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STAAD.Pro - RC Designer



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Table of Contents

SECTION 1. GENERAL OVERVIEW.....	6
1.1. Introduction.....	6
SECTION 2. HOW TO USE RC DESIGNER	7
2.1. Page Control Layout.....	7
2.2. Design Layer Mode.....	7
2.3. Job Information Page.....	8
2.4. Envelopes Page.....	8
2.5. Members Page.....	9
2.6. Groups / Briefs Page.....	9
2.7. Design Mode.....	9
2.8. BS 8110 Beam.....	10
2.8.1. BS8110 Beam Summary Page.....	10
2.8.2. BS8110 Beam Design Page.....	10
2.8.3. BS8110 Beam Main Layout Page.....	10
2.8.4. BS8110 Beam Main Reinforcement Page.....	10
2.8.5. BS8110 Beam Shear Layout Page.....	11
2.8.6. BS8110 Beam Shear Reinforcement Page.....	11
2.8.7. BS8110 Beam Drawing Page.....	11
2.9. BS 8110 Beam Brief.....	11
2.9.1. General.....	11
2.9.2. Main Reinforcement.....	12
2.9.3. Shear Reinforcement.....	12
2.10. BS8110 Column.....	12
2.10.1. BS8110 Column Summary Page.....	12
2.10.2. BS8110 Column Input Page.....	13
2.10.3. BS8110 Column Design Page.....	13
2.10.4. BS8110 Column Main Layout Page.....	13
2.10.5. BS8110 Column Shear Layout Page.....	13
2.10.6. BS8110 Column Result Page.....	13
2.10.7. BS8110 Column Drawing Page.....	13
2.11. BS8110 Column Brief.....	14
2.11.1. General.....	14
2.11.2. Column Factors.....	14
2.11.3. Member Combinations.....	14
2.12. Eurocode 2 Beam.....	14
2.12.1. Eurocode 2 Beam Summary Page.....	15
2.12.2. Eurocode 2 Beam Design Page.....	15
2.12.3. Eurocode 2 Beam Main Layout Page.....	15
2.12.4. Eurocode 2 Beam Main Reinforcement Page.....	15
2.12.5. Eurocode 2 Beam Shear Layout Page.....	15
2.12.6. Eurocode 2 Beam Shear Reinforcement Page.....	16
2.12.7. Eurocode 2 Beam Drawing Page.....	16
2.13. Eurocode 2 Beam Brief.....	16
2.13.1. General.....	16
2.13.2. Main Reinforcement.....	16
2.13.3. Shear Reinforcement.....	17
2.13.4. Boxed Values - General.....	17
2.13.5. Boxed Values - Anchorage's and Laps.....	18
2.13.6. Boxed Values - Shear.....	18
2.14. Eurocode 2 Column.....	18
2.14.1. Eurocode 2 Column Summary Page.....	18
2.14.2. Eurocode 2 Column Input Page.....	19
2.14.3. Eurocode 2 Column Design Page.....	19
2.14.4. Eurocode 2 Column Main Layout Page.....	19
2.14.5. Eurocode 2 Column Shear Layout Page.....	19
2.14.6. Eurocode 2 Column Result Page.....	19

2.14.7.	<i>Eurocode 2 Column Drawing Page</i>	20
2.15.	<i>Eurocode 2 Column Brief</i>	20
2.15.1.	<i>General</i>	20
2.15.2.	<i>Column Factors</i>	20
2.15.3.	<i>Boxed Values Main</i>	20
2.15.4.	<i>Boxed Values Shear</i>	21
2.15.5.	<i>Member Combinations</i>	21
SECTION 3. ENGINEERING INFORMATION		22
3.1.	<i>Basic Principles</i>	22
3.1.1.	<i>Introduction:</i>	22
3.2.	<i>Suitable member properties:-</i>	22
3.2.1.	<i>Beam Design Briefs</i>	22
3.2.2.	<i>Column Design Briefs</i>	22
3.3.	<i>Filenames:</i>	23
3.4.	<i>Engineering Information</i>	23
3.5.	<i>BS8110 Beam Design Principles</i>	24
3.5.1.	<i>Introduction</i>	24
3.5.2.	<i>Design for Flexure</i>	24
3.5.3.	<i>Design for Shear</i>	25
3.5.4.	<i>Anchorage and Bond Lengths</i>	25
3.6.	<i>BS8110 Column Design Principles</i>	26
3.6.1.	<i>Introduction</i>	26
3.6.2.	<i>Principles</i>	26
3.7.	<i>Eurocode 2 Beam Design Principles</i>	28
3.7.1.	<i>Introduction</i>	28
3.7.2.	<i>Design for Flexure</i>	28
3.7.3.	<i>Design For Shear</i>	29
3.7.4.	<i>Anchorage and Bond Length</i>	29
3.8.	<i>Eurocode 2 Column Design Principles</i>	30
3.8.1.	<i>Introduction</i>	30
3.8.2.	<i>Design Principles</i>	30
SECTION 4. REFERENCE		33
4.1.	<i>Commands</i>	33
4.1.1.	<i>FILE</i>	33
4.1.2.	<i>EDIT</i>	33
4.1.3.	<i>VIEW</i>	33
4.1.4.	<i>SELECT</i>	33
4.1.5.	<i>MEMBERS</i>	34
4.1.6.	<i>BRIEF</i>	34
4.1.7.	<i>GROUP</i>	34
4.1.8.	<i>DESIGN</i>	34
4.1.9.	<i>RESULTS</i>	34
4.1.10.	<i>DRAWING</i>	34
4.1.11.	<i>MODE</i>	35
4.1.12.	<i>WINDOW</i>	35
4.1.13.	<i>HELP</i>	35
4.2.	<i>Open Link File Ctrl+N</i>	35
4.3.	<i>Re-open... Ctrl+O</i>	35
4.4.	<i>Save Ctrl+S</i>	35
4.5.	<i>Job Information</i>	36
4.6.	<i>Report Setup</i>	37
4.7.	<i>Printer Setup</i>	40
4.8.	<i>Print Ctrl+P</i>	41
4.9.	<i>Print Preview</i>	42
4.10.	<i>Exit</i>	42
4.11.	<i>Undo Ctrl+Z</i>	43
4.12.	<i>Cut Ctrl+X</i>	43
4.13.	<i>Copy Ctrl+C</i>	43

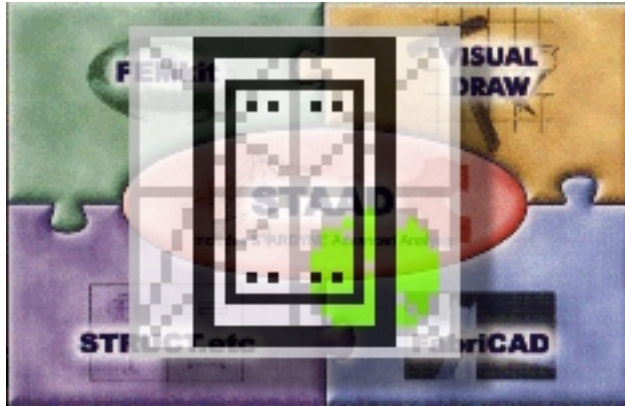
4.14.	Copy Picture.....	43
4.15.	Paste Ctrl+V.....	44
4.16.	Delete Del.....	44
4.17.	Take Picture.....	44
4.18.	Go To... F5.....	45
4.19.	Zoom.....	45
4.20.	Tables.....	46
4.21.	Structure Diagrams.....	46
4.21.1.	<i>General Tab</i>	46
4.21.2.	<i>Results Tab</i>	46
4.21.3.	<i>Scales Tab</i>	47
4.21.4.	<i>Labels Tab</i>	47
4.21.5.	<i>Force Limits Tab</i>	47
4.22.	Colours.....	48
4.23.	Orientation F4.....	48
4.24.	Labels.....	49
4.25.	Whole Structure.....	50
4.26.	Open View.....	50
4.27.	New View.....	51
4.28.	View Management.....	51
4.28.1.	<i>Detach View</i>	51
4.28.2.	<i>Add to View</i>	51
4.28.3.	<i>Save View</i>	51
4.28.4.	<i>Rename View</i>	52
4.29.	Toolbars.....	52
4.30.	Options.....	52
4.30.1.	<i>Tables Tab</i>	53
4.30.2.	<i>Node Labels Tab</i>	53
4.30.3.	<i>Annotation Labels Tab</i>	53
4.30.4.	<i>Element Labels Tab</i>	54
4.30.5.	<i>View Highlights Tab</i>	55
4.30.6.	<i>Structure Units Tab</i>	55
4.30.7.	<i>Section Units Tab</i>	56
4.30.8.	<i>Force Units Tab</i>	56
4.31.	Elements Cursor.....	57
4.32.	Members Cursor.....	57
4.33.	Select All.....	57
4.34.	By Member.....	57
4.35.	By Section Property.....	58
4.36.	By Design Group.....	58
4.37.	New Design Group.....	58
4.38.	Members Table.....	58
4.39.	Form Member.....	59
4.40.	AutoForm Members.....	59
4.41.	Design Brief.....	59
4.42.	Design Brief Table.....	60
4.43.	Select By Design Group.....	60
4.44.	Group Members List Table.....	60
4.45.	Design Group Table.....	61
4.46.	Design Options.....	61
4.46.1.	<i>Member Select Tab</i>	61
4.47.	Design Now.....	61
4.48.	Design Results Setup.....	61
4.48.1.	<i>Display Groups Tab</i>	62
4.48.2.	<i>Colour Config Tab</i>	62
4.49.	Individual Graphs.....	62
4.50.	Main Reinforcement Diagram.....	63
4.50.1.	<i>Beam Design</i>	63
4.50.2.	<i>Column Design</i>	65
4.51.	Shear Reinforcement Diagram.....	65

4.51.1.	Beam Design.....	65
4.51.2.	Column Design.....	66
4.52.	Plan View.....	67
4.53.	Beam Spans.....	67
4.54.	Main Reinforcement.....	67
4.55.	Shear Links.....	68
4.56.	Shear Zones.....	68
4.57.	Deflection.....	69
4.58.	Scheduled Bars.....	69
4.59.	Member Summary.....	69
4.60.	Clear Results.....	69
4.61.	Export to Multi RC.....	69
4.61.1.	Preview Window.....	70
4.61.2.	Size and Spacing.....	70
4.61.3.	Title Block.....	70
4.61.4.	Cut Section.....	70
4.61.5.	Spacing.....	70
4.62.	Design Layer.....	71
4.63.	Design.....	71
4.64.	Page Control.....	71
4.65.	Cascade.....	71
4.66.	Tile Horizontal.....	71
4.67.	Tile Vertical.....	71
4.68.	Arrange Icons.....	71
4.69.	Structure Only.....	71
4.70.	Contents.....	72
4.71.	Search for Help On.....	72
4.72.	Using Help.....	72
4.73.	About STAAD/Pro RC.....	72

Section 1. General Overview

1.1. Introduction

Welcome to the STAAD/Pro Reinforced Concrete Designer (RC Designer). This is part of the STAAD/Pro Design Studio. For information on other components of the STAAD/Pro Design Studio, refer to separate documentation.



The STAAD/Pro Reinforced Concrete Designer (RC Designer) is a post processor that works from the STAAD/Pro analysis results. The data is passed into RC Designer includes the geometry, section and material properties, loads and combination information and analysis results.

This manual is divided into three sections that will help you find the answers you are looking for.



Section 2

How to use RC Designer



Section 3

Engineering Information



Section 4

Reference

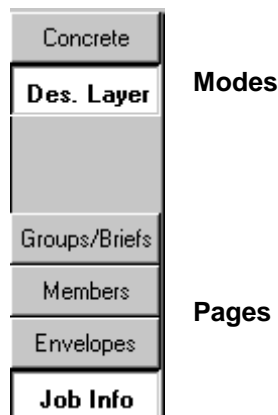


Section 2. How to use RC Designer

2.1. Page Control Layout

As with STAAD/Pro, RC Designer operates with Page Control. Each mode has 'Pages' that set the layout of the application. To turn the Page Control menu on / off, select 'Page Control' from the Mode menu.

The Page Control menu is comprised of two sets of the buttons, the top set which indicate the Mode and the lower set which are the Pages. The Pages are dependent upon the current Mode.



There are 2 stages in completing a design in RC Designer, they have been separated into 2 modes, similar in principle to the Modeling Mode and Post Processing Mode of STAAD/Pro. These modes are:-

- 1) Design Layer
This is used to set out the overall parameters of the design including which design code is to be implemented and which members are to be grouped and designed together. Once a Design Group is defined and assigned a Design Brief, then the Design Mode can be entered.
- 2) Concrete Design
The Design Mode is determined by the Design Code associated with the current Design Group. This allows the user to perform the design and interrogate the design results.

It is also possible to switch off Page Control from the Mode Menu if the additional space on the left side of the screen is required.

2.2. Design Layer Mode

There are four 'Pages' in the Design Layer. Each page lays out the screen so that the user can easily step through the process of setting up and checking data. They are read from the bottom left corner upwards. The pages in the Design Layer are:-

Job Information
Envelopes
Members
Groups / Briefs

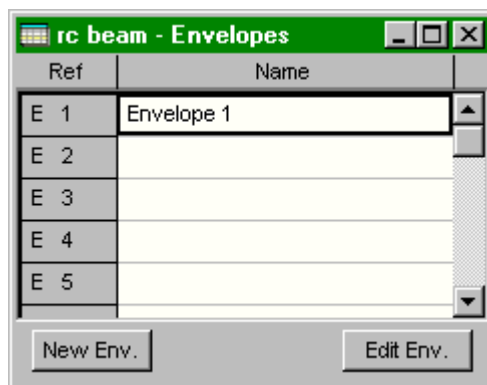
2.3. Job Information Page

The Job Information Page is to allow the user to add additional information into the Job Information dialog box.

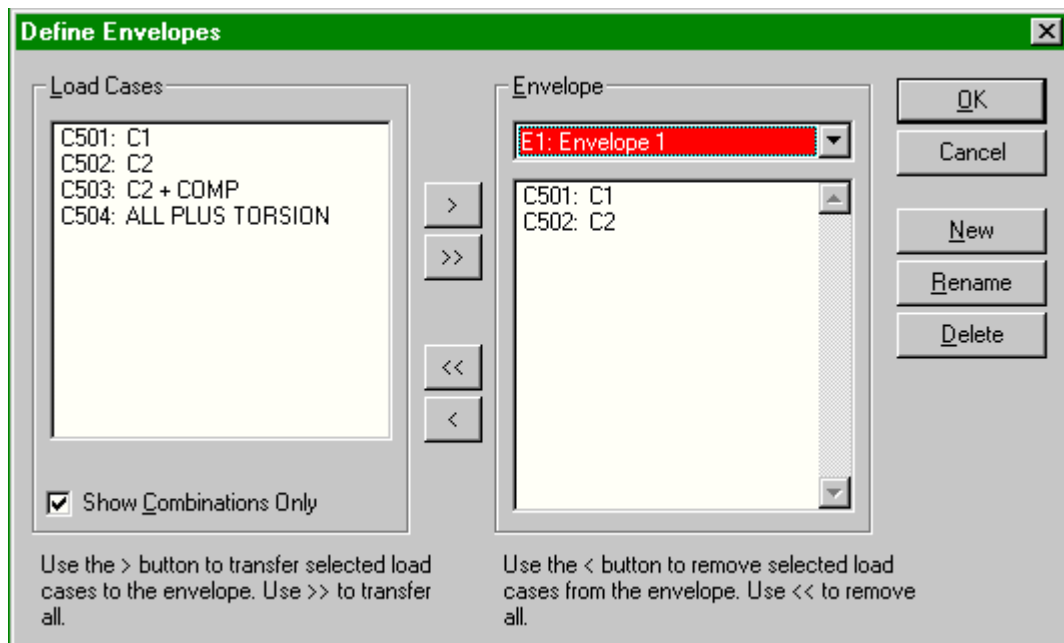
When RC Designer is first opened, the Job Information dialog is populated with the Job Information entered in STAAD/Pro.

2.4. Envelopes Page

The Envelopes Page is to allow the user to define envelopes of basic loadcases and combination loadcases that have been defined in the analysis model. Envelopes are required for Beam Design Briefs.



Clicking on the New Env. Button prompts for an envelope name, then opens the envelope edit dialog.



Basic loadcases and combinations included in the envelope by selecting them from the Load Cases list on the left and transferring them to the Envelope list on the right by highlighting them, by clicking on the loadcase name and clicking on the > button. To include them all, click on the >> button. To remove them again, highlight it as above in the Envelope list and click on the < button. To remove them all click on the << button.

To display all basic loadcases as well as the combinations, ensure that the Show Combinations Only check box is not set.

2.5. Members Page

The Members Page is to allow the user to combine together a number of individual beam elements and create members. All designs are performed on these members.

2.6. Groups / Briefs Page

The Groups / Briefs Page is to allow the user to define Design Groups and setup the parameters in Design Briefs. Any number of Design Groups and Design Briefs can be defined, however it is important to note that it is only possible to enter the Design Mode if the security device supports the design code associated with the Design Brief of the current Design Group.

2.7. Design Mode

The design mode is dependent on the Design Code associated with the current Design Group.

Design Codes that are currently available include:-

- BS 8110 Beam**
- BS8110 Column**
- Eurocode 2 Beam**
- Eurocode 2 Column**

To enter the Design Mode either select the option 'Design' from the Modes menu, or if Page Control is active, click on the 'Concrete' button from the Page Control menu on the left of the screen.

2.8. BS 8110 Beam

With this Brief there are seven pages.. Each page lays out the screen so that the user can easily step through the process of setting up and checking data. They are read from the bottom left corner upwards.

Summary
Design
Main Layout
Main Reinforcement
Shear Layout
Shear Reinforcement
Drawing

2.8.1. BS8110 Beam Summary Page

The **Summary Page** displays the summary of the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Member Summary Table on the right.

2.8.2. BS8110 Beam Design Page

The **Design Page** is similar to the Summary Page, but on entering the page the Design Options dialog box is opened allowing the design to be initiated.

2.8.3. BS8110 Beam Main Layout Page

The **Main Layout Page** graphically displays the main reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a main reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.8.4. BS8110 Beam Main Reinforcement Page

The **Main Reinforcement Page** displays the main reinforcement resulting from the design of the current Design Group as numerical data.

The page is laid out with a Structure View window on the left and a main reinforcement table for the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.8.5. BS8110 Beam Shear Layout Page

The **Beam Shear Layout Page** displays the shear reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Shear reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.8.6. BS8110 Beam Shear Reinforcement Page

The **Beam Shear Reinforcement Page** displays the shear reinforcement resulting from the design of the current Design Group as numerical data.

The page is laid out with a Structure View window on the left with a Shear reinforcement table and a Shear Zones table on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.8.7. BS8110 Beam Drawing Page

The **Drawing Page** is used to generate a Multi-RC drawing file.

The page is laid out with a Structure View on the left and a Bar Bending Schedule table for the current member on the right. When entering the page an Export dialog box is automatically opened with the current beam information loaded.

2.9. BS 8110 Beam Brief

The BS8110 Beam Design Brief has 3 tabs for setting out the design parameters:

2.9.1. General

Minimum covers. Set the cover to the top, bottom and sides of the beams.

Bond Co-efficients. Set the values for use in calculating the anchorage lengths.

Aggregate size. The maximum size of aggregate.

Concrete Grade. Either select a standard grade from the pulldown list or enter the concrete cube strength into the user value.

Envelope. The beams will be designed to the forces from the envelope selected from the pulldown list. (See section 11.6.3 for the Define Envelope command)

Divide Beam. Set the minimum number of segments that each member should be divided into for calculating the reinforcement.

2.9.2. Main Reinforcement

Top Bar Criteria. Set the Minimum and Maximum allowable bar sizes to be used on the top of the beams. The link hanger size is used for detailing where no reinforcement bars are required for bending, but bars are required for supporting links. The Min gap defines the spacing between the top 2 layers.

Bottom Bar Criteria. Set the Minimum and Maximum allowable bar sizes to be used on the bottom of the beams. The link hanger size is used for detailing where no reinforcement bars are required for bending, but bars are required for supporting links. The Min gap defines the spacing between the bottom 2 layers.

Side Bar Criteria. Set either the minimum bar size to be used or let the program calculate which bars can be used to achieve a 250mm c/c spacing on deep beams.

Main Bar Type. Either select a standard grade from the pulldown list or enter the steel yield strength into the user value and set the bending dimensions to be used with that strength.

2.9.3. Shear Reinforcement

Design Shear For. Select either centre line or column face. Select Enhanced Shear Effects to include clause 3.4.5.8. Select Include Axial Load Effects to include clause 3.4.5.12

Shear Bar Criteria. Select the minimum bar size and number of legs to be used and set the minimum spacing. Select either open or closed links to determine the link shape codes to be used with the schedule and link to Multi-RC.

Shear Bar Type. Either select a standard grade from the pulldown list or enter the steel yield strength into the user value and set the bending dimensions to be used with that strength.

2.10.BS8110 Column

With this Brief there are seven pages. Each page lays out the screen so that the user can easily step through the process of setting up and checking data. They are read from the bottom left corner upwards.

Summary
Input
Design
Main Layout
Shear Layout
Result
Drawing

2.10.1. BS8110 Column Summary Page

The **Summary Page** displays the summary of the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Member Summary Table on the right.

2.10.2. BS8110 Column Input Page

The **Input Page** displays the summary of the design of the current Design Group.

The page is laid out with a Structure View window on the left and the Column Input table on the right. The Input table is used to set the directions in which columns are braced.

2.10.3. BS8110 Column Design Page

The **Design Page** is similar to the Summary Page, but on entering the page the Design Options dialog box is opened allowing the design to be initiated.

2.10.4. BS8110 Column Main Layout Page

The **Main Layout Page** graphically displays the main reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a main reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.10.5. BS8110 Column Shear Layout Page

The **Beam Shear Layout Page** displays the shear reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Shear reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.10.6. BS8110 Column Result Page

The **Result Page** displays the reinforcement resulting from the design of the current Design Group as numerical data.

The page is laid out with a Structure View window on the left and a main reinforcement table for the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.10.7. BS8110 Column Drawing Page

The **Drawing Page** is used to generate a Multi-RC drawing file.

The page is laid out with a Structure View on the left and a Bar Bending Schedule table for the current member on the right. When entering the page an Export dialog box is automatically opened with the current beam information loaded.

2.11.BS8110 Column Brief

The BS8110 Column Design Brief has 3 tabs for setting out the design parameters:-

2.11.1. General

Concrete grade, f_{cu} , either selected as a standard grade (C30 to C50) or a user specified value (N/mm^2).

Aggregate size.

Cover to shear links.

Main steel strength, f_y , either selected as type T ($460 N/mm^2$), R ($250 N/mm^2$) or a user specified value.

If a user value is specified, the minimum bending radii and anchorage provided by a bend may also be specified.

Minimum and maximum main bar sizes to be used in finding the most efficient arrangement.

Link steel strength, as for main steel.

Minimum link size.

2.11.2. Column Factors

Bracing conditions in x-x and y-y directions.

Effective length factors in x-x and y-y directions.

Slenderness limits. This may be set conservatively as 1, or calculated iteratively.

Area provided by starter bars (for checking the final percentage of steel).

2.11.3. Member Combinations

Select from the available list of combinations for those that are required for the design by selecting them and pressing the '>' button. Pressing '>>' will select all the available combination results for design.

2.12.Eurocode 2 Beam

With this Brief there are seven pages.. Each page lays out the screen so that the user can easily step through the process of setting up and checking data. They are read from the bottom left corner upwards.

Summary
Design
Main Layout
Main Reinforcement
Shear Layout
Shear Reinforcement
Drawing

2.12.1. Eurocode 2 Beam Summary Page

The **Summary Page** displays the summary of the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Member Summary Table on the right.

2.12.2. Eurocode 2 Beam Design Page

The **Design Page** is similar to the [Summary Page](#), but on entering the page the Design Options dialog box is opened allowing the design to be initiated.

2.12.3. Eurocode 2 Beam Main Layout Page

The **Main Layout Page** graphically displays the main reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a main reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.12.4. Eurocode 2 Beam Main Reinforcement Page

The **Main Reinforcement Page** displays the main reinforcement resulting from the design of the current Design Group as numerical data.

The page is laid out with a Structure View window on the left and a main reinforcement table for the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.12.5. Eurocode 2 Beam Shear Layout Page

The **Beam Shear Layout Page** displays the shear reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Shear reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.12.6. Eurocode 2 Beam Shear Reinforcement Page

The **Beam Shear Reinforcement Page** displays the shear reinforcement resulting from the design of the current Design Group as numerical data.

The page is laid out with a Structure View window on the left with a Shear reinforcement table and a Shear Zones table on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.12.7. Eurocode 2 Beam Drawing Page

The **Drawing Page** is used to generate a Multi-RC drawing file.

The page is laid out with a Structure View on the left and a Bar Bending Schedule table for the current member on the right. When entering the page an Export dialog box is automatically opened with the current beam information loaded.

2.13. Eurocode 2 Beam Brief

The Eurocode 2 Beam Brief has 6 tabs for setting out the design parameters:-

2.13.1. General

Minimum covers. Set the cover to the top, bottom and sides of the beams.

Bond Co-efficients. Set the values for use in calculating the anchorage lengths.

Aggregate size. The maximum size of aggregate.

Concrete Grade. Either select a standard grade from the pulldown list or enter the concrete cube strength into the user value f_{ck} in N/mm^2 .

Envelope. The beams will be designed to the forces from the envelope selected from the pulldown list. (See section 11.6.3 for the Define Envelope command)

Divide Beam. Set the minimum number of segments that each member should be divided into for calculating the reinforcement.

2.13.2. Main Reinforcement

Top Bar Criteria. Set the Minimum and Maximum allowable bar sizes to be used on the top of the beams. The link hanger size is used for detailing where no reinforcement bars are required for bending, but bars are required for supporting links. The Min gap defines the spacing between the top 2 layers.

Bottom Bar Criteria. Set the Minimum and Maximum allowable bar sizes to be used on the bottom of the beams. The link hanger size is used for detailing where no

reinforcement bars are required for bending, but bars are required for supporting links. The Min gap defines the spacing between the bottom 2 layers.

Side Bar Criteria. Set either the minimum bar size to be used or let the program calculate which bars can be used to achieve a 250mm c/c spacing on deep beams.

Main Bar Type. Either select a standard grade from the pulldown list or enter the steel yield strength into the user value and set the bending dimensions to be used with that strength.

2.13.3. Shear Reinforcement

Design Shear For. Select either centre line or column face. Select option to include for Enhanced Shear Effects close to supports.

Shear Bar Criteria. Select the minimum bar size and number of legs to be used and set the minimum spacing. Select either open or closed links to determine the link shape codes to be used with the schedule and link to Multi-RC.

Shear Bar Type. Either select a standard grade from the pulldown list or enter the steel yield strength into the user value and set the bending dimensions to be used with that strength.

2.13.4. Boxed Values - General

These can all be set to use the values from a National Application Document by selecting the country from the pulldown list. Alternatively, a user set of values can be set.

Partial Safety factors for concrete and steel.

Additional factor for sustained compression.

Maximum reinforcement percentage of tension and compression reinforcement.

K factor used in equation 4.78

fct(eff) factor used in equation 4.78

sigma s used in equation 4.78 as a percentage of fyk.

Steel stress for determining the maximum bar size in table 4.11 as a percentage of fyk.

Steel stress for determining the maximum bar spacing in table 4.12 as a percentage of fyk.

Checks on the bar spacing is not less than a) $d_g + 5\text{mm}$ when $d_g > 32\text{mm}$ (always), b) the maximum bar diameter (optional), c) a minimum distance set by the user (optional).

2.13.5. Boxed Values - Anchorage's and Laps

Limit of overall section for a good anchorage bond in mms.

Minimum distance from top surface to provide a good anchorage in mms.

Minimum anchorage length in mms.

Minimum cover perpendicular to hooks to determine alpha a factor in equation 5.4, measured in bar diameters.

Co-efficient alpha 1, the upper and lower limits in bar diameters.

The upper limit of the diameter of bar for which nominal shear reinforcement is sufficient at the laps in mms.

Maximum distance between bars that are considered to be lapped, measured in bar diameters.

2.13.6. Boxed Values - Shear

Maximum diameter of link bars in mms

The maximum spacing of links when V_{Sd} is greater than $2/3 V_{Rd2}$ and when it is less than or equal to $2/3 V_{Rd2}$. Both measured in mms.

The maximum transverse spacing of links, measured in mms.

The upper limit of beta, the shear force enhancement coefficient used in equation 4.17.

For equation 4.18, the following values can be set. The values in calculating the constant k, the average stress in the concrete due to axial force, σ_{cp} and the maximum value of the reinforcement ratio corresponding to the area of reinforcement effective at the section under consideration.

2.14. Eurocode 2 Column

With this Brief there are seven pages. Each page lays out the screen so that the user can easily step through the process of setting up and checking data. They are read from the bottom left corner upwards.

Summary
Input
Design
Main Layout
Shear Layout
Result
Drawing

2.14.1. Eurocode 2 Column Summary Page

The **Summary Page** displays the summary of the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Member Summary Table on the right.

2.14.2. Eurocode 2 Column Input Page

The **Input Page** displays the summary of the design of the current Design Group.

The page is laid out with a Structure View window on the left and the Column Input table on the right. The Input table is used to set the directions in which columns are braced.

2.14.3. Eurocode 2 Column Design Page

The **Design Page** is similar to the Summary Page, but on entering the page the Design Options dialog box is opened allowing the design to be initiated.

2.14.4. Eurocode 2 Column Main Layout Page

The **Main Layout Page** graphically displays the main reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a main reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.14.5. Eurocode 2 Column Shear Layout Page

The **Beam Shear Layout Page** displays the shear reinforcement resulting from the design of the current Design Group.

The page is laid out with a Structure View window on the left and a Shear reinforcement diagram of the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.14.6. Eurocode 2 Column Result Page

The **Result Page** displays the reinforcement resulting from the design of the current Design Group as numerical data.

The page is laid out with a Structure View window on the left and a main reinforcement table for the current member on the right. The current member can be changed by selecting it from the pulldown menu on the second toolbar or by clicking on a member in the current Design Group on the Structure View window.

2.14.7. Eurocode 2 Column Drawing Page

The **Drawing Page** is used to generate a Multi-RC drawing file.

The page is laid out with a Structure View on the left and a Bar Bending Schedule table for the current member on the right. When entering the page an Export dialog box is automatically opened with the current beam information loaded.

2.15. Eurocode 2 Column Brief

The Eurocode 2 Column Brief has 5 tabs for setting out the design parameters:-

2.15.1. General

Concrete strength, either select a standard grade or specify a user value for the concrete crushing strength, f_{ck} in N/mm² (default C35/45)

Aggregate. Specify the largest nominal aggregate size d_g in mm (default 20mm).

Cover to the main reinforcement in mm (default 30mm).

Steel grade of the main reinforcement bars or specify a user value of the yield strength f_y in N/mm² (default S400). If a user value is selected, then the associated bending radii should be set as well as the anchorage of the bar.

The Minimum and Maximum sizes of main bars to use in calculating the most efficient design (default Min 12 and Max 40).

Steel grade of the shear reinforcement bars or specify a user value of the yield strength f_{yv} in N/mm² (default S220). If a user value is selected, then the associated bending radii should be set as well as the anchorage of the bar.

Minimum size of shear link bars (default 8).

2.15.2. Column Factors.

Slenderness factor, K. Either set to 1 or automatically calculated (the default).

Value of the inclination from vertical to be used in equation 4.61 (default 0.005).

Effective length factors in the local y-y and z-z axes (default 1 for both)

Area of starter bars (default 4 number 16mm diameter bars = 804mm²)

Maximum spacing between main bars (default 300mm)

Minimum spacing between shear links bars (default 100mm)

2.15.3. Boxed Values Main

These can all be set to use the values from a National Application Document by selecting the country from the pulldown list. Alternatively, a user set of values can be set.

Partial Safety factors for concrete and steel.

Sustained compression factor for rectangular and circular sections.

Reinforcement percentages, both the maximum value the minimum can hold in equation 5.13 and overall maximum percentage of the cross section of the concrete.

Minimum number of bars in a circular section.

Minimum transverse dimension of a section.

Upper slenderness limit for the model column method.

Checks on the bar spacing is not less than a) $d_g + 5\text{mm}$ when $d_g > 32\text{mm}$ (always), b) the maximum bar diameter (optional), c) a minimum distance set by the user (optional).

2.15.4. Boxed Values Shear

For the selected Country the following boxed values for the shear calculations can be set.

Minimum diameter of links or a fraction of the diameter of the longitudinal bars.

Check on the minimum spacing of the links, a) a user multiple of the largest longitudinal bar diameter, b) the least diameter of the column, c) a minimum distance specified by the user. Note that at least one of these options must be set.

Equation 4.18. Set the value of from which k is calculated and its minimum limit. The co-efficient that σ_{cp} , the average stress in the concrete due to axial force, is multiplied by. The limit of the reinforcement ratio corresponding to A_{sl} .

2.15.5. Member Combinations

Select from the available list of combinations for those that are required for the design by selecting them and pressing the '>' button. Pressing '>>' will select all the available combination results for design.



Section 3. Engineering Information

3.1. Basic Principles

3.1.1. Introduction:

STAAD/Pro RC Designer is started by selecting the menu option **Run StaadPro RC Design** from STAAD/Pro. When this is done a link file is produced that contains the basic data for creating concrete designs. This data is created each time the program is started. Additional data that is created during the use of the program is stored, such as the members, envelopes, design groups and design briefs is stored in a persistent file. This means that if the program is closed and re-opened at a later date, the data remains available and does not need to be re-entered.

Note that at any time the persistent data can be removed by selecting the re-load link option from the File menu.

3.2. Suitable member properties:-

Concrete design can only be performed on beam elements (not plate or solid elements) that have been defined with the following section property commands:-

3.2.1. Beam Design Briefs

Rectangular or Square sections

PRISMATIC YD ZD

or

User Table PRISMATIC

Tee shaped sections

PRISMATIC YD ZD YB ZB

or

User Table TEE

3.2.2. Column Design Briefs

Rectangular or Square sections

Prismatic YD

or

User Table PRISMATIC

Circular sections

Prismatic YD

(No User Table)

3.3. Filenames:

These are the files that are used by STAAD/Pro RC Designer:-

<filename>.std	Structure Input file.
<filename>.ben	Analysis result file.
<filename>.bmd	Analysis result file.
<filename>.dbs	Analysis result file.
<filename>.dsp	Analysis result file.
<filename>.rea	Analysis result file.
<filename>.scn	Analysis result file.
<filename>.sec	Analysis result file.
<filename>.Rei_Concrete	Persistent File
<filename>.Rei_Concrete_Link	Link file

All these files are stored in the same folder, the data folder.

The program also makes use of the files SPRORC.INI and QSE.INI that are stored in the user's Windows folder.

SPRORC.INI contains the user settings for fonts, colours and the current units.

QSE INI contains the conversion factors for the various unit settings.

3.4. Engineering Information

The information that the design uses is determined by the design code associated with the design group.

BS8110 Beam
BS8110 Column
EC2 Beam
EC2 Column

3.5. BS8110 Beam Design Principles

3.5.1. Introduction

The BS8110 1997 Beam Design Brief is for single or multi span, prismatic, rectangular solid or tee shaped members. The member sections must be setup in the 'Section Property Calculator' and assigned from the User section database. See the 'Section Property Calculator' manual for setting up standard sections and User databases.

Beams are designed for flexure, and shear only. Each member is divided into equally spaced sections and the locations of maximum positive and negative moments along each element that makes up the member. The user can specify the number of segments to be considered between 4 and 25 for each member.

3.5.2. Design for Flexure

The main (longitudinal) reinforcement is calculated for both sagging and hogging moments on the basis of the section profile and parameters defined in the Design Brief. Compression reinforcement is provided where required.

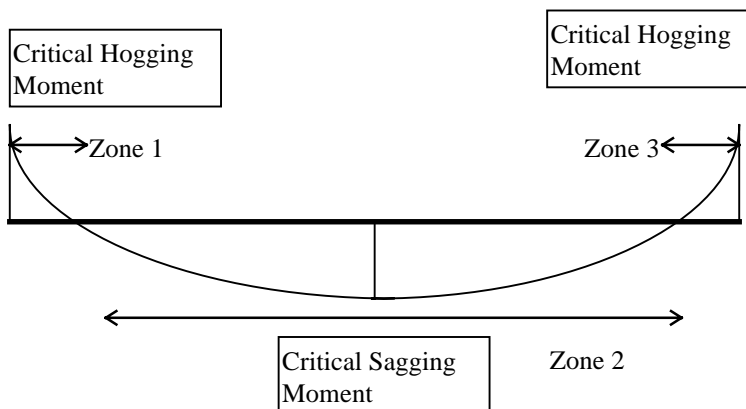
Automatic Design Process:

The design of a beam is based on an envelope of design forces and thus at each of the defined sections, the program determines the required area of steel for both the maximum hogging moment and maximum sagging moment at that section.

The beam is then divided into sub-beams, those that can use the same cage

- 1) Same size
- 2) Same covers

For each sub-beam, the sections that have the largest sagging and hogging moments are identified and the most efficient reinforcement is calculated for the range of bars specified in the Design Brief. The program limits 8 bars in any one layer and uses a maximum of 2 layers.



The program then goes along the beam and checks each section to see how many bars from the critical sections can be removed. The bars are only removed at the section if they are not required for compression reinforcement or would result in failure in a crack check.

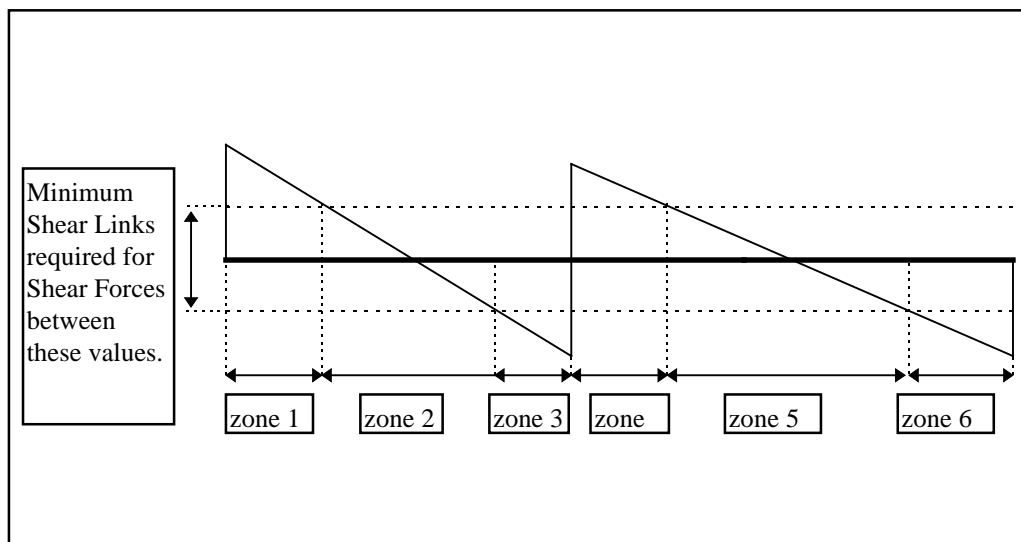
3.5.3. Design for Shear

The shear reinforcement is designed to resist the major axis shear force envelope, F_z , acting through the beam. The minor axis shear and torsional forces are not considered.

Automatic Design Process:

The number of shear legs and the shear link size is specified in the Design Brief. Therefore the required spacing for minimum links can be defined. The program then checks each section to determine the shear stress v and concrete shear capacity v_c . From this, the section is classified as either minimum link or a high shear section. Adjacent sections of the same type are grouped into zones. For non minimum link zones, the shear links are designed for the maximum shear force within that zone.

If necessary, additional legs may be added to the shear links in order to restrain tension or compression reinforcement.



3.5.4. Anchorage and Bond Lengths

Anchorage and bond lengths are calculated in accordance with the requirements of clause 3.12.8. They can be displayed graphically on the Main Reinforcement diagram and are used for the schedule table and export to Multi-RC.

3.6. BS8110 Column Design Principles

3.6.1. Introduction

The BS 8110 Column Design Brief is for prismatic, rectangular solid or circular shaped members. As with Beam Design, section properties must be taken from the User databases. See the 'Section Property Calculator' manual for setting up standard sections and User databases. Members may be built up from multiple elements, but only the member end moments are considered, so only single height columns are recommended.

3.6.2. Principles

Columns are designed for axial force and bi-axial end moments, as well as bi-axial shear. Reinforcement is provided by the program based on the forces generated in the Analysis mode and the code clauses outlined below.

If the member has a reinforcement cage already defined, then the program checks the reinforcement for compliance. Otherwise the program will select a reinforcement cage from the bars and specifications of the Design Brief to minimise the area of main reinforcement bars. Selecting a column member from the design group and selecting 'Copy' from the 'Edit' menu, copies the reinforcement cage which can be pasted on columns in the Design Group of the same dimensions, which can then be checked with that same reinforcement.

The main reinforcing bars may be modified to allow for other bars passing through the section and then re-checked to ensure that the design requirements are satisfied.

All selected load combinations are used to calculate the required reinforcement. The combination which produces the maximum required reinforcement area is called the 'Guiding Load Case', and the bar arrangement is chosen based on that combination. Detailed printout of the design calculations is also for that combination.

The requirements of section 3.8 of BS 8110: Part 1 1997 utilised in the design module are as follows:-

CHAPTER	CONTENT	STATUS
3.8	Columns	
3.8.1	General	Program Conforms
3.8.1.1	Symbols	Program Conforms
3.8.1.2	Size of columns	N/A
3.8.1.3	Short and slender columns	Program Conforms
3.8.1.4	Plain concrete columns	N/A
3.8.1.5	Braced and unbraced columns	Program Conforms
3.8.1.6	Effective height of a column	
3.8.1.6.1	General	Program Conforms with
3.8.1.6.2	End conditions	Beta as a user input.
3.8.1.7	Slenderness limits for columns	Program Conforms
3.8.1.8	Slenderness of unbraced columns	Program Conforms
3.8.2	Moments and forces in columns	
3.8.2.1	Columns in monolithic frames designed to resist lateral forces	User decision
3.8.2.2	Additional forces induced by deflection at ULS	Program Conforms for

		column being designed, not for members connected.
3.8.2.3	Columns in column and beam construction, or in monolithic braced structural frames	Forces to be designed for are determined by the users own model.
3.8.2.4	Minimum eccentricity	Program Conforms
3.8.3	Deflection induced moments in solid slender columns	
3.8.3.1	Design	Program Conforms
3.8.3.2	Design moments in braced columns bent about a single axis	Program Conforms
3.8.3.3	Slender columns bent about a single axis (major or minor)	Program Conforms
3.8.3.4	Columns where l_e/h exceeds 20, bent about their major axis	Program Conforms
3.8.3.5	Columns bent about their major axis	Program Conforms
3.8.3.6	Slender columns bent about both axes	Program Conforms
3.8.3.7	Unbraced structures	Program Conforms
3.8.3.8	Deflection of unbraced columns	N/A
3.8.3.9	Additional moments on members attached to a slender column	N/A
3.8.4	Design of column section for ULS	
3.8.4.1	Analysis of sections	Program Conforms
3.8.4.2	Design charts for symmetrically-reinforced columns	N/A
3.8.4.3	Nominal eccentricity of short columns resisting moments and axial loads	N/A
3.8.4.4	Short braced columns supporting an approximately symmetrical arrangement of beams	N/A
3.8.4.5	Biaxial bending	Program Conforms
3.8.4.6	Shear in columns	Program Conforms
3.8.5	Deflection of columns	N/A
3.8.6	Crack control in columns	The clause states that if crack check is required, then the member should be checked as a beam.

N/A is to be interpreted as either not applicable or not implemented.

Clauses that do not appear in the list are deemed not to be considered by the program.

3.7. Eurocode 2 Beam Design Principles

3.7.1. Introduction

The Eurocode 2 Beam Design Brief is for single or multi span, prismatic, rectangular solid or tee shaped members. The member sections must be setup in the 'Section Property Calculator' and assigned from the User section database. See the 'Section Property Calculator' manual for setting up standard sections and User databases.

Beams are designed for flexure, and shear only. Each member is divided into equally spaced sections and the locations of maximum positive and negative moments along each element that makes up the member. The user can specify the number of segments to be considered between 4 and 25 for each member.

3.7.2. Design for Flexure

The main (longitudinal) reinforcement is calculated for both sagging and hogging moments on the basis of the section profile and parameters defined in the Design Brief. Compression reinforcement is provided where required.

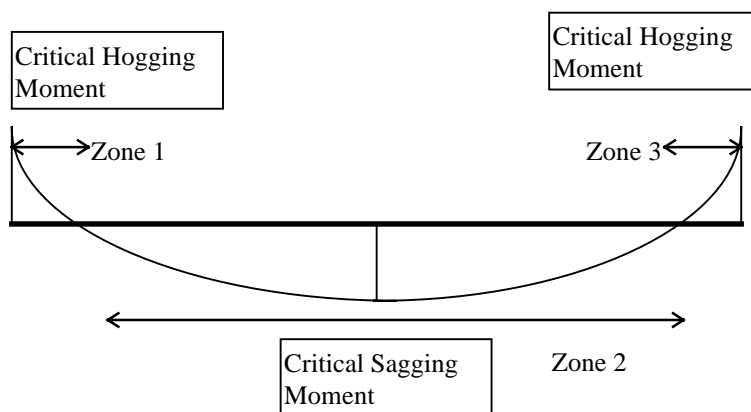
Automatic Design Process:

The design of a beam is based on an envelope of design forces and thus at each of the defined sections, the program determines the required area of steel for both the maximum hogging moment and maximum sagging moment at that section.

The beam is then divided into sub-beams, those that can use the same cage

- 1) Same size
- 2) Same covers

For each sub-beam, the sections that have the largest sagging and hogging moments are identified and the most efficient reinforcement is calculated for the range of bars specified in the Design Brief. The program limits 8 bars in any one layer and uses a maximum of 2 layers.



The program then goes along the beam and checks each section to see how many bars from the critical sections can be removed. The bars are only removed at the section if they are not required for compression reinforcement or would result in failure in a crack check.

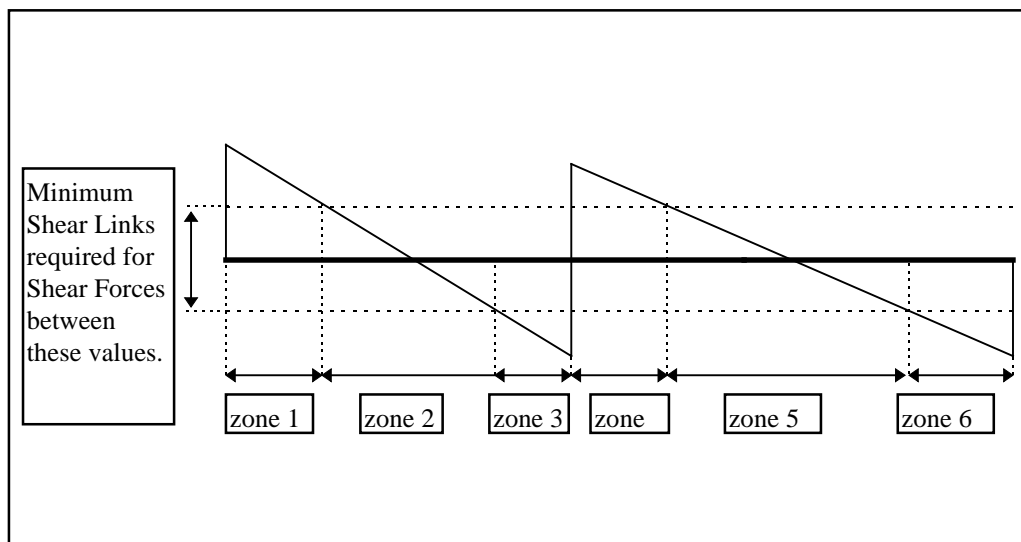
3.7.3. Design For Shear

The shear reinforcement is designed to resist the major axis shear force envelope, F_z , acting through the beam. The minor axis shear and torsional forces are not considered.

Automatic Design Process:

The number of shear legs and the shear link size is specified in the Design Brief. Therefore the required spacing for minimum links can be defined. The program then checks each section to the concrete shear capacity V_{rd1} . From this, the section is classified as either minimum link or a high shear section. Adjacent sections of the same type are grouped into zones. For non minimum link zones, the shear links are designed for the maximum shear force within that zone.

If necessary, additional legs may be added to the shear links in order to restrain tension or compression reinforcement.



3.7.4. Anchorage and Bond Length

Anchorage and bond lengths are calculated in accordance with the requirements of Eurocode 2. They can be displayed graphically on the Main Reinforcement diagram and are used for the schedule table and export to Multi-RC.

3.8. Eurocode 2 Column Design Principles

3.8.1. Introduction

The Eurocode 2 Column Design Brief is for prismatic, rectangular solid or circular shaped members. As with Beam Design, section properties must be taken from the User databases. See the 'Section Property Calculator' manual for setting up standard sections and User databases. Members may be built up from multiple elements, but only the member end moments are considered, so only single height columns are recommended.

3.8.2. Design Principles

Columns are designed for axial force and bi-axial end moments, as well as bi-axial shear. Reinforcement is provided by the program based on the forces generated in the Analysis mode and the code clauses outlined below.

If the member has a reinforcement cage already defined, then the program checks the reinforcement for compliance. Otherwise the program will select a reinforcement cage from the bars and specifications of the Design Brief to minimise the area of main reinforcement bars. Selecting a column member from the design group and selecting 'Copy' from the 'Edit' menu, copies the reinforcement cage which can be pasted on columns in the Design Group of the same dimensions, which can then be checked with that same reinforcement.

The main reinforcing bars may be modified to allow for other bars passing through the section and then re-checked to ensure that the design requirements are satisfied.

All selected load combinations are used to calculate the required reinforcement. The combination which produces the maximum required reinforcement area is called the 'Guiding Load Case', and the bar arrangement is chosen based on that combination. Detailed printout of the design calculations is also for that combination.

The main reinforcing bars may be modified to allow for other bars passing through the section and then re-checked to ensure that the design requirements are satisfied.

The requirements of Eurocode 2 utilised in the design module are as follows:-

CHAPTER	CONTENT	STATUS
2	Basis of Design	
2.3.3.2		Fundamental safety values default
2.5.1.3.(4)		vv (nu) value used in column design
3	Material Properties	
3.1.2.3.(4)		Equations 3.2 and 3.3 used
3.1.2.4		Followed
3.2.4.1		f_{yk} used
3.2.4.3.(1)		Followed
4	Section and Member Design	
4.1.3.3.(5)		Followed
4.2.1.3.3.(9)		Followed for all section types except flanged beams

	flanged beams
4.2.1.3.3.(10) &(12)	Simple rectangular concrete stress block used in the design of flanged beams
4.2.1.3.3.(11)	Followed
4.2.2.3.2.(4)&(5)	Followed using horizontal flat top branch
4.3.1.2.(6)	Followed
4.3.2.2.(1)	Followed
4.3.2.2.(2)	Followed
4.3.2.2.(7)	Standard method followed
4.3.2.2.(9)	Followed
4.3.2.3.(1)	Followed
4.3.2.4.2.(3)	Followed
4.3.2.4.3.(1)	Followed
4.3.2.4.3.(2)	Followed
4.3.2.4.3.(4)	Followed
4.3.5.3.5.(2)	Followed
4.3.5.4.(3)	Followed
4.3.5.5.3.(2)	Followed
4.3.5.5.3.(3)	Followed
4.3.5.5.3.(4)	Followed
4.3.5.5.3.(5)	Followed
4.3.5.5.3.(6)	Followed
4.3.5.6.1.(1)	Followed
4.3.5.6.2.(1)	Followed
4.3.5.6.3.(2)	Followed
4.3.5.6.3.(5)	Followed
4.3.5.6.3.(6)	Followed
4.3.5.6.4.(1)	Followed
4.3.5.6.4.(2)	Followed
4.3.5.6.4.(3)	Followed
4.3.5.7.(2)	Followed
4.4.2.2.(3)	Followed
4.4.2.3.(2)	300mm max spacing limit is applied in all cases. The max bar size limit is not applied.
4.4.2.3.(5)	Followed
4.4.3.2.(2)	Followed
4.4.3.2.(3)	Followed

4.4.3.2.(4)	Followed
4.4.3.2.(5)(a)	Followed
4.4.3.2.(5)(b)	Followed
4.4.3.2.(5)(c)	Followed

5 Detailing Provisions

5.2.1.2.(2)	The 'hooks, bends, loops' part of table 5.1 is followed
5.2.2.1.(2)	Followed
5.2.2.1.(3)	Followed
5.2.2.2.(2)	Followed
5.2.2.3.(2)	Followed
5.2.3.2.(1)	Followed
5.2.3.3.(2)	Followed
5.2.3.3.(3)	Followed
5.2.3.3.(4)	Followed
5.2.3.4.1.(1)	Followed
5.4.1	Followed
5.4.1.1.(1)	Followed
5.4.1.2.1.(1)	Followed
5.4.1.2.1.(2)	Followed
5.4.1.2.1.(3)	Followed
5.4.1.2.1.(4)	Followed
5.4.1.2.2.(1)	Followed
5.4.1.2.2.(3)	Followed
5.4.2.1.1.(2)	Followed
5.4.2.2.(1)	Followed (always 90 degrees)
5.4.2.2.(5)	Followed
5.4.2.2.(7)	Followed
5.4.2.2.(9)	Followed

Section 4. Reference

4.1. Commands

These are the commands that are available from the menus. The menus and items change depending on the mode and the type of current window, e.g. Graphic or Table.

4.1.1. FILE

- Open Link File
- Re-open..
- Save
- Job Information
- Report Setup...
- Printer Setup...
- Print
- Print Preview
- Exit

4.1.2. EDIT

- Undo
- Cut
- Copy
- Copy Picture
- Paste
- Delete
- Take Picture
- Go To...

4.1.3. VIEW

- Zoom
- Tables...
- Structure Diagrams...
- Colours...
- Design Results
- Orientation
- Labels...
- Whole Structure
- Open View...
- New View...
- View Management
 - Detach View
 - Add to View
 - Save View
 - Rename View
- Toolbars...
- Options...

4.1.4. SELECT

- Elements Cursor

- Members Cursor**
- Select All**
- By Member...**
- By Section Property...**
- By Design Group...**
- New Design Group...**

4.1.5. MEMBERS

- Members Table**
- Form Member**
- AutoForm Members**

4.1.6. BRIEF

- Design Brief**
- Design Brief Table**

4.1.7. GROUP

- Select By Design Group**
- Group Members List Table**
- New Design Group**
- Design Group Table**
- Member Summary**

4.1.8. DESIGN

- Design Options**
- Design Now**

4.1.9. RESULTS

- Design Results Setup**
- Individual Graphs**
- Main Reinforcement Diagram**
- Shear Reinforcement Diagram**
- Plan View**
- Beam Spans**
- Main Reinforcement**
- Shear Links**
- Shear Zones**
- Deflection**
- Scheduled Bars**
- Member Summary**
- Clear Results**

4.1.10. DRAWING

- Export to Multi RC**

4.1.11. MODE

- Design Layer
- Design
- Page Control

4.1.12. WINDOW

- Cascade
- Tile Horizontal
- Tile Vertical
- Arrange Icons
- Structure Only

4.1.13. HELP

- Contents
- Search for Help On...
- Using Help
- About STAAD/Pro RC

4.2. Open Link File **Ctrl+N**

Opens the link file and ignores the data in the persistent file.

Keyboard Shortcut **CTRL+N**

4.3. Re-open... **Ctrl+O**

Opens the link file and includes the data in the persistent file.

Effectively restarts the RC Designer, removing any data that has been added since the current RC Designer session started.



Open button

Keyboard Shortcut **CTRL+O**

4.4. Save **Ctrl+S**

Saves the data that has been generated in the RC Designer in a persistent file <filename>.Rei_Concrete.

To save a structure quickly, click the Save button on the Standard toolbar.



Save button

Keyboard Shortcut **CTRL+S**

4.5. Job Information

Displays the Job Info window for the active structure. General information and comments about the structure can be recorded here. When first opened, the dialog is populated with the data that is in the STAAD/Pro data file.

The screenshot shows a dialog box titled "rc beam - Job Information". It contains the following fields and sections:

- Job: Job Name
- Client: Client Name
- Job No.: Job No.
- Part: Part No.
- Ref: Ref.
- Engineer, Checker, Approved: Name and Date fields.
- Comment: A large text area for entering comments.

Some of the Job Information is printed in the header on every page of the reports. The rest may be printed in the special Job Information report item.

Job

The job title (up to 100 characters) is printed in the report header.

Client

The client name (up to 100 characters) is printed in the report header.

Job No.

The job number (up to 100 characters) is printed in the report header.

Part

The part reference (up to 100 characters) is printed in the report header.

Ref

The reference (up to 100 characters) is printed in the report header.

Quality Assurance

Six edit boxes are available for recording information required by quality assurance procedures. There are spaces (10 characters) for the names or initials of the Engineer, the Checking Engineer and the Approving Engineer, together with dates.

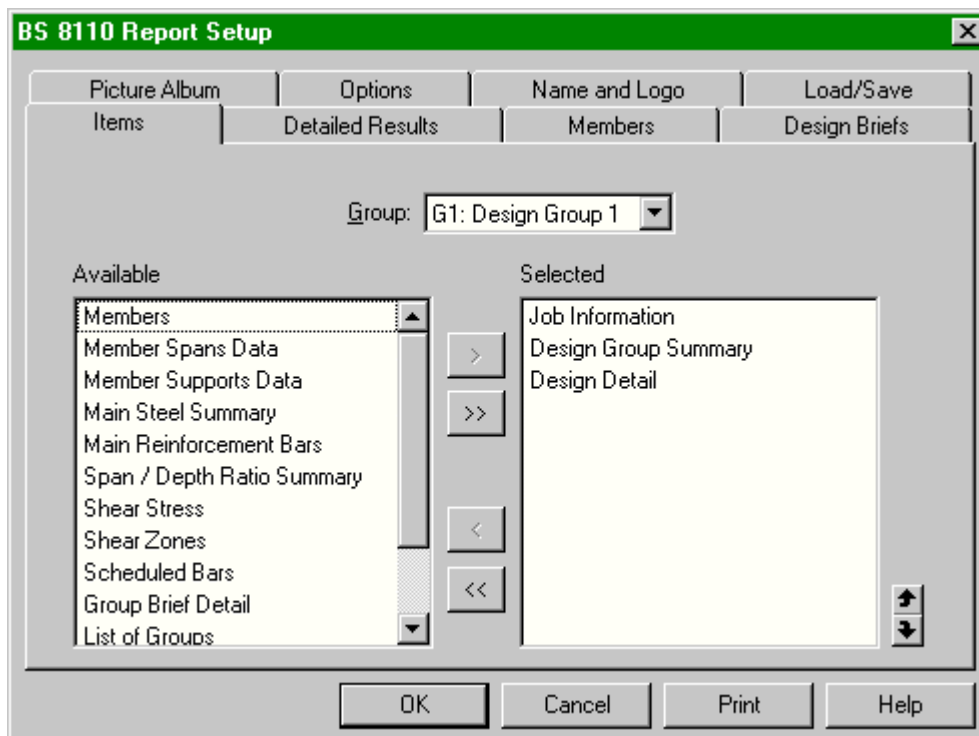
The name, initials and date of the engineer and checker are printed on the report header.

Comments

Up to 1000 characters of comments can be typed into this edit box. The comments appear on the special Job Information report item.

4.6. Report Setup...

The Report Setup command is sensitive to the current mode and to the current design code if in Design mode.



Dialog Box Options

Items

Available

The Available list shows the tables and pictures that can be included in the report.

Select an item by clicking then item, then clicking the '>' button to transfer it to the Selected list. More than one item can be selected at once by holding down the CTRL key while selecting. A range of items can be selected by click and dragging up or down the list or clicking on the first item and clicking on the last whilst holding down the SHIFT key.

Items are always added to the bottom of the Selected list. All the items in the Available list can be selected by clicking the '>>' button.

Selected

The Selected list shows the tables and pictures to be included in the report, in the order in which they will appear.

To remove an item from the Selected list, highlight it by clicking and then click the < button to return it to the Available list.

All the items can be removed from the Selected list by clicking the '<<' button.

Detailed Results

Available

The Available list shows the detailed items that *can* be included in the report if the 'Design Detail' item is included in the **Items** list (see above).

Selected

The Selected list shows the detailed items that *will* be included in the report if the 'Design Detail' item is included in the **Items** list (see above).

Members

Available

The Available list shows the members that *can* be included in the report.

Selected

The Selected list shows the members that *will* be included in the report.

Design Briefs

Available

The Available list shows the detailed items that *can* be included in the report if the 'Other Brief's Details' item is included in the **Items** list (see above).

Selected

The Selected list shows the detailed items that *will* be included in the report if the 'Other Brief's Details' item is included in the **Items** list (see above).

Picture Album

The Picture Album shows the pictures that have been captured for inclusion in the report. It also allows the captions for these pictures to be edited.

Name

Select the picture to view using the drop-down list.

Caption

Edit the caption for the picture in this edit box. The caption appears printed below the picture in the report.

Delete

Removes the picture from the picture album.

Full Page

This sets the current picture to take a full page in the printout if it is an included item.

Options

Sets options for how the printed pages of the report appear.

Header

Check this option to include a header on the report. Note that the header contains the Sheet Numbering, company Name and Logo, and much of the Job Info.

Page Outline

Check this option to add an outline to each page of the report.

Footer

Check this option to include a footer on the report. Note that the print run information, that is page numbers, time and date, is included on the footer.

Prefix

Sheet numbers are printed at the top right of each page. Edit the prefix for sheet numbers here. The prefix is printed one space in front of the sheet number.

Leave the text box empty if a prefix is not needed.

No. Pages From

Give a number from which to start the sheet numbering.

Leave this text box empty if you do not wish QSE Space to number the report's pages at the top right of the page. Note that if the footer of the report is included, there is always a record of the order of the pages.

Suffix

Edit the suffix for the sheet numbers at the top right of the page. Leave this text box empty if a suffix is not needed.

Grid

Check the Grid option to draw the grid lines in the data tables of the report. Leaving the grid lines off increases printing speed on some printers.

Start each table on a new page

Check this option to start each new data table on a new report page. This option is useful for reports on very large structures, but it wastes paper on small structures where the tables are short.

Table Heading

Click on the Font button to show the Font dialog for the table headings in the report. Choose a new font using the dialog and click the OK button to return to the Report Setup dialog.

Table Text

Click on the Font button to show the Font dialog for the table text in the report. Choose a new font using the dialog and click the OK button to return to the Report Setup dialog.

Reverse Page Order

Some printers do not turn over the pages that they have printed. This results in a printed report coming out back to front. If your printer does this, then check the Reverse Page Order option and QSE Space will print the last page first!

Name and Logo

Configures the company name and logo area of the report page. This is situated in the box between the Research Engineers logo (top left) and the Job No. box.

Preview

Shows a preview of how the company name and logo appear. The company name is edited directly by typing in the preview.

Graphic File

Click on the File button to insert a Windows Metafile graphic file into the company logo area.

Graphic Paste

A bitmap or Windows Metafile can be pasted into the company logo area. To do this, click on the Paste button. If the button is shaded out, the clipboard does not contain graphical data.

Position

Adjust the position of the graphic using these options. If the graphic is placed in the centre, then the company name does not appear.

Font

Click on the Font button to change the font and size of the text used for the company name. The text itself is edited directly in the Preview area.

Alignment

Adjust the alignment of the company name using these options. The company name is aligned within the space left after the company logo (if any) is drawn. Note that if the logo is placed in the center then the company name does not appear (although it is not deleted).

Load/Save

This allows the user to save a report setup which can be recalled at a later date. The arrangement of Items, Members and Design Briefs with the sort options are saved.

When a picture is deleted, it is removed from all reports.

A Saved Report Setup can be deleted.

4.7. Printer Setup...

Displays the Print Setup dialog box. This provides a list of installed printers, sets the default printer, and provides access to other printing options for the printer selected.

Before printing from RC Designer for the first time, do the following:

- 1) Connect the printer to the computer or a network by using the instructions in the printer's manual.
- 2) Install a printer driver using the Windows Setup or Windows Control Panel. For more information refer to the Windows documentation.
- 3) Select the printer to be used from the Print Setup dialog.

Dialog Box Options

Default Printer

Displays the name of the default printer and shows the printer's connection.

Printers

Selects the printer to be used. Only printers that have been installed are listed here. For more information refer to the Windows documentation.

Set As Default Printer

Changes the default printer that RC Designer uses to print reports. Select the printer to be used in the Printers list and then choose this button.

Options

Changes the printer settings from the printer selected in the Printers list. The options vary according to the printer driver installed.

To get Help for the selected printer, press the Options button and then press the Help button in the Options dialog.

Network

Connects the computer to a printer across a network. For more information refer to the Windows documentation or press Help in the Network dialog.

4.8. Print **Ctrl+P**

Controls how the RC Designer report is printed. Before using this command, install and select a printer. For more information refer to the Windows documentation.

The appearance and content of the RC Designer report can be configured using the Report Setup command on the File menu.

To print one copy of the report quickly, using the current Report Setup, click on the Print button on the Standard toolbar.



Print button

Keyboard Shortcut **CTRL+P**



Dialog Box Options

Printer

Displays the name of the active printer and printer connection.

Print Range

Select how much of the report is to be printed.

Click on the **All** option to print all the pages of the report.

Click on the **Pages** option to print a selection of pages. Enter a selection of pages separated by commas, or a range separated by a hyphen.

Alternatively, enter the first page number of a range in the **From** text box and the last page number in the **To** text box.

Setup

Displays the Print Setup dialog. This is equivalent to choosing the Printer Setup command from the File menu.

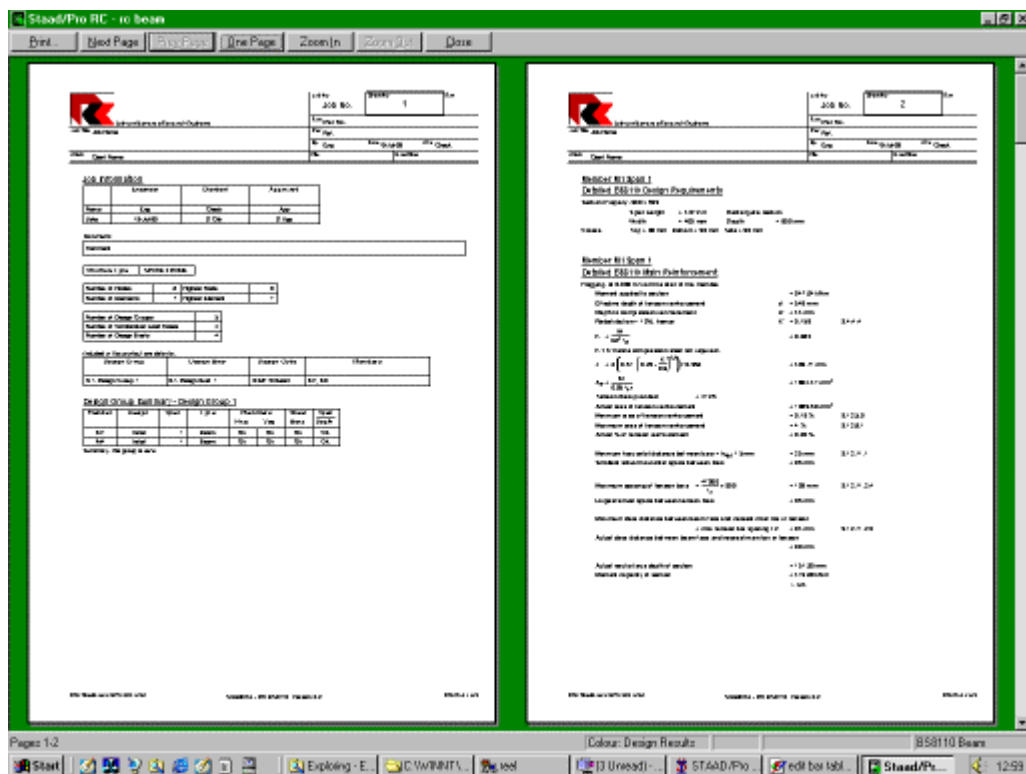
4.9. Print Preview

Shows how the RC Designer report appears when printed. Use the buttons at the top of the print preview window to inspect the report. The arrangement and contents of a report are set up in the Report Setup.

When satisfied with the print preview, click the Print button to send the report to the current printer. This is the same as the Print command on the File menu.

When entering the print preview, RC Designer repaginates the report and retrieves all the current data it needs, so the preview is the same as would be printed.

To show the print preview quickly, click the Print Preview button on the standard toolbar.



4.10. Exit

Ends the current RC Designer session. If any additional data has been added, RC Designer prompts to save this in the persistent file.

RC Designer can also be exited by one of the following.

- 1) Open the application control menu by pressing the ALT and Spacebar keys together.
- 2) Double click on the application control menu box.



Application control menu

4.11. Undo **Ctrl+Z**

Reverses the last change made to the active structure. The name of the command depends on the most recent action taken - for example: Undo Delete.

RC Designer cannot undo some actions. If the most recent action cannot be undone, then the name of the command reverts to Undo and it is disabled.

To quickly reverse the most recent action on the active structure, click on the Undo button on the Standard toolbar.



Undo button

Keyboard Shortcut **CTRL+Z**

4.12. Cut **Ctrl+X**

Removes the selected table data and puts it on to the Clipboard. Data cut to the clipboard replaces the previous contents of the clipboard. It remains on the clipboard until new data is cut or copied.

This command is only available once a valid selection has been made in the active window.

To quickly cut information to the clipboard, make a selection and then click the Cut button on the Standard toolbar.



Cut button

Keyboard Shortcut **CTRL+X**

4.13. Copy **Ctrl+C**

Copies the selected table data and puts it on to the Clipboard. Data that is copied to the clipboard replaces the previous contents of the clipboard. It remains on the clipboard until new data is cut or copied.

This command is only available once a valid selection has been made in the active window.

To quickly copy information to the clipboard, make a selection and then click the Copy button on the Standard toolbar.



Copy button

Keyboard Shortcut **CTRL+C**

4.14. Copy Picture

Copies the picture in the active structure window to the clipboard. No selection is needed for this command to work. The picture replaces the previous contents of the clipboard and can be pasted into any windows application that supports graphics such as MS Word or MS Excel.

4.15.Paste Ctrl+V

Inserts a copy of the data on the clipboard into the active window.

If the data on the clipboard is empty or is unsuitable for pasting into the active window, then the command is disabled.

Table Rows

When pasting into a table, any selected rows are overwritten. The paste command for a table keeps the data in the same order as it is on the clipboard.

If the data on the clipboard is longer than the selection in the active table, then the paste fills in any blank rows before appending the remaining data to the end of the table.

If the data on the clipboard is narrower than the active table, the data is pasted into the columns on the left of the table, leaving other columns unchanged or displaying default values.

If paste comes across an empty field in the clipboard data, it leaves any existing data alone, or enters a default value.

Tip

To paste quickly, click the Paste button on the Standard toolbar.



Paste button

Keyboard Shortcut CTRL+V

4.16.Delete Del

Deletes the selection in the active window. A selection must be made for this command to be available. If the current window is a structure, a warning message is shown allowing the command to be cancelled if required.

Tip

If a mistake is made, use the Undo command on the Edit menu to reverse the delete. This must be done immediately after the mistake or the Undo may not be available.

Keyboard Shortcut Del

4.17.Take Picture

Copies the picture in the active structure window to the report picture album. No selection is needed for this command to work.



Tab Options

Id

This gives the photograph a name that is displayed in the Items list and Picture Album of a Report Setup.

Caption

This sets the caption to be used if the picture is a selected item in the Report Setup

To quickly copy the picture to the picture album, click the Take Picture button on the Standard toolbar.



Take Picture button

Photographs are stored for future use in a separate file in the same folder as the structure file with the same filename but with the file extension .REI Saved Picture.

4.18. Go To... F5

Scrolls the active table window so that a given row is visible. Shows the Go To Row dialog in which the row number to move to may be given.

Keyboard Shortcut **F5**

4.19. Zoom

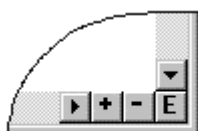
Opens a Zoom Window onto the active structure window.

When the Zoom command is chosen, the cursor changes to a cross (+).

Define a zoom area on the structure window. Press down the left mouse button on one corner of this area, hold down the button and move the mouse (drag) to open up the area. The zoom area is outlined with a dotted box as it is dragged. Release the mouse button when the area is the desired size.

A <Zoom> window is now opened showing the zoom area enlarged. If the Highlight Zoom Area option is checked in the options dialog, a box appears on the structure window, locating the extents of the zoom window.

Only one zoom window per structure window can be open. A zoom window cannot be opened from another zoom window. However, the scale of zoomed area can be increased or decreased by clicking on the '+' or '-' buttons on the bottom right of the zoom window.



Zoom Extents Button

Clicking on the 'E' button to zoom to the extent of the structure view.

Holding the CTRL key down and pressing one of the direction keys on the keyboard will rotate the structure on the original and zoomed windows.

To quickly open a zoom window, click the Zoom button on the Standard toolbar.



Zoom button

To move the position of the zoom window use either the scroll bars on the window, the cursor keys on the keyboard or the Viewpoint buttons on the toolbar. The cursor keys and the viewpoint buttons, move the viewing point around the structure.



Viewpoint buttons

4.20. Tables...

Displays the Tables dialog. This displays any of the table windows in RC Designer.

Dialog Box Options

Tables

The list shows the table names next to check boxes which show whether they are being displayed. Click in the check boxes to show or hide a table window.

In the case of the Load Summary table, the Tables dialog affects only the load summary associated with the active structure window.

List

The Design Input and Design Results options can be used to limit the list of tables to help find items more easily.

4.21. Structure Diagrams...

Displays the Structure Diagrams dialog, which has five tabs, for the active structure window.

Tip

To quickly show the Structure Diagrams dialog, click the Structure Diagrams button on the Standard toolbar.



Structure Diagrams button

Dialog Box Options

4.21.1. General Tab

Margin Around Structure

Sets the percentage of the window to allow around the structure to allow for drawing force diagrams.

4.21.2. Results Tab

Sets the results to be displayed and their colours.

LoadCase

A pulldown list of all defined loadcases and combinations.

Forces

Check boxes to toggle the display of the particular force on the structure. The colour on the adjacent button shows the colour of that diagram. Click on the button to select an alternative colour.

Increments

This sets the number of intermediate results that are shown for each element.

4.21.3. Scales Tab

Sets the scales that loads and results are to be displayed to. Note that units for each item is set in the [Options dialog](#). If the range does not provide a suitable scale, try alternative units.

Load Scale	Range 0.001-999999
Bending Scale	Range 0.001-999999
Shear Scale	Range 0.001-999999
Axial Scale	Range 0.001-999999
Torsion Scale	Range 0.001-999999
Displacement Scale	Range 0.001-999999
Stress Scale	Range 0.001-999999
Load Scale	Range 0.001-999999

4.21.4. Labels Tab

Displays the Labels page of the Diagrams dialog for the active structure window.

Label Check Boxes

Node Labels	Nodes Numbers Node Points Supports
Element Labels	Element Numbers Orientation Labels Element Length
Property Labels	None (select option) Reference (select option) Section (select option)
Member Labels	Member Numbers Group References
General	Axes Diagram

The dialog contains check boxes for configuring which labels appear on the structure diagram in the active window.

The user must choose between display of section property References or the names of the Sections.

4.21.5. Force Limits Tab

This allows the user to colour the stick line model of the structure to indicate which elements have end forces or stresses that fall outside a specified range.

Label Case

A pulldown list of all loadcases, combinations and envelopes. Note that loadcase chosen in this pulldown updates the similar pulldown on the Results tab and vice versa.

View Limits

Choose the range. Whether the maximum limit, minimum limit or both should remain within range.

Colour within limit

Click on the coloured box to change the pass colour and set the thickness of line in pixels between 1 and 10 (structure elements are always drawn 1 pixel wide).

Colour outside limit

Click on the coloured box to change the fail colour and set the thickness of line in pixels between 1 and 10 (structure elements are always drawn 1 pixel wide).

4.22.Colours...

Displays the Colour Manager dialog for the active structure window.

Structure Colours

Sets the colours used in various highlights.

Analysis Results

Sets the colours for the Forces (see also Structure Diagrams) and element Limits.

Design Results

Sets the colours for the Pass/Fail ratios and member Efficiencies.

Current Structure Colour Scheme

Sets the colours for the drawing the wire frame of the structure. The chosen scheme is shown on the status bar.

4.23.Orientation **F4**

Displays the Orientation dialog. This adjusts the orientation and projection of the picture of the structure in the active structure window.

The Orientation dialog is modeless; it floats on top of the other windows in RC Designer. Changes can be seen in the active window if the Apply Immediately check box is selected.

 **Dialog Box Options****View**

Choose between Isometric and Perspective drawing.

Default Orientation To

Click on one of these buttons to set the Elevation, Distance and Rotation to default values.

Distance to Structure

The distance from the viewpoint to the origin of the structure.

Elevation Angle

The height above ground level (global **Z** = 0) for Perspective drawing, or the projection angle used for Isometric drawing.

Rotation Angle

The rotation of the structure about the global **Z** axis.

Apply Immediately

Check this box to see the picture in the active structure window redraw as soon as changes are made in the dialog.

Apply

Click this button to apply the changes in the dialog to the drawing in the active structure window. This button is not needed if the Apply Immediately box is checked.

Restore

Restores the values in the dialog to those that were current when it was opened. Be careful because any changes made are lost.

Close









Closes the dialog and applies any changes made to the picture in the active structure window.

To cancel changes, click on the Restore button before clicking on Close.

Tips**Keyboard Shortcut F4**

Use the arrow keys to move the view point when a structure window is active.

The picture in the active structure window can be adjusted without using the Orientation dialog because eight of the options are available on the Standard toolbar as buttons.

Button	Name	Action
	X-Z Side Elevation	Draws the side elevation in the active window
	Y-Z End Elevation	Draws the end elevation in the active window
	X-Y Plan	Draws the plan in the active window
	X-Y-Z Isometric	Draws the default isometric in the active window
	Viewpoint Left	Moves the viewpoint to the left
	Viewpoint Right	Moves the viewpoint to the right
	Viewpoint Up	Moves the viewpoint up
	Viewpoint Down	Moves the viewpoint down

4.24.Labels...











Displays the Labels tab of the Dialogs dialog.

To quickly show the labels dialog, click on the Labels button on the Standard toolbar.

**Labels button**

There is a Labels toolbar. Use the Toolbars command on the View menu to show this toolbar. The labels toolbar and many of the Page Control toolbars have buttons which control individual labels as follows.

Button	Name	Action
--------	------	--------

	Node Labels	Draws node labels (toggle) in the active window
	Node Points	Draws a spot (toggle) at the location of the nodes in the active window
	Element Labels	Draws element labels (toggle) in the active window
	Element Length	Draws the length of each element (toggle) in the active window
	Member Labels	Draws member labels (toggle) on elements in the active window
	Property Labels	Draws section property reference labels (toggle) in the active window
	Section Names	Draws section name labels (toggle) in the active window
	Orientation Symbols	Draws orientation symbol labels (toggle) in the active window
	Axes Diagram	Draws the axis key diagram (toggle) in the active window
	Support Symbols	Draws support symbol labels (toggle) in the active window (not S1)
	Release Symbols	Draws release symbol labels (toggle) in the active window (not R1)
	Group Labels	Draws design group references (toggle) on elements in the active window

4.25. Whole Structure

Creates a new whole structure window. The program can display multiple whole structure windows of the structure, each showing different information, e.g. different loadcases, bending moments, displacements etc. They may be created at any time. However, the next time the structure file is opened, only one whole structure window is shown.

4.26. Open View...

Opens a saved view of the structure. Displays the Open View dialog. A view

Dialog Box Options

Views

Choose the view to be opened from the list of stored views.

Options

A new window in which to open the view can be created, or the view can be opened in the currently active structure window. Click OK to open the view.

4.27. New View...

Creates a new view window from the selection of elements in the active window. One or more elements must be highlighted in the active window before the **New View** option becomes available.

If elements are accidentally omitted from the new view, use [Add to View](#)

If elements are to be excluded from the new view, select the required elements, then use New View to create a corrected view. Close the view window which shows the incorrect selection.

4.28. View Management

Displays a sub menu with various commands to help manage the views of the structure in RC Designer.

4.28.1. Detach View

Detaches the active view from the active structure's data file. Once a view is detached, it regains a title with <Untitled> in it and is lost when closing the view window, the data file or exiting RC Designer.

A view window must be active for this command to be available.

4.28.2. Add to View

Adds elements which are selected in the active window to another view window which has already been created.

To create a view window, use the [New View](#) command.

One or more elements must be highlighted in the active window before the **Add to View** option becomes available.

It does not matter if selected elements already exist in the target view, as they remain selected.

Dialog Box Options

Structure

The file name of the active structure is displayed.

Views

Select the view name to which the selected elements are to be added.

4.28.3. Save View

Saves the view in the active window in the data file for the active structure. The view window can then be closed without losing the view.

Use Save View to save a copy of the view in the active window under a new name.

A view window must be active for this command to be available.

If the content, diagrams or annotation of a saved view are changed, the view is marked as changed by having an asterisk * added to its name. A view with a * appended to its name must be saved in order to retain the changes.

Because RC Designer uses an asterisk at the end of a view name to indicate that it has changed since it was last saved, it is not recommended to use an asterisk in a view name.

4.28.4. Rename View

Renames the view in the active window.

Before a view can be renamed, it must be saved.

A saved view must be active for this command to be available.

4.29. Toolbars...

Displays the Toolbars dialog which configures the toolbars that are shown.

Dialog Box Options

Toolbars

The names of the various toolbars provided in RC Designer are listed next to the check boxes. Check the box next to a toolbar name to show the toolbar.

Large Buttons

RC Designer provides two sizes of toolbar buttons. Check the Large Buttons box if RC Designer is run on a very high resolution screen or if you have difficulty seeing the normal size buttons.

Although increasing the button size may help you, it also reduces the space in which RC Designer can draw the structure.

Show Tool Tips

This option is helpful for learning what the toolbar buttons in RC Designer mean. RC Designer displays a short name (Tool Tip) for the button in a small box if the mouse cursor is placed over a toolbar button for one second.

When familiar with the buttons, the Tool Tips can be turned off by leaving this box unchecked.

Tips

Choose one of the first three toolbars on the list from a pop-up menu that appears if the right mouse button is clicked over a visible toolbar. The Toolbars command can also be accessed in this manner.

When the mouse cursor is placed over a toolbar button, the Status Bar displays a sentence explaining what the toolbar button does.

4.30. Options...

Displays the Options dialog. This dialog configures many of the graphical features of RC Designer. The options dialog has eight tabs.

Tab Options

4.30.1. Tables Tab

Contains a button to configure the font used in the tables in RC Designer.

Click on the Font button to change the font. A sample of the font chosen is displayed.

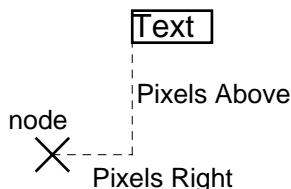
Note that this font is only used when Page Control is turned off. This is because with Page Control turned on and a very large font would cause problems on pages that have wide tables and picture views.

4.30.2. Node Labels Tab

Contains the options for configuring how the node labels on the picture of the structure appear, if used.

To turn Node Labels on, use the Labels command on the View menu.

A sample of how the node labels appear is provided.



Style

Choose the style of the node labels.

Horizontal Alignment

Choose an option for the horizontal alignment of the node label with respect to the start point for the text.

Vertical Alignment

Choose an option for the vertical alignment of the node label with respect to the start point for the text.

Pixels Right & Above

Enter the distance in pixels from the node to the start point for the text.

Font

Click on the Font button to change the font used for the label. The font colour can also be changed here.

Opaque

Check this box to make the label opaque. This obscures any structure or diagram behind the label, ensuring that it can be read.

4.30.3. Annotation Labels Tab

Contains the options for configuring how the annotation labels on the picture of the structure appear, if used.

To turn Annotation ON, use the Annotation command on the View menu..

A sample of how the labels appear is provided.

Style

Choose the style of the labels.

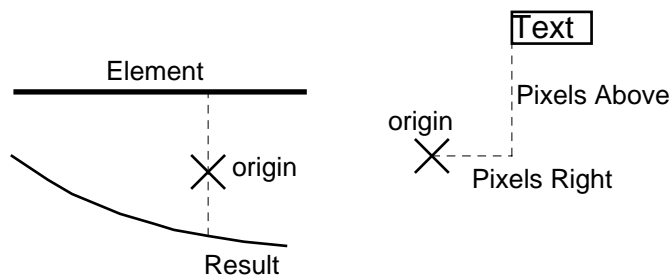
Horizontal Alignment

Choose an option for the horizontal alignment of the label with respect to the start point for the text.

Vertical Alignment

Choose an option for the vertical alignment of the node label with respect to the start point for the text.

Pixels Right & Above



The annotation labels origin is situated halfway along a line joining the element to its results graph. Enter the distances in pixels from the origin to the start point for the text.

Font

Click on the Font button to change the font used for the label. The font colour can also be changed from here.

Opaque

Check this box to make the label opaque. This obscures any structure or diagram behind the label, ensuring that it can be read.

4.30.4. Element Labels Tab

Contains the options for configuring how the element labels on the picture of the structure appear, if used.

To turn Node Labels ON, use the Labels command on the View menu.

A sample of how the node labels appear is provided.

Elements Style & Properties Style

Choose the style of the labels. Configure the style used for the property independently of the style used for the element reference. The property reference is appended to the element reference separated by a colon. e.g. E34 : P2

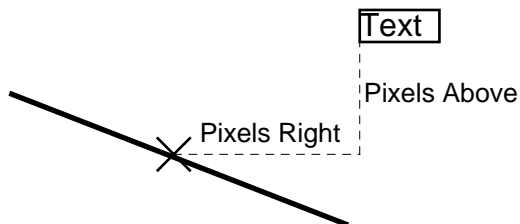
Horizontal Alignment

Choose an option for the horizontal alignment of the label with respect to the text start position.

Vertical Alignment

Choose an option for the vertical alignment of the label with respect to the text start position.

Pixels Right & Above



The text start point is positioned with respect to the center point of the element. Enter the distance in pixels from the element center to the start point for the text.

Font

Click on the Font button to change the font used for the label. The font colour can also be changed from here.

Opaque

Check this box to make the label opaque. This obscures any structure or diagram behind the label, ensuring that it can be read.

Angle Text

Check this box to angle the label along the line of the element. If this box is unchecked, the label is drawn horizontally.

4.30.5. View Highlights Tab

Contains the options to configure the appearance of the highlights between structure windows in RC Designer.

View Highlight

Changes the view highlight colours of the elements in the active view or in the whole structure window, if it is open. This helps locate elements in the view.

Check the Highlight in the Whole Structure window box to see this highlight.

Zoom Area

The zoom area of a Zoom window is highlighted on the original window. It helps locate the zoomed in area on the original.

Check the Zoom Area box to use this highlight.

Width

Edit the width of the highlights using the edit box.

4.30.6. Structure Units Tab

Contains the options to configure the displayed structure units. Internally the program stores units using the SI convention. The conversion factors for other units are stored in the file QSE.INI. Other units can be added to this file.

Dimension

Options selected from the list below section [Length] in QSE.INI.

Displacement

Options selected from the list below section [Length] in QSE.INI.

Springs-Linear

Options selected from the list below section [Spring Stiffness] in QSE.INI.

Springs-Rotational

Options selected from the list below section [Rotational Spring Stiffness] in QSE.INI.

Temperature

Options selected from the list below section [Temperature] in QSE.INI.

Weight

Options selected from the list below section [Mass] in QSE.INI.

4.30.7. Section Units Tab

Contains the options to configure the displayed cross sectional units. Internally the program stores units using the SI convention. The conversion factors for other units are stored in the file QSE.INI. Other units can be added to this file.

Area

Options selected from the list below section [Area] in QSE.INI.

Inertia

Options selected from the list below section [2nd Moment of Area] in QSE.INI.

Dimension

Options selected from the list below section [Length] in QSE.INI.

E,G (Youngs Modulus, Shear Modulus)

Options selected from the list below section [Pressure or Stress] in QSE.INI.

Density

Options selected from the list below section [Density] in QSE.INI.

Alpha (co-efficient of thermal expansion)

Options selected from the list below section [Alpha] in QSE.INI.

4.30.8. Force Units Tab

Contains the options to configure the displayed forces units. Internally the program stores units using the SI convention. The conversion factors for other units are stored in the file QSE.INI. Other units can be added to this file.

Force

Options selected from the list below section [Force] in QSE.INI.

Distributed Force

Options selected from the list below section [Distributed Force] in QSE.INI.

Moment

Options selected from the list below section [Moment] in QSE.INI.

Distributed Moment

Options selected from the list below section [Distributed Moment] in QSE.INI.

Stress

Options selected from the list below section [Pressure or Stress] in QSE.INI.

Acceleration

Options selected from the list below section [Acceleration] in QSE.INI.

4.31. Elements Cursor

Choosing one of the cursor commands changes the cursor shape and its selection function when it is over a structure window. The elements cursor allows individual analytical elements to be selected and joined into design members.



Elements Cursor

The cursor currently selected is indicated by a tick against the menu item and is designated as the current selection mode. It also remains as a depressed item on the toolbar.

4.32. Members Cursor

Choosing one of the cursor commands changes the cursor shape and its selection function when it is over a structure window. The members cursor allows members to be selected and grouped into Design Groups. In the Design mode, selecting a member with the members cursor makes that member the current member and displays the information relating to that member.



Members Cursor

The cursor currently selected is indicated by a tick against the menu item and is designated as the current selection mode. It also remains as a depressed item on the toolbar.

4.33. Select All

The action of the Select All command depends on the current selection mode and cursor.

If the Select Elements cursor is current then all the elements in the active structure window are selected.

If the Select Nodes cursor is current then all the nodes in the active structure window are selected.

If the Select Element Ends cursor is current then all the element ends in the active structure window are selected. Note that this may look similar to all the elements being selected, but it is not the same.

4.34. By Member...

Selects members in the active structure window by their member numbers.

Displays the Select Members dialog which contains a single list box with all the member numbers. The selection in this list reflects any selection already made on the active structure window.

Extend the selection in the list by holding down the CTRL key while selecting new members. To remove a selection from the list, hold down the CTRL key and click on the item.

Click OK to transfer the selection to the active structure window.

4.35. By Section Property...

Selects elements in the active structure window according to their section property.

Displays the Select by Property dialog which contains a list of the section properties defined in the active structure and the option of 'No Property' (a useful check to see that all elements do have a property prior to analysis).

Click on properties in the list to select them. Extend the selection by holding down the CTRL key and clicking on further properties.

Click the OK button to update the selection in the active structure window.

To quickly show the Select by Property dialog, click the Select by Property button on one of the toolbars.

4.36. By Design Group...

Before selecting by Design Group, at least one design group must be defined.

This command displays the Select Design Groups dialog which contains a list of the groups defined in the active structure.

Click on groups in the list to select them. Extend the selection by holding down the CTRL key and clicking on further groups.

Click the OK button to update the selection in the active structure window.

4.37. New Design Group...

A Design Group is the selection of members that are to be designed with one of the QSE Designer modules.

Before defining a new Design Group, one or more members must be selected in the active structure window.

This command displays the New Design Group dialog.

Dialog Box Options

Name

Type a new name or select one from the list.

Design Brief

Select a Design Brief from the pulldown list. The Design Briefs are the design parameters to which the Design Group will be designed.

4.38. Members Table

Displays the Members Table window for the active structure. This table is un-editable, but clicking on a member reference number will highlight that member on the diagram.

Table Columns

Mem	The reference number of the member.
Emt	The elements that form the particular member.
A B	The nodes that define the start and end of the element.
Prop A, Prop B	The reference of the section properties at the start and end of the element.

Length	The length of the element (in the chosen units).
O. length	The overall length of the member, reduced by any cutbacks if applied (in the chosen units).

**Members Table button**

4.39. Form Member

Forms a structural member from a selection of one or more connected elements. Elements must be selected for this command to be available.

If the selection of elements is not connected then the form member command uses the first connected part of the selection only. A warning regarding this appears.

To view the members in the structure, use the Member Labels option in the Labels dialog which is available from the Labels command on the View menu.

To form a member, the following rules must be obeyed.

- 1) All elements must form a single continuous line. But they do not have to form a straight line. Thus curved members may be formed.
- 2) There must be a free end. Whilst curved members are allowed, they cannot form a closed loop.
- 3) All elements must have the same beta angle.
- 4) All elements must point in the same direction. Check with the orientation labels if necessary. Use the reverse element command on elements that point the wrong way.
- 5) None of the elements can be part of another member.
- 6) The section properties must be consistent at each element end. Elements can taper along their length, but where one element ends and the next starts, they must have the same section reference.
- 7) All elements must be made from the same material.

**Form Member button**

4.40. AutoForm Members

Forms a number of Members from a selected range of elements. Each member will obey the general rules for generating a member specified above, but uses the following rules in addition.

Vertical elements are converted into columns first.

Where four elements cross and share a single node, if the elements can form two members, the deeper section will form a continuous member, but the other elements will form parts of two separate members.

**AutoForm Member button**

4.41. Design Brief

A Design Brief is a set of design parameters, which allows the Concrete Design checks to be done. Each Design Brief is setup for a particular Design Code.

Briefs are independent of Member Design Groups so that the same brief can be re-used for several design groups. For example, you may have several groups of beams but only one brief for beams. Alternatively, you may tailor each brief to each member group.

Available Codes:

BS8110 Beam

BS8110 Column

Eurocode 2 Beam

Eurocode 2 Column



Design Brief dialog button

4.42. Design Brief Table

The Design Briefs table lists the design briefs already defined and the codes of practice used for each brief.

To edit an existing brief, either double click the table entry or select the entry with the cursor and then press the Edit Brief button.

To change the design code for a brief, select the code entry with the cursor and select a new code from the pull down.

4.43. Select By Design Group

Before selecting by Design Group, member groups must be defined for the structure.

Displays the Select Design Groups dialog which contains a list of the groups defined in the active structure.

Click on groups in the list to select them. Extend the selection by holding down the CTRL key and clicking on further groups.

Click the OK button to update the selection in the active structure window

4.44. Group Members List Table

This option displays a list of the members in the current design group with their Analysis and Design sections.



Table Columns

Mem	Shows the member number
Analysis Section	Shows the section used in the last analysis
Design Section	Shows the section from the last design, last analysed section if no design has been done.

To remove a member from the group, highlight the entry in the table and delete with the delete key.

To add a member to the design group, type the member number, omitting the "M", in the first column of the table.

Note that the contents of the two columns "Analysis Section" and "Design Section" can not be changed.

4.45. Design Group Table

This table is opened automatically when the Des.Groups option in Page Control Mode is selected.

To open this table when not running in Page Control Mode, select the table from the table list. To display the table list, use the menu option View/Tables.

Table Columns

Column 1	Shows the group reference G?
Design Group	Shows the name of the design group.
Design Brief	Shows the design brief to be used in designing the group.

4.46. Design Options

Opens the Design Options dialog. This has a single tab.

Design Options button

4.46.1. Member Select Tab

Available

The Available list shows the members in the current group that have not been selected.

Select a member by clicking on it, then clicking on the > button to transfer it to the Selected list. More than one member can be selected at once by holding down the CTRL key while selecting.

Select all the members in the Available list by clicking on the >> button.

Selected

The Selected list shows the members to be included in the design.

To remove a member from the Selected list, highlight it by clicking on it, then click on the < button to return it to the Available list.

Once the options have been set, a design can be initiated by clicking on the Design button.

4.47. Design Now

Designs the current group according to the settings in the Design Options dialog.

4.48. Design Results Setup

Opens the Design Results Setup dialog. This has two tabs.

Tab Options

4.48.1. Display Groups Tab

Choose the design groups for which results are to be displayed in the graphics window.

Available

The Available list shows the groups for which results may be displayed.

Select a group by clicking on it, then transfer it to the Selected list by clicking on the > button. Select more than one at once by holding down the CTRL key while selecting.

All the groups in the Available list can be selected by clicking on the >> button.

Selected

The Selected list shows the groups for which results are displayed.

To remove a group from the Selected list, highlight it by clicking on it, then click on the < button to return it to the Available list.

All the groups can be removed from the Selected list by clicking on the << button.

4.48.2. Colour Config Tab

The colour coding of the results display can be configured.

Select the "None" check box and no results are shown on the graphic.

Select the "Pass/Fail" check box to activate the left hand option list. Select the options to display by picking the check boxes.

To reconfigure the colours used for the various options, pick one of the colour blocks next to the option list. This brings up the Design Results Pass/Fail Colours dialog. Pick the item to be changed from the pull down list, then select the colour to be used for displaying this item from the palette displayed.

Select the "Efficiencies" check box to activate the right hand option list.

To reconfigure the colours used for the various options, pick on one of the colour blocks next to the option list. This brings up the Design Results Efficiency Colours dialog. Pick the item to be changed from the pull down list, then select the colour to be used for displaying this item from the palette displayed.

4.49. Individual Graphs

Creates Element/Member Results Graph windows for the elements/members selected in the active structure window. Each window can show results of multiple force types and multiple loadcases, combinations and/or envelopes.

A selection of elements/members must be present in the active structure window before this command is available.

To change or add load cases or lines to the graph, use the Diagrams command from the View menu.

Dialog Box Options

Load Cases

Select the load cases for which the graphs are to be drawn. More than one load case can be selected by holding down the CTRL key during selection.

Forces

Select the forces graphs to be drawn.

Colours

Click on this button to customize the colours of the graphs . This button displays the Graph Colours dialog. Select a graph from the drop-down list and then set its colour by clicking on the palette.

Tips

Change the load case displayed in an element graph window by using the drop-down list of load cases on the Results toolbar or right clicking over the Graph window.

To show the element graphs quickly, click on the Element Graphs button on the Results toolbar.



Element Graphs button

4.50. Main Reinforcement Diagram

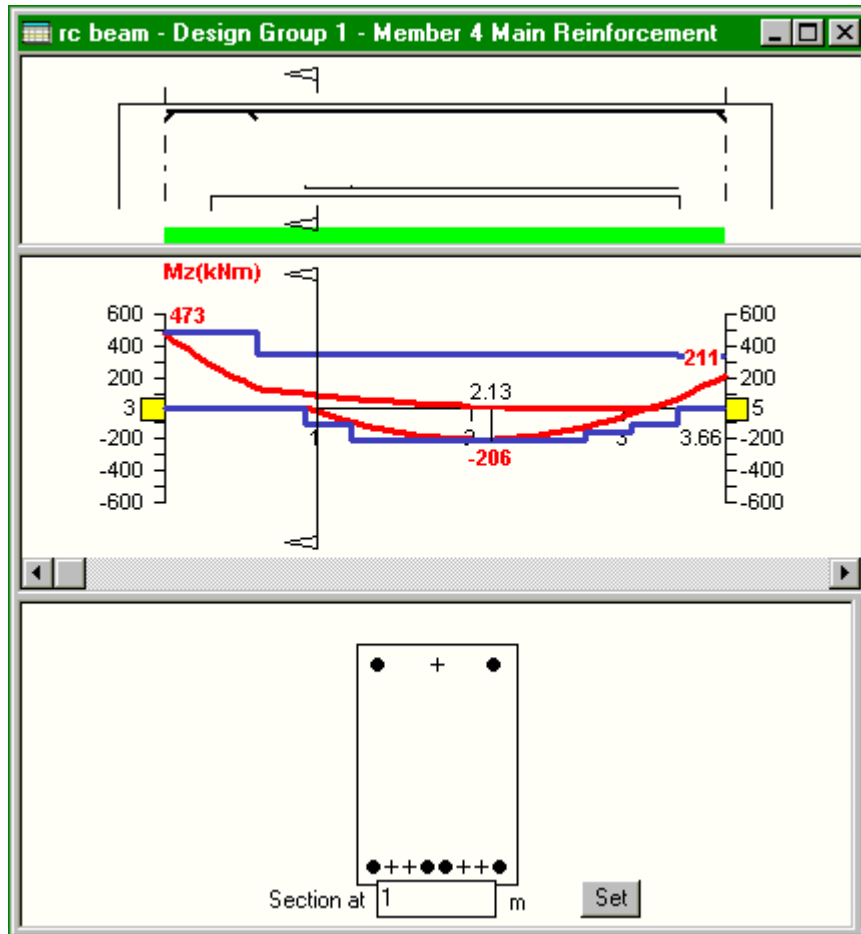
Displays the result of the design on the current member. The diagram is divided into parts which can be resized by dragging the separator. A Beam Design produces a different diagram to a column design.

4.50.1. Beam Design

There are three parts to a Beam design diagram. The top section displays an elevation of the member with the reinforcement layout, the centre section the major axis design moment envelope (M_z) with the design capacity and the lower section a cross section of the beam.

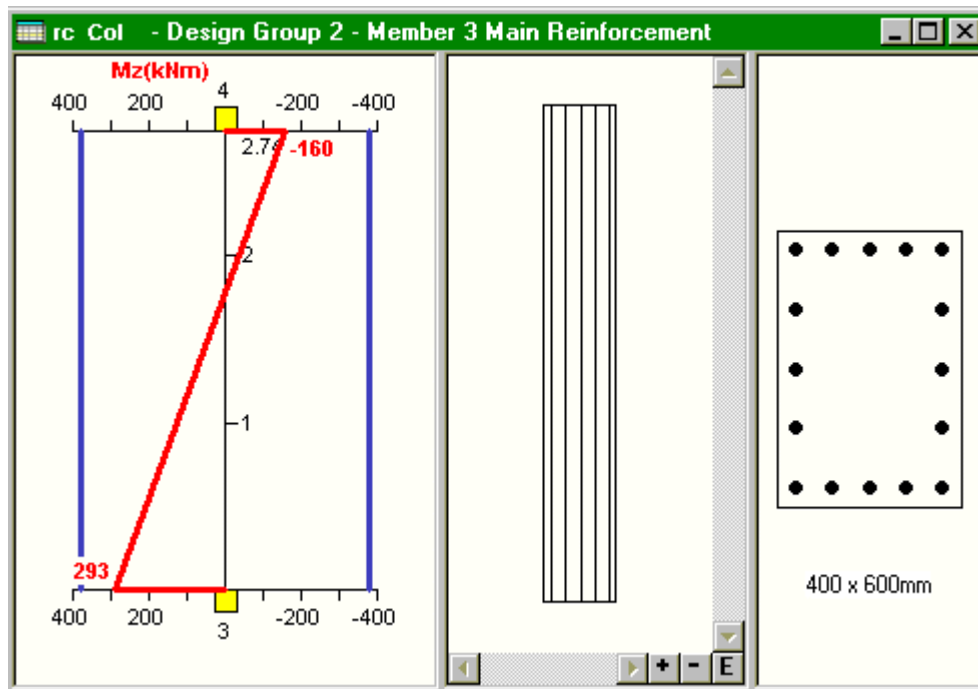
The location of the cross section can be determined by dragging the section marks on the top two parts of the diagram or by typing in the distance from the start of the beam and clicking on the set button.

The cross section shows locations of bars at that cross section with a dot and bars that occur elsewhere along the beam at that location with a '+'.



4.50.2. Column Design

There are three parts to a Column design diagram.



From left to right, the first section displays the major axis moment envelope (M_z) with the design capacity, the second section displays an elevation of the column. The final section is a typical cross section through the column.

4.51. Shear Reinforcement Diagram

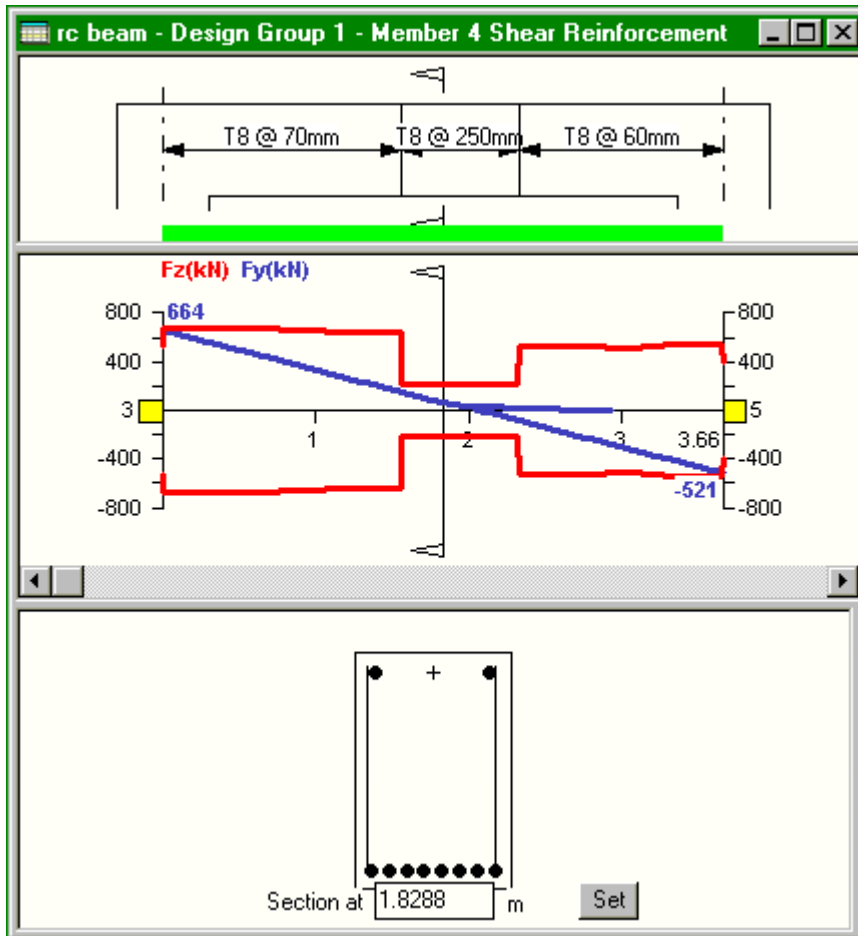
Displays the shear result of the design on the current member. The diagram is divided into three parts that can be resized by dragging the separator. A Beam Design produces a different diagram to a column design.

4.51.1. Beam Design

There are three parts for a beam design. The top section displays an elevation of the member with the shear reinforcement layout, the centre section the design shear force envelope (F_y) with the design capacity and the lower section a cross section of the beam.

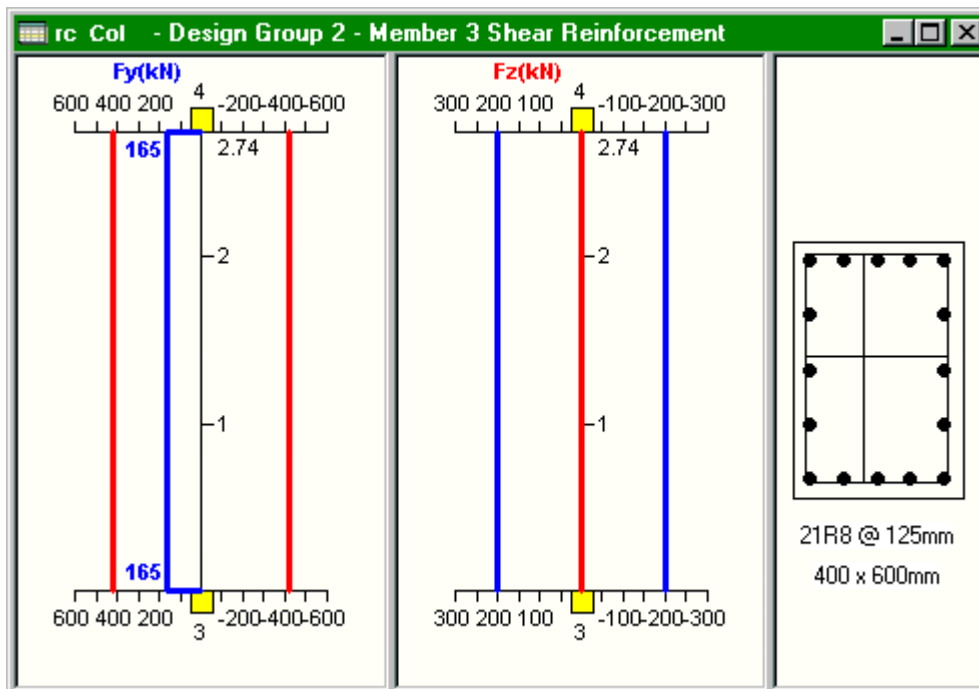
The location of the cross section can be determined by dragging the section marks on the top two parts of the diagram or by typing in the distance from the start of the beam and clicking on the set button.

The cross section shows locations of bars at that cross section with a dot and bars that occur elsewhere along the beam at that location with a '+'.



4.51.2. Column Design

There are three parts to a Column design diagram.



From left to right, the first section displays the major axis shear force envelope (F_y) with the design capacity, the second section the minor axis design shear force envelope (F_z) with the design capacity. The final section is a typical cross section through the column.

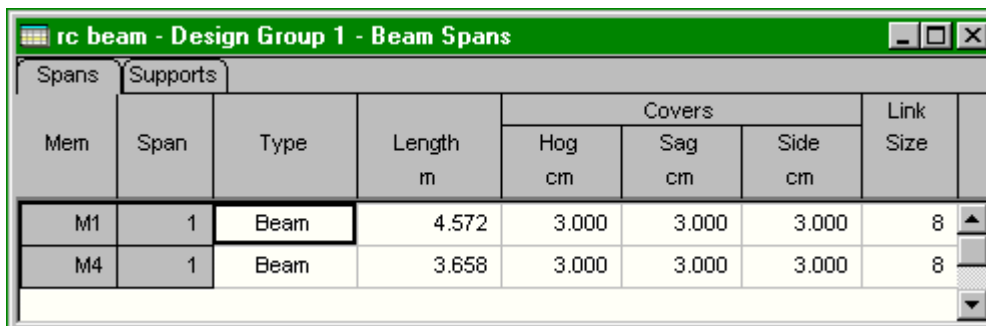
4.52. Plan View

Toggles the view on the top section of a main or shear reinforcement diagram to display the reinforcement from an elevational view to a plan view.

4.53. Beam Spans

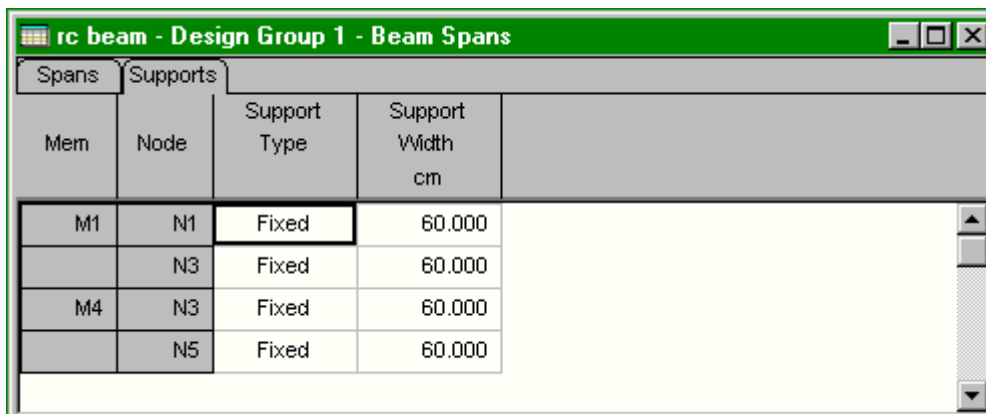
Displays the Beam Spans table. This has two tabs **Spans** and **Supports**.

The **Spans** tab allows the user to setup individual covers and link sizes for each span. The values for the Covers and Link Size are initially set by the values from the Design Brief, but can be edited and set separately for each span.



Mem	Span	Type	Length m	Covers			Link Size
				Hog cm	Sag cm	Side cm	
M1	1	Beam	4.572	3.000	3.000	3.000	8
M4	1	Beam	3.658	3.000	3.000	3.000	8

The **Supports** tab allows the user to define the size and type of support that can be used for shear enhancement. Both the Support Type (No support, Simple or Fixed) and Support Width can be set.



Mem	Node	Support Type	Support Width cm
M1	N1	Fixed	60.000
	N3	Fixed	60.000
M4	N3	Fixed	60.000
	N5	Fixed	60.000

A span is defined as the distance between two supports. The program will attempt to identify any nodes that would be considered as supports, but the user can override these assumptions and assign appropriate supports.

4.54. Main Reinforcement

Displays the **Main Reinforcement** table. This shows the design moments, required steel areas and provided steel bars for each location along the beam that was checked.

rc beam - Design Group 1 - Member 4 Main Reinforcement								
Distance (m)	Span	Moment (kNm)	As Req. (mm ²)	As' Req. (mm ²)	Bottom Layers		Top Layers	
					Bars	Area	Bars	Area
0.000	1(s)	472.922	2320	0		0	3T32	2413
0.300	1	285.662	1302	0		0	3T32	2413
0.305	1	285.662	1302	0		0	3T32	2413
0.610	1	131.291	578	0		0	3T32	2413
0.914	1	98.825	435	0	4T12	452	2T32	1608
1.219	1	70.951	313	0	8T12	905	2T32	1608
1.524	1	47.670	313	0	8T12	905	2T32	1608
1.829	1	28.981	313	0	8T12	905	2T32	1608
2.134	1	14.884	313	0	8T12	905	2T32	1608

Values that are displayed in green indicate sections where the reinforcement that is provided is to meet the minimum reinforcement requirements, as the design moment is too small. Values that are displayed in red indicate that not all the design requirements were met for the provided reinforcement.

4.55.Shear Links

Displays the **Shear Links** table. This shows the shear forces and stresses at the design locations along with the required steel area.

rc beam - Design Group 1 - Member 4 She...					
Distance (m)	Span	Shear (kN)	Shear Stress (kN/mm ²)	Asv Req. (mm ²)	
0.000	1(s)	663.717	3.039	147.888	
0.300	1	565.023	2.587	118.934	
0.305	1	565.023	2.587	118.934	
0.610	1	466.330	2.135	89.980	
0.914	1	367.636	1.683	66.946	
1.219	1	268.943	1.209	43.916	

4.56.Shear Zones

Displays the **Shear Zones** table. The result of the shear design, the program divides the beams into a number of shear zones where the provided shear reinforcement remains constant.

rc beam - Design Group 1 - Member 4 Shear Zones						
Zone	Start (m)	End (m)	No. of Legs	Link Size	Centres (mm)	Asv prov. (mm ²)
1	0.001	1.564	3	8	70	151
2	1.564	2.325	2	8	250	101
3	2.325	3.657	2	8	60	101

4.57. Deflection

Displays the **Span / Effective** table. This is the check to ensure that the limit of effective depth divided by the actual span is not exceeded.

Mem	Span	Length (m)	Type	Basic Limit	Modified Limit	Actual Span / Eff. Depth
M1	1	4.572	Beam	26.000	25.180	8.283
M4	1	3.658	Beam	26.000	35.990	6.578

4.58. Scheduled Bars

Displays the **Bar Bending Schedule** table.

Bar Mark	Type and size	No. of Bars	Bar Length mm	Shape code	A mm	B mm	C mm	D mm	E/R mm
01	T32	2	4400	35	4200				
02	T32	1	1525	34	1425				
03	T12	4	3575	20	3555				
04	T12	2	2650	20	2640				
05	T12	2	2950	20	2945				
06	T8	50	1850	61	535	335			
07	T8	23	775	85	120	535	65	120	

4.59. Member Summary

Displays the **Member Summary** table. This shows where the members in the Design Group have passed or failed to meet the design requirements.

Mem	Design	Span	Type	Main Bars		Shear Bars	Span Depth
				Hog	Sag		
M1	Initial	1	Beam	Ok	Ok	Ok	Ok
M4	Initial	1	Beam	Ok	Ok	Ok	Ok

4.60. Clear Results

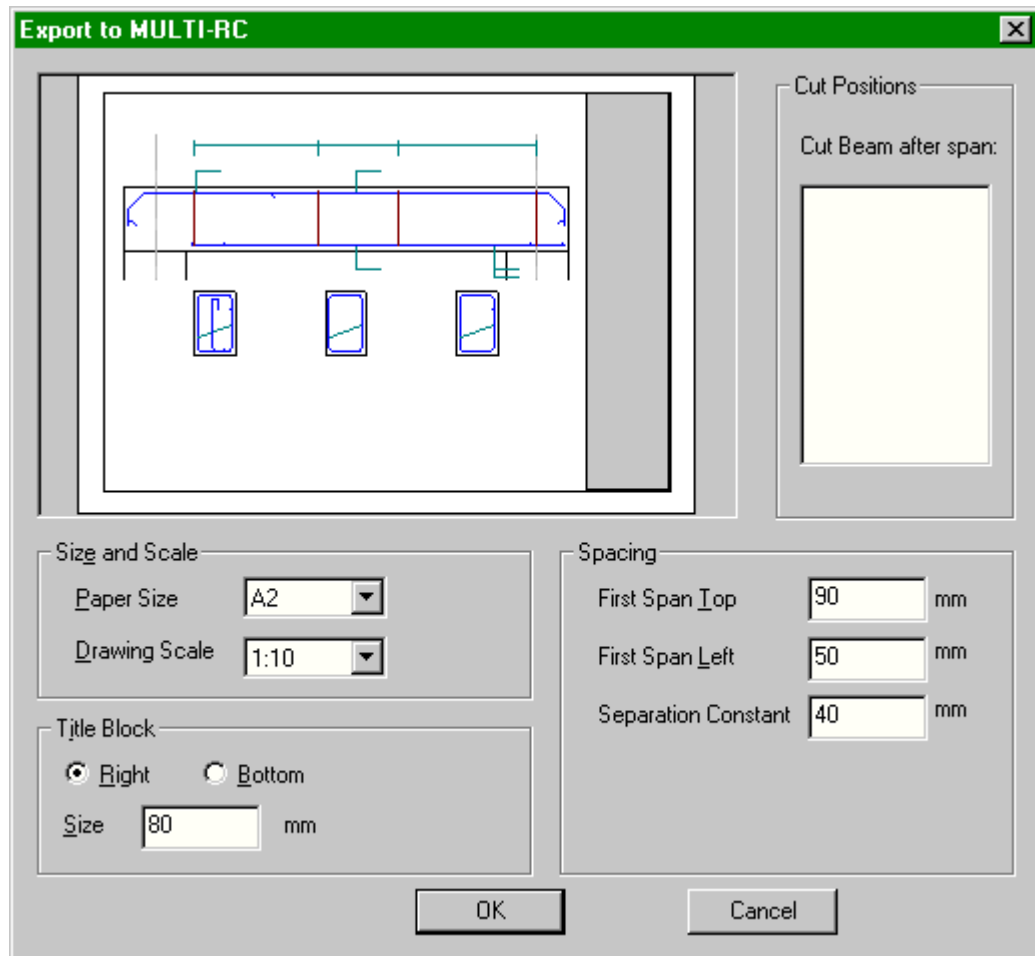
Clears all the results the designs of the current Design Group.

4.61. Export to Multi RC

Displays the Export to Multi-RC dialog box. This will create a DXF file of the current member that can be read into the AutoCAD application Multi-RC (please contact your

Research Engineers supplier for more information on this product). The file will contain elevations, sections and a bending schedule.

The dialog box is comprised of five sections:-



4.61.1. Preview Window

This shows how the member will appear when imported into Multi-RC with the current settings.

4.61.2. Size and Spacing

This sets the size of paper that the drawing is to be imported into and scale of the drawings to be generated.

4.61.3. Title Block

This is used for guidance so that the user can position the drawing without encroaching the space that is provided for title blocks in the final drawing.

4.61.4. Cut Section

When the current beam is a multiple span, then the beam can be cut at support locations and the next section is then continued below.

4.61.5. Spacing

There are three values that are used to locate the drawings onto the drawing sheet. The **1st Span Left** and **1st Span Top** locate the top left corner of the first span relative to the top left corner of the drawing. The value **Separation Constant** defines the distance between sections of a beam that have been cut using the Cut Section as outlined above.

4.62. Design Layer

Switches the operating mode of RC Designer to the Design Layer mode and page layout to the Job Information Page.

4.63. Design

Switches the operating mode of RC Designer to the Concrete Design mode associated with the current design code.

4.64. Page Control

Toggles the Page Control menu on the left hand side of RC Designer.

4.65. Cascade

Arranges the windows in RC Designer in an overlapping pattern so that the title bar of each window remains visible.

4.66. Tile Horizontal

Arranges the windows in RC Designer so that all the windows which are not minimized do not overlap and are as wide as possible. Any minimized window icons are arranged in a gap underneath the tiled windows.

4.67. Tile Vertical

Arranges the windows in RC Designer so that all the windows which are not minimized do not overlap and are as tall as possible. Any minimized window icons are arranged in a gap underneath the tiled windows.

4.68. Arrange Icons

Arranges the icons of any minimized RC Designer windows into rows across the bottom of the MDI window. This command does not affect the size or position of any open windows.

4.69. Structure Only

Closes all RC Designer windows for the active structure except for a single whole structure window. If a whole structure window is not currently open, then RC Designer creates a new one.

4.70. Contents

Displays the contents page of the RC Designer Help system. The Help system contains sections for Overview, Engineering Information, Using RC Designer step-by-step, Options and a Command Reference.

When looking through Help, the Contents page can be returned to by clicking on the Contents button in the RC Designer Help window.

4.71. Search for Help On...

Searches in Help for information about a given keyword. Shows the Search dialog.

In the Search dialog, type the topic or select it from the list. Then click on the Show Topics button to see the related topics. To view the Help on a particular topic, select it and click on the Go To button.

4.72. Using Help

Displays the How to Use Help window which gives more information on using Help.

4.73. About STAAD.Pro RC

Displays the name and version of the program. Also gives the address of Research Engineers, whom you may wish to contact for the details of our latest software.
