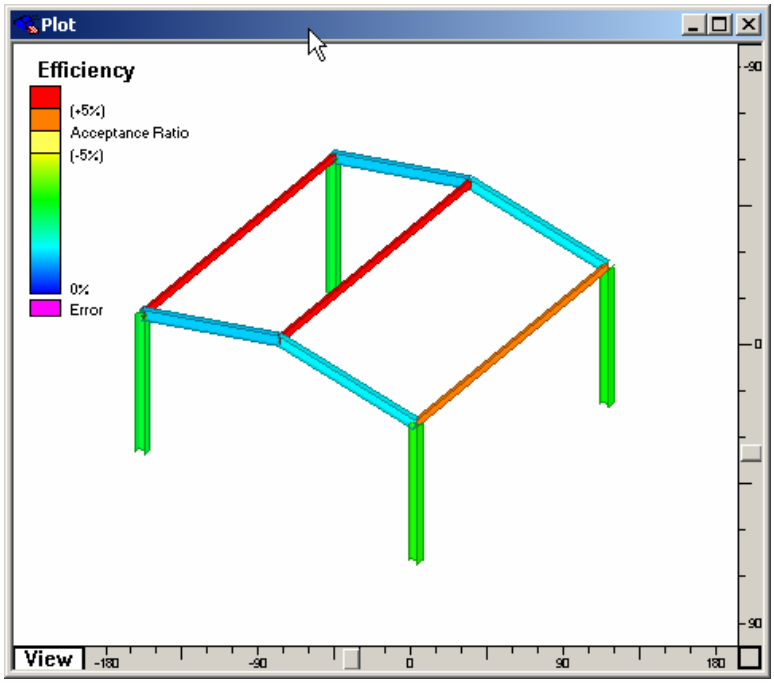
Acceptance Ratio

For design checks to AS4100, LRFD or BS5950, the efficiency at which a design check on a member is deemed to have failed can now be modified to values other than 100%. This value is known as the Acceptance Ratio. The acceptance ratio for a member is set via the Design->Options command.

Note that the acceptance ratio is only applied to strength design checks and is not considered when checking deflections or in the application of design constraints.

Efficiency Plots

The graphical presentation of design results has been improved via the introduction of a new colour scale, new legend, and support for OpenGL rendering.



The new colour scale for displaying design efficiencies highlights members that have failed or are near failure. Member that have just failed but are within 5% of the acceptance ratio are shown in orange. Members with efficiencies exceeding this are shown in red except for members that failed to be designed due to an error which are displayed in magenta. Members that have passed but have an efficiency within 5% of the acceptance ratio are shown in yellow. All other members with a successful design are shown in a colour scale that varies from blue to yellow.

Section Maker

The following features have been modified or added to Section Maker in this release.

Version 8.63

- **Fixed a problem with tapered section placement**
- **Corrected units display in Place Shape dialog**

Plastic Modulus

Section Maker now computes the plastic modulus of the shape drawn in the Shape Window. The plastic modulus about the x-x, y-y and the principal axes are all computed and displayed in the Properties Window.

Warping Constant

The value of the warping constant is now evaluated for shapes that Section Maker can identify as one of the standard shapes supported within the program. The calculation of the warping constant in based on empirical equations and provides a close estimate of the true value. For any shape not recognised as a standard shape, the warping constant will be set to zero.

Composite Sections

The evaluation of section properties for composite sections is now performed using the modular ratio theory. The user may select the material used as the reference material via the “Reference Material…” command in the Shape menu.

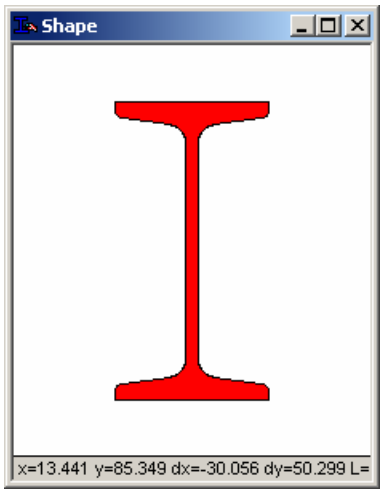
Menu Rationalisation

A large number of changes have been made to the menu to make it more intuitive.

- **The Properties, Polygons, Circles and Rectangle menu items have been moved from the Display menu into the new Display->Data submenu.**
- **The menu items for displaying graphic symbols have been moved into the new Display->Symbols submenu from both the Display and View menus .**
- **The Edit->Clear command has been renamed to Delete.**
- **The Shape menu has been split in two, all commands in relation to manipulating the geometry of a shape have been moved into a new Geometry menu.**
- **The Install command has been renamed to “Add to Library…”**
- **The Taper menu item has been moved to the Library menu and renamed “Generate Tapered Sections…”**
- **The Section menu has been renamed the Library menu**
- **The Material main menu has been moved to be a submenu in the Library menu. The Select Material command has been moved to the Shape menu and renamed to “Material…”. Furthermore, the Remove Material command has become redundant and has been removed.**
- **A new Group submenu has been created in the Library menu. This menu now contains the all the commands for adding, editing, deleting and reordering of groups, sections and fields.**

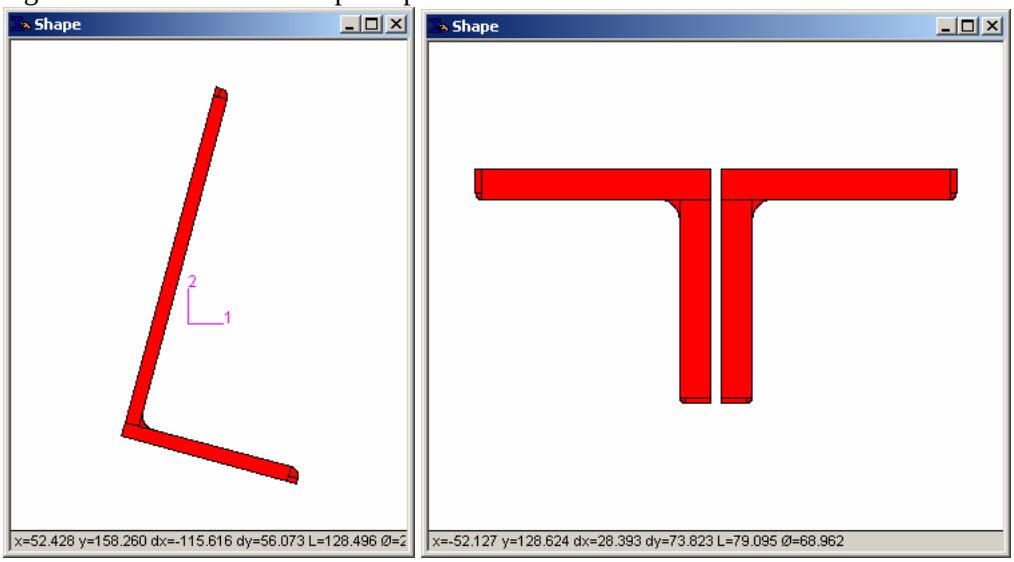
Tapered Shapes

Tapered flange sections are now supported within Section Maker. The representation of tapered shapes assumes that the flange thickness is the thickness of the flange computed midway between the tip of the flange and the web.



New Standard Sections

New standard section shapes have been added to support double angles sections and angles described about their principal axes.



New Section Properties

The following section properties can now be stored within the library

- r_0 - Polar radius of gyration about shear centre.
- H - Flexural constant as defined by Appendix E of AISC LRFD design code.
- k - Distance from outer face of flange to toe of fillet on web.
- k_1 - Distance from outer centre of web to toe of fillet on flange.
- Q_f - Statical moment of the flange.
- Q_w - Statical moment of the web.
- x_p - x position of equal area axis used in computing plastic modulus as measured from centroid.
- y_p - y position of equal area axis used in computing plastic modulus as measured from centroid.

A number of addition fields have also been added for storing the dimensions of shapes. These allow for the description of more complex shapes.

- t_1 - Additional thickness dimension.
- t_2 - Additional thickness dimension.
- s - Spacing dimension.
- taper - Flange taper angle.

In addition, there are five (5) user properties that may be used to store any property not supported within the library. These properties will be displayed in the terms of the base unit set used within Section Maker and Multiframe.

Property Window

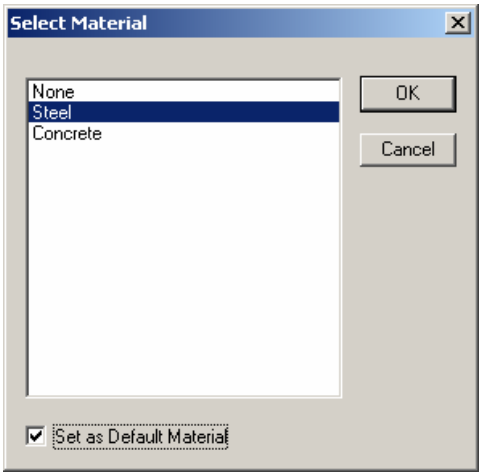
The Property window has changed from a single table view to a multi-table view that contains new tables displaying specific subsets of the section properties. The user now has the choice of viewing tables containing properties relevant to the geometric axes, the principal axes, or just the dimensions of the section. In addition, there are also tables that display all section properties, the properties of the current group selected within Section Maker or the properties of the Frame group used within Multiframe. The last

two groups can be used to help exchange section property data with Multiframe via cut and Paste into the Multiframe Add or Edit section dialogs.

Note that the section properties in the Group Table are displayed in the units of the current group. All other tables are displayed using the current units selected within Section Maker.

Default Material

A default material is now assigned to shapes drawn in the Shape Window. The default material is specified via the Select Material dialog. This dialog now has an option to set the selected material as the default material.



When the application starts or a new library is opened the default material is reset to no material.

New Polygon Commands

Two new commands have been added to assist in building complex shapes. The first of these commands allows the user to merge one or more closed polygons into a single shape. The second command complements the Merge command and allows the user to convert shapes other than polygons into closed polygons.

The merging of polygons will join all connecting or overlapping closed polygons. In doing so it considers if each of the polygons is solid or forms a hole. As such, the result of merging polygons may not be a single polygon but a number of polygons.

Align, Stack and Size commands

New commands have been added to the Geometry menu for the alignment of shapes within the Shape Window. Shapes can now be moved to align the sides or centres of all the shapes selected within the Shape Window.

Selected shapes can now be moved to align the shapes side by side or on top of one another via the new Stack commands. The Stack Horizontal command will move shapes horizontally such that the left and right edges of adjacent shapes are aligned to one another. Similarly, the Stack Vertical command will move shapes such that the top and bottom sides of adjacent shapes and aligned.

Three other commands are now available via the Geometry menu for resizing shapes to make them equal in width, height or in both directions.

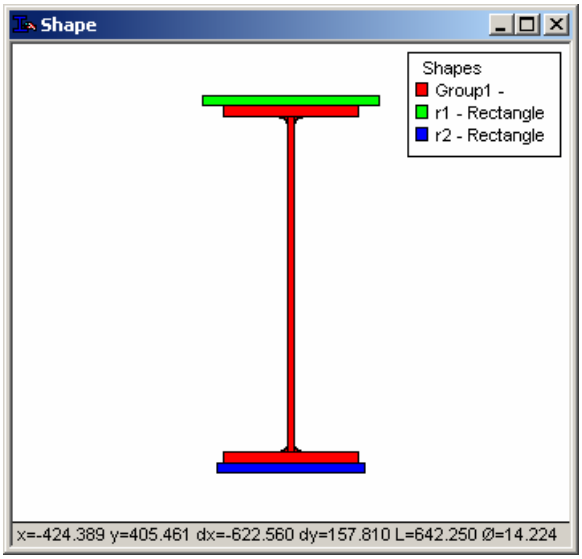
For all these commands, shapes will be resized or aligned to the shape that was selected first. A Geometry toolbar incorporating all these commands has also been added to the user interface. The display of this toolbar can be toggled via the View->Toolbars submenu.

Colours and Legends

Drawing in the Shape window has been enhanced by the introduction of a number of options for choosing the colour used to draw each shape displayed within the window.

- **No Colour scheme – Shapes all drawn in black**
- **By Shape – Each shape or section is drawn in an individual colour.**
- **By Material – Each shape is drawn in the colour of it's material.**
- **By Shape Type – The type of shape (i.e. box, tube, polygon, etc.) is used to determine the colour in which a shape is drawn.**

A feature of the legend is that all items corresponding to a particular item in the legend can be selected by simple double clicking on the text of that legend item. In most cases the colour of a legend item can be changed by simply double clicking on the colour box associated with each item.

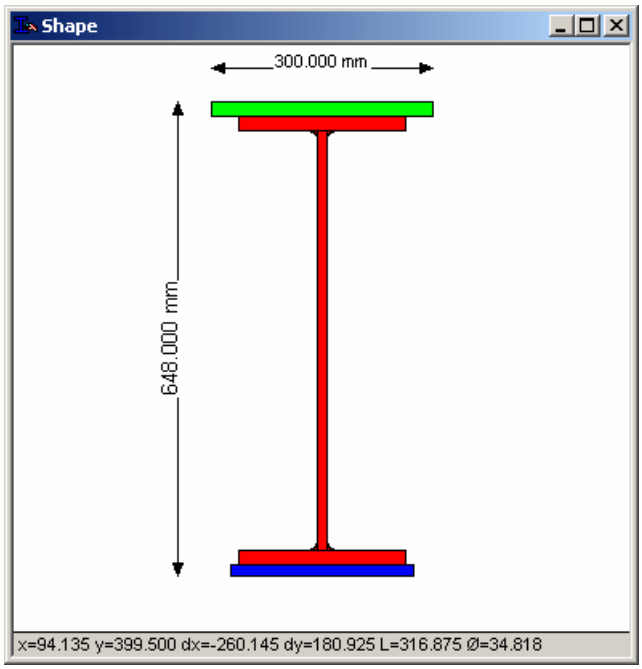


Symbols

The display of symbols has been rationalised with the grouping of all symbol commands into a new Symbols submenu. A new Symbols toolbar has also been added to provide access to many of these commands.

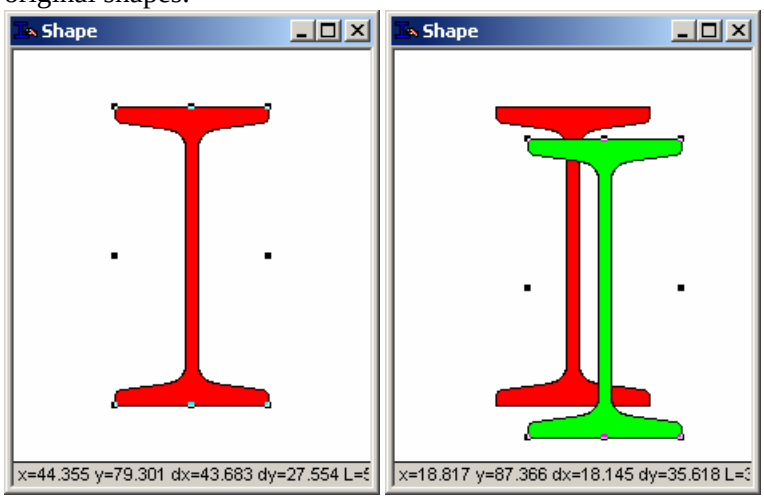
Shape Dimensions

The overall dimensions of a shape may now be displayed in the Shape Window. In addition, internal dimensions showing the position of the centroid can also be shown in this window. The display of these dimension are toggled via the command in the Display->Symbols submenu.



Copy and Paste Shapes

Shapes selected within the Shape Window can now be cut, copied and pasted within the window. The duplicate shapes will be inserted into the window offset slightly from the original shapes.



Note that the existing behaviour of the copy command to place an image of the windows contents onto the clipboard has been preserved.

Duplicating Groups

A new command has been added for creating a duplicate of a group. The group that is currently displayed in the Group Window can be duplicated using the Library->Groups->Duplicate command. This command adds a new group to the library and all properties of the current group and sections within this group are then copied to the new group.

Section Mover

When groups are moved between libraries using Section Mover, any materials referenced by the sections in that group will also be moved to the destination library if a corresponding material does not already exist in that library.

Drawing Grid

The existing drawing grid used within Section Maker has been improved. Grid lines are now drawn as solid light grey lines and grid snap has been modified to only snap to the grid when the cursor is close to a grid point.

Graphical Enhancements

A number of graphical enhancements have been made to the program to improve the look and feel of the program when drawing or dragging within the Shape window.

Problems Fixed

This version fixes the following problems experienced with previous versions of Multiframe, Steel Designer or Section Maker.

- **Efficiency plots were not refreshed when design data was modified.**
- **Design tables in Result and Data windows were not refreshed when design data was modified.**
- **Orientation of section shapes in rendering was incorrect.**
- **Headings of last two columns in Member Efficiency table for AS4100 where incorrect.**
- **Best Section can now be edited via Efficiency Table in Result Window.**
- **Ctrl+A selects all in Report Window.**

Problem Reports

We greatly appreciate any bug reports or suggestions we receive, please keep them coming. Please continue to report any bugs or anomalies you find:

Fax: +61 8 9335 1526 Email: support@formsys.com

You can also lodge your problem reports via our web site at the following location:
http://www.formsys.com/Multiframe/MFSupport/MFProblemReport.html

When emailing reports, please attach the frame and sections library with your message.