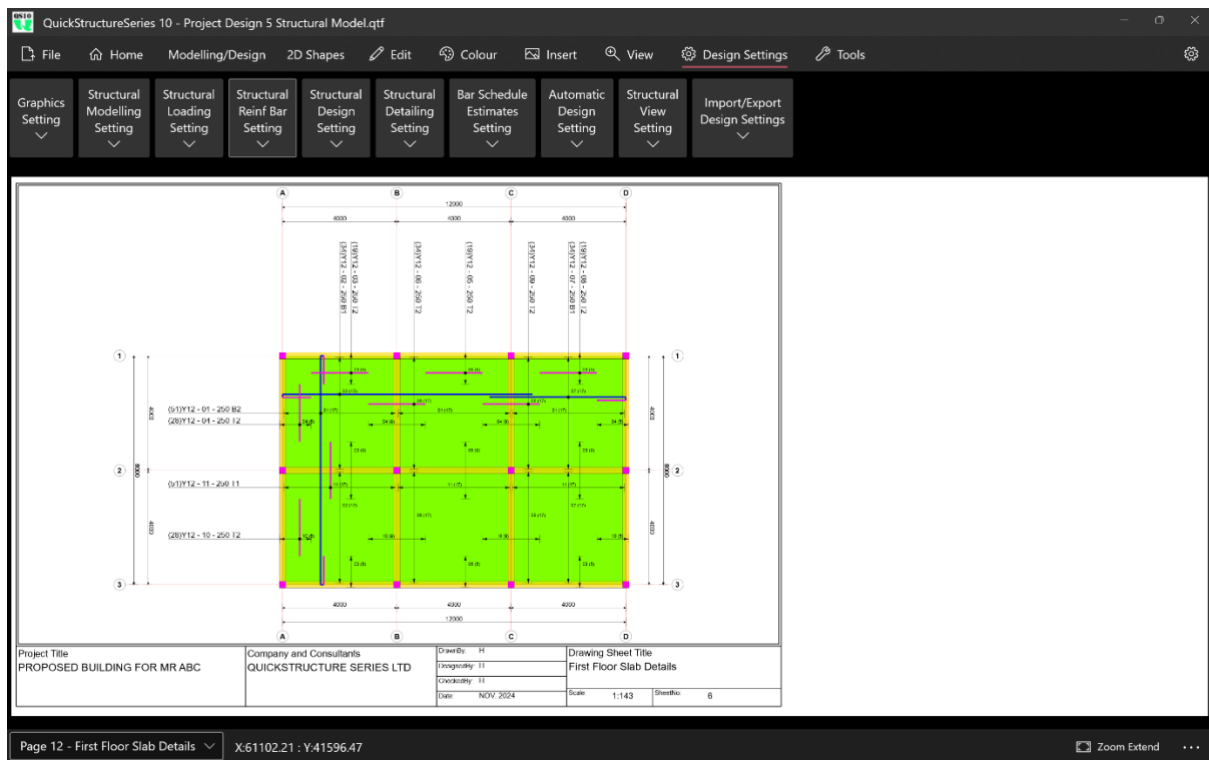


QUICKSTRUCTURE 10

TUTORIAL | PART 6

REINFORCEMENT DESIGN SETTINGS



Reinforcement Design Settings

In QS10 Reinforcement Design settings control various aspects of the reinforcement design process. You can set these settings to take control of the design and make it more personal.

If you are new to QS10 software is better to start with the default settings and progress in your learning after you can now change the settings where necessary.

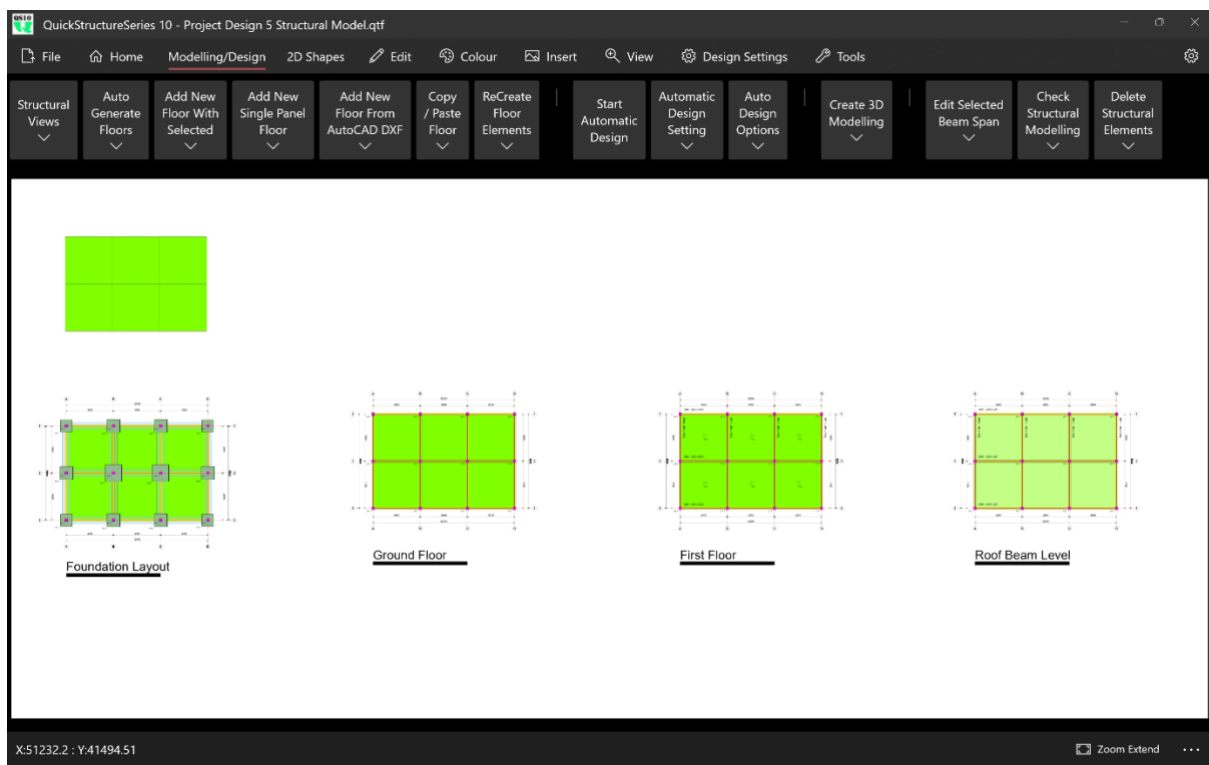
In this tutorial I will be going straight to the settings involved in controlling the reinforcement, it is assumed that you have gone through part 1 to part 5 of QS10 manual to get used to the software. I will not be creating project from the scratch but with your knowledge of the software you can easily create the project and test some of the settings we will be checking out.

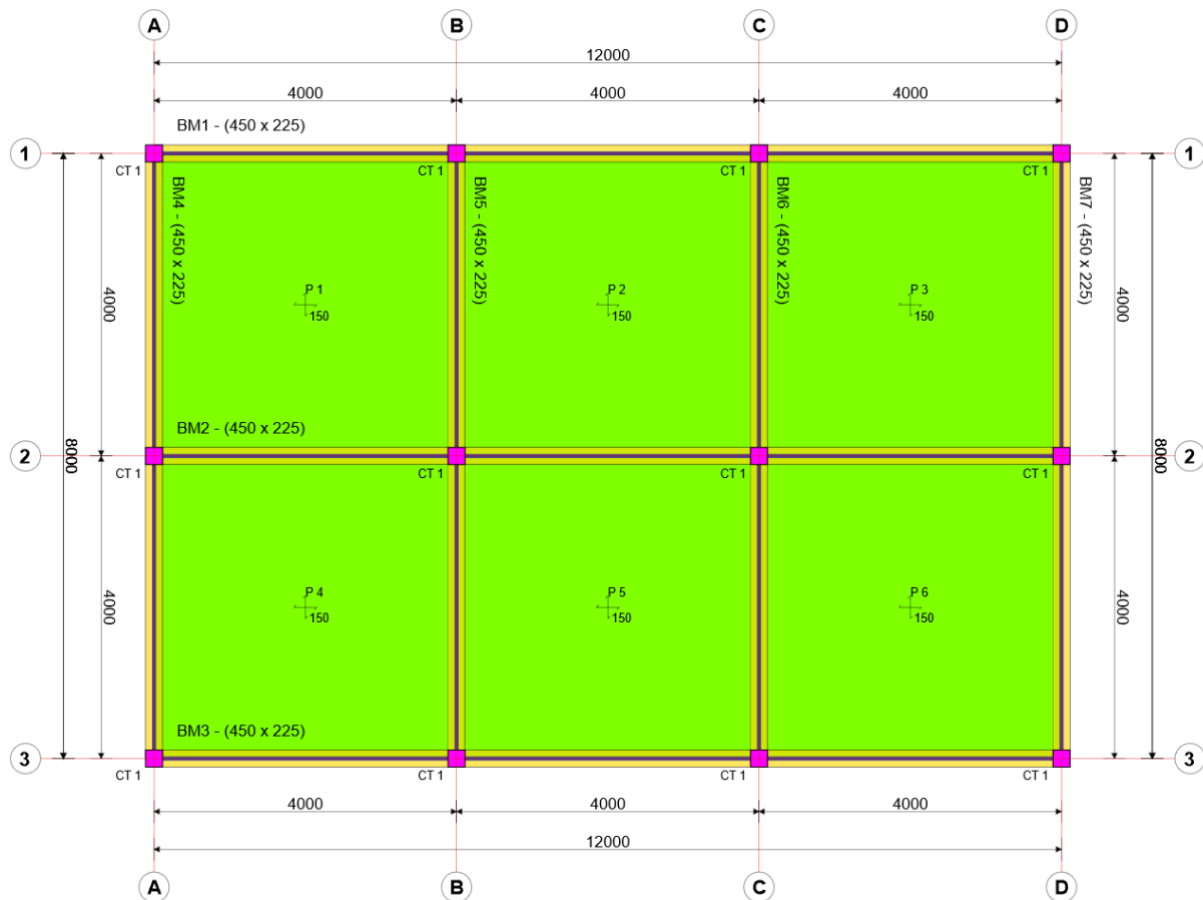
How to Set Reinforcement Design Settings

1. Open QuickStructure 10 Software

Note: It will always open with a new project by default. You don't need to create new project.

2. Create the project below.





It is expected that you are already familiar with creating projects in QS10.

- Create 6 rectangles, 4000x4000 dimensions.
- Create ground floor, first floor and roof beam level.

3. Click Design Settings Tab, and click Structural Reinf Bar Setting.

Design 5 Struc

/Design 2D

Structural Reinf Bar Setting

Design Settings

Import/Export Design Settings

General Notes:

1. Valid Bar Spacing: 300,250,225,200,175,150,125,100,75,50
2. Valid Bar Diameter: 6,8,10,12,16,20,25,32,40
3. Valid Link Spacing: 300,275,250,225,200,175,150,125,100,90,85
4. Valid Link Diameter: 6,8,10,12,16
5. Upper Limit means the greatest amount of reinforcement and Lower limit means the lowerest amount of reinforcement.
6. Upper limit bar diameter must be greater or equal to lower limit bar diameter. If upper limit and lower limit diameter is the same, then the upper limit spacing must be less or equal to lower limit spacing.

Reinforcement Bar Type Text: Y

Structural Slab Reinforcement Setting

Slab Lower Limit Bar Specification

Lower Limit Bar Diameter: 12

Lower Limit Bar Spacing: 200

Slab Lower Limit Bar Specification: Y12 @ 200mm c/c

4. General Notes

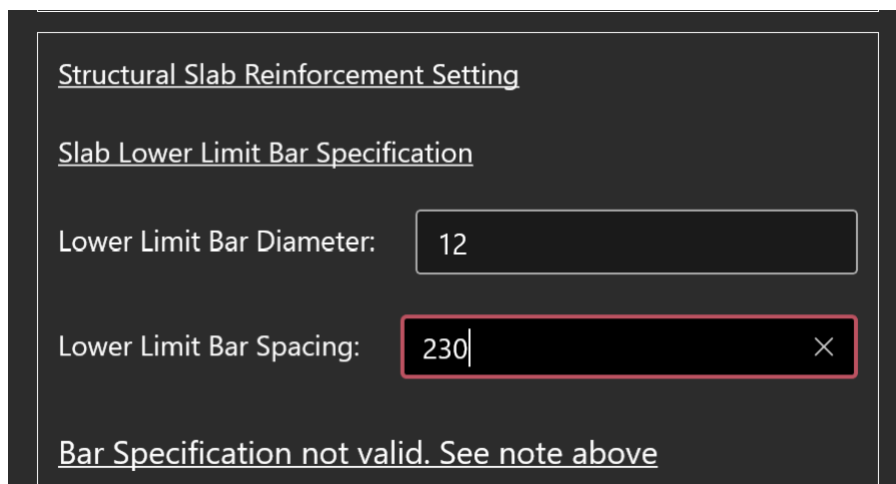
General Notes:

1. Valid Bar Spacing: 300,250,225,200,175,150,125,100,75,50
2. Valid Bar Diameter: 6,8,10,12,16,20,25,32,40
3. Valid Link Spacing: 300,275,250,225,200,175,150,125,100,90,85
4. Valid Link Diameter: 6,8,10,12,16
5. Upper Limit means the greatest amount of reinforcement and
Lower limit means the lowerest amount of reinforcement.
6. Upper limit bar diameter must be greater or equal to
lower limit bar diameter. If upper limit and lower
limit diameter is the same, then the upper limit spacing
must be less or equal to lower limit spacing.

Most of the information in these notes applies to most part of the reinforcement settings. We will look at them in details later.

- Valid Bar Spacing:
300,250,225,200,175,150,125,100,75,50

Please always use the valid bar spacing for varies part of the elements. If you try to use values that are not valid the software will show this error.



Structural Slab Reinforcement Setting

Slab Lower Limit Bar Specification

Lower Limit Bar Diameter: 12

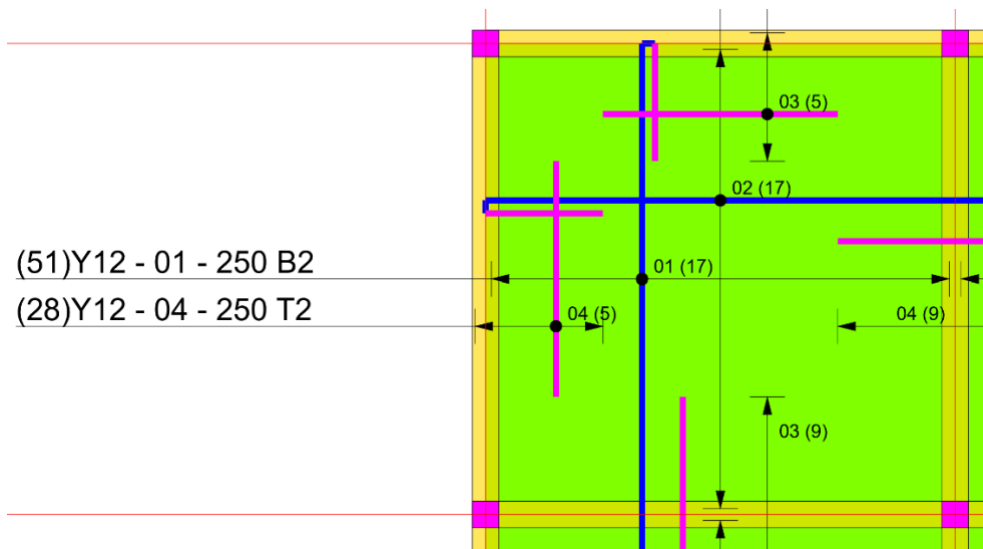
Lower Limit Bar Spacing: 230

Bar Specification not valid. See note above

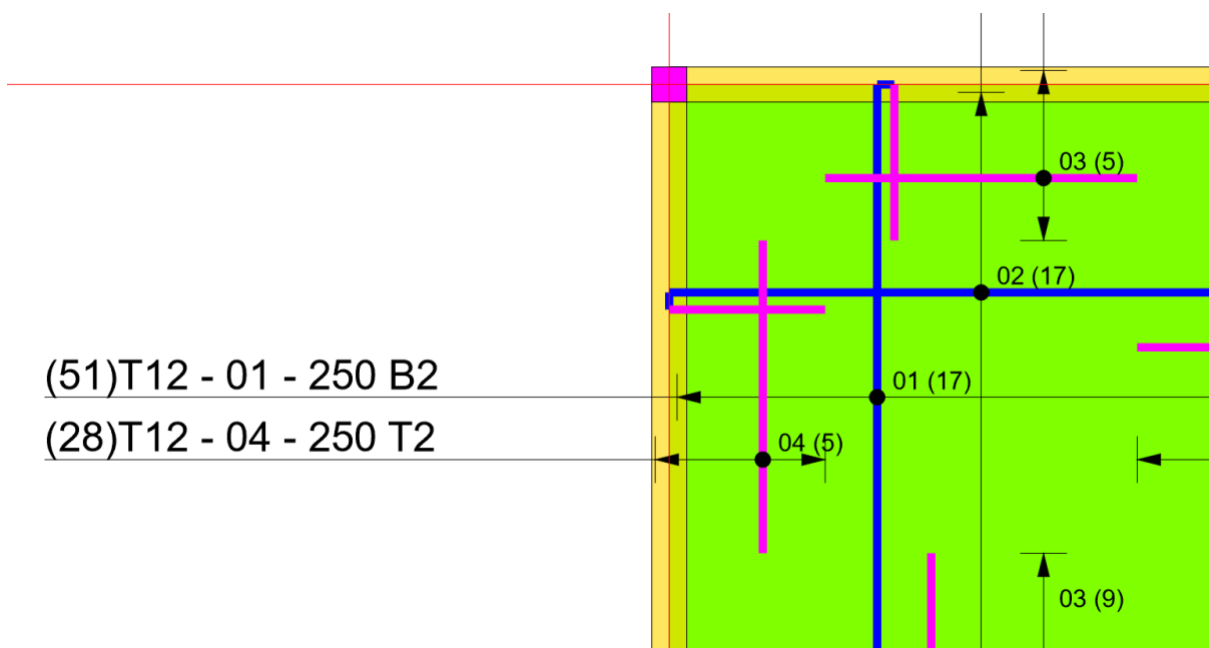
- Valid Bar Diameter:
6,8,10,12,16,20,25,32,40
- Valid Link Spacing:
300,275,250,225,200,175,150,125,100,90,
85
- Valid Link Diameter: 6,8,10,12,16

5. Reinforcement Bar Type Text

Reinforcement Bar Type Text:	Y
------------------------------	--------------------------------



This controls the text of the reinforcement bar type, you can use Y or T and the software will work with it.



6. Slab Reinforcement Setting

Structural Slab Reinforcement Setting

Slab Lower Limit Bar Specification

Lower Limit Bar Diameter: 12

Lower Limit Bar Spacing: 200

Slab Lower Limit Bar Specification: Y12 @ 200mm c/c

Slab Upper Limit Bar Specification

Upper Limit Bar Diameter: 20

Upper Limit Bar Spacing: 200

Slab Upper Limit Bar Specification: Y20 @ 200mm c/c

Slab Minimum and Maximum Bar Spacing

Slab Minimum Bar Spacing: 200

Slab Maximum Bar Spacing: 250

- You can set the lower limit and the upper limit of the slab bar specification.

The default setting is:

Slab lower limit: Y12@200

Slab upper limit: Y20@200

As you can see the lower limit has less reinforcement and the upper limit has more reinforcement.

When setting the lower and upper limit boundaries, it should always be in the order above. The upper limit must be greater than or equal to the lower limit bar specification.

These are valid examples

- a. Lower limit: Y12@200, Upper limit Y20@200
- b. Lower limit: Y12@200, Upper limit: Y12@200.

You can set both lower limit and upper limit to the same value to force the software to use specific spec.

In most slab panels, the reinforcement might be Y12@300, by setting the upper limit and lower limit to Y12@200, you will force the software to use Y12@200.

In most cases, it is better to leave the settings as they are. You can set the lower limit, but leave the upper limit @ Y20@200, the reason is that it is only in extreme cases that the slab will get to Y20@200.

The lower limit set the lower boundary, if the slab reinforcement design (say Y12@300) is lower than the setting (say Y12@200), the software will use Y12@200. This is because Y12@200 is better than Y12@300.

The Upper limit set the upper boundary, if the slab reinforcement design (say Y20@150) is more than the setting (say Y20@200), the software will take further action, it will increase the slab depth.

7. Slab Panel Bottom Outer Layer B1, Bottom Second Layer B2, Top Outer Layer T1, Top Second Layer T2 Setting.

Set Slab Bottom Outer Layer, Bottom Second Layer
and Slab Top Outer Layer, Top Second Layer Reinforcement.

Use this to further control the slab reinforcement.

☒ Set Bottom Outer, Second Layer Reinf. etc.

Bottom Outer Layer Minimum Bar Diameter: 12

Bottom Outer Layer Minimum Bar Spacing: 200

Bottom Second Layer Minimum Bar Diameter: 12

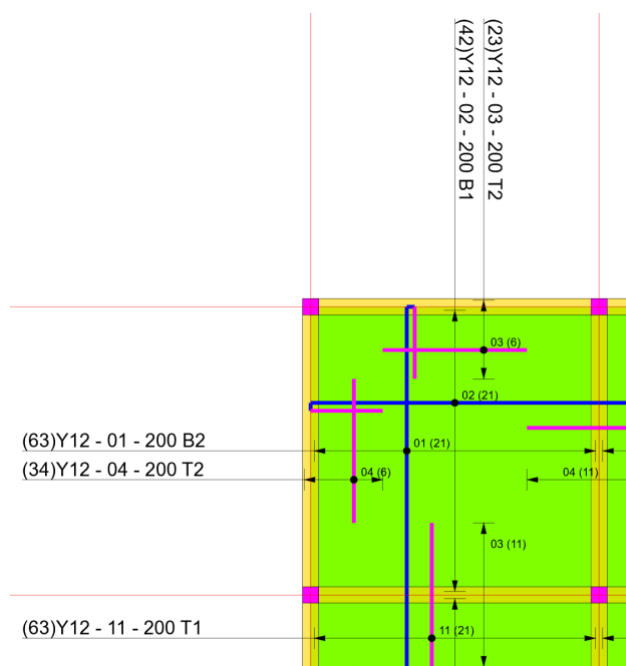
Bottom Second Layer Minimum Bar Spacing: 200

Top Outer Layer Minimum Bar Diameter: 12

Top Outer Layer Minimum Bar Spacing: 200

Top Second Layer Minimum Bar Diameter: 12

Top Second Layer Minimum Bar Spacing: 200



- Check Set Bottom Outer, Second Layer Reinf. etc to edit the B1,B2,T1 and T2 specs.

You can set the individual specification of the slab panel to further control the reinforcement. Bottom Outer Layer (B1) and Top Outer Layer (T1) are the main bars, while Bottom Second Layer (B2) and Bottom Second Layer (T2) are the secondary bars. I will refer them from now as B1, T1, B2 and T2.

The setting for B1, T1, B2 and T2 are minimum setting. They are controlled by lower limit setting at first. If you change the lower limit, it will change them, after you can change them individually.

In the example above,

Lower limit: Y12@200

B1: Y12@200

B2: Y12@200

T1: Y12@200

T2: Y12@200

We will change the B1, B2, T1, T2

B1: Y12@150

B2: Y12@225

T1: Y12@150

T2: Y12@225

Set Slab Bottom Outer Layer, Bottom Second Layer
and Slab Top Outer Layer, Top Second Layer Reinforcement.

Use this to further control the slab reinforcement.

☒ Set Bottom Outer, Second Layer Reinf. etc.

Bottom Outer Layer Minimum Bar Diameter: 12

Bottom Outer Layer Minimum Bar Spacing: 150

Bottom Second Layer Minimum Bar Diameter: 12

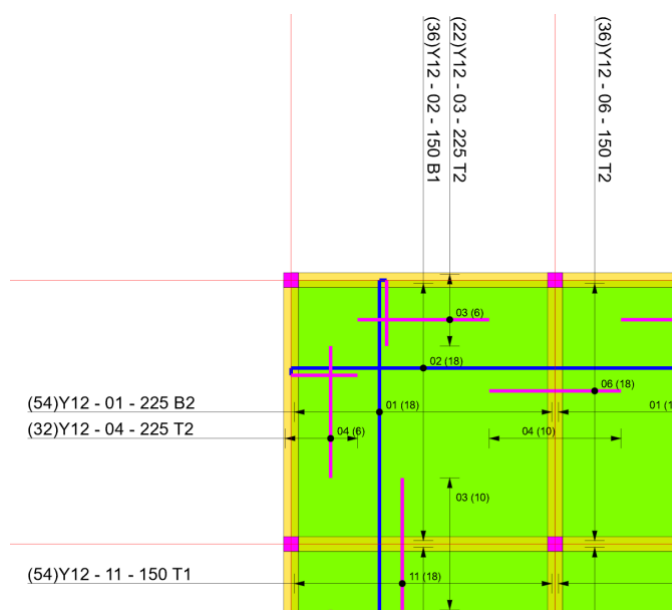
Bottom Second Layer Minimum Bar Spacing: 225

Top Outer Layer Minimum Bar Diameter: 12

Top Outer Layer Minimum Bar Spacing: 150

Top Second Layer Minimum Bar Diameter: 12

Top Second Layer Minimum Bar Spacing: 225



- The values of B1, B2, T1, and T2 will take precedent over the lower limit values.
- Limit the lower limit, the values of B1, B2, T1 and T2 must be lower or equal to the upper limit.
- Is always better to set the upper limit to a higher diameter bar (like Y20@200).

Because slab design reinforcements are usually low (like Y12@250) most of the control is done with lower limit bar spec. or the minimum B1, B2, T1, and T2 bar spec.

8. Structural Beam reinforcement Setting

Structural Beam Reinf Setting

Beam Minimum Bar Diameter:

12

Beam Maximum Bar Diameter:

25

Control How Beam Bar Diameter and Number are selected

Maximum No Of 6mm Diameter Bar:

4

Maximum No Of 8mm Diameter Bar:

4

Maximum No Of 10mm Diameter Bar:

4

Maximum No Of 12mm Diameter Bar:

6

Maximum No Of 16mm Diameter Bar:

10

Maximum No Of 20mm Diameter Bar:

12

Maximum No Of 25mm Diameter Bar:

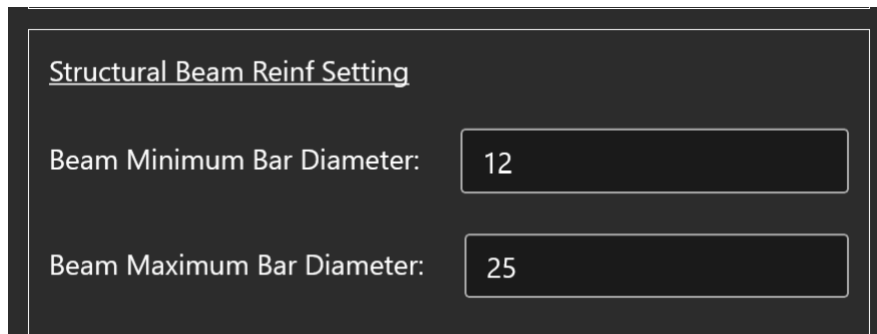
14

Maximum No Of 32mm Diameter Bar:

16

Maximum No Of 40mm Diameter Bar:

20



Structural Beam Reinf Setting

Beam Minimum Bar Diameter: 12

Beam Maximum Bar Diameter: 25

- Set the Beam Minimum Bar Diameter value to control the initial bar diameter of the beam design. This is the lowest bar diameter the software will use for the beam. It will not go lower than this.
- Set the Beam Maximum Bar Diameter value to control the maximum bar diameter for the design. This is the upper boundary, once the design is higher than the maximum diameter the software will increase the depth of beam.

9. Control How Beam Bar Diameter and Number are selected.

Control How Beam Bar Diameter and Number are selected

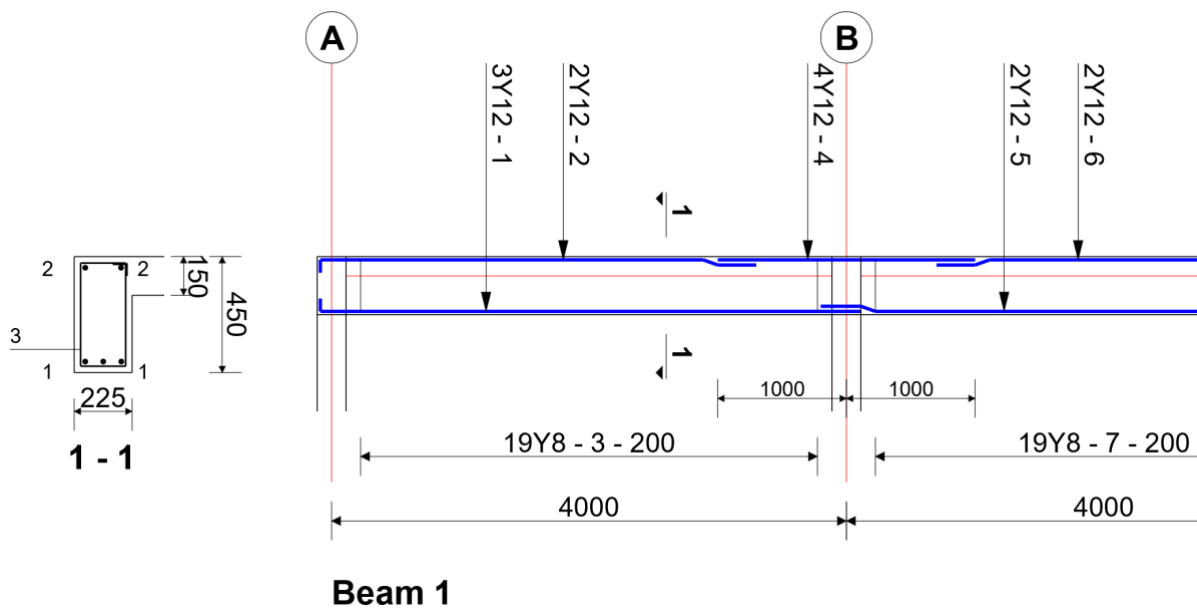
Maximum No Of 6mm Diameter Bar:	4
Maximum No Of 8mm Diameter Bar:	4
Maximum No Of 10mm Diameter Bar:	4
Maximum No Of 12mm Diameter Bar:	6
Maximum No Of 16mm Diameter Bar:	10
Maximum No Of 20mm Diameter Bar:	12
Maximum No Of 25mm Diameter Bar:	14
Maximum No Of 32mm Diameter Bar:	16
Maximum No Of 40mm Diameter Bar:	20

- You can control the maximum number of bars for a particular diameter. This is also a control measure. You can leave the settings as they are or set them.
- Let say you want to use more of Y16, you can limit the number of Y12 to 2, so that once the design gets 3Y12, it will jump to Y16.

- Maximum No of 12mm diameter bar:6

Control How Beam Bar Diameter and Number are selected

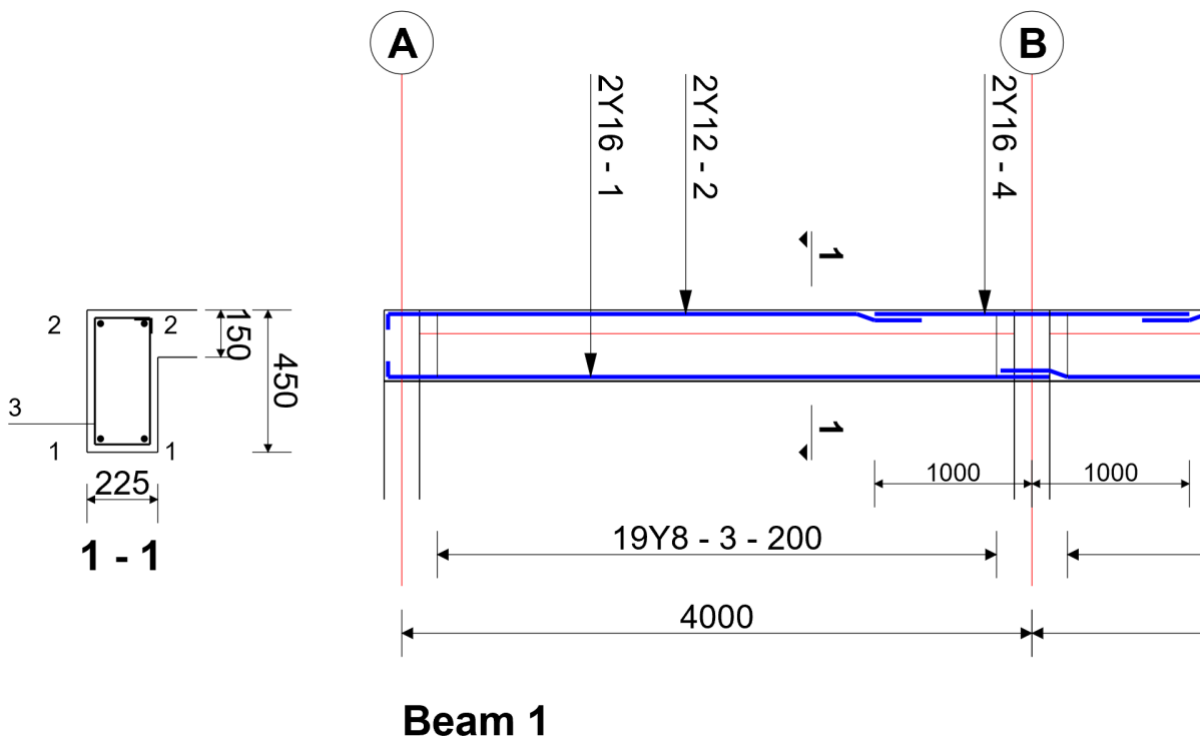
Maximum No Of 6mm Diameter Bar:	4
Maximum No Of 8mm Diameter Bar:	4
Maximum No Of 10mm Diameter Bar:	4
Maximum No Of 12mm Diameter Bar:	6 ×
Maximum No Of 16mm Diameter Bar:	10



- Maximum No of 12mm diameter bar:2

Control How Beam Bar Diameter and Number are selected

Maximum No Of 6mm Diameter Bar:	4
Maximum No Of 8mm Diameter Bar:	4
Maximum No Of 10mm Diameter Bar:	4
Maximum No Of 12mm Diameter Bar:	2 ×
Maximum No Of 16mm Diameter Bar:	10



As you can see by changing the maximum no of Y12 to 2, it forces the software to change to Y16.

10. Structural Beam Link Reinforcement Setting

Structural Beam Link Reinforcement Setting

Beam Link Lower Limit Bar Specification

Lower Limit Bar Diameter:

Lower Limit Bar Spacing:

Beam Link Lower Limit Bar Specification: Y8 @ 150mm c/c

Beam Link Upper Limit Bar Specification

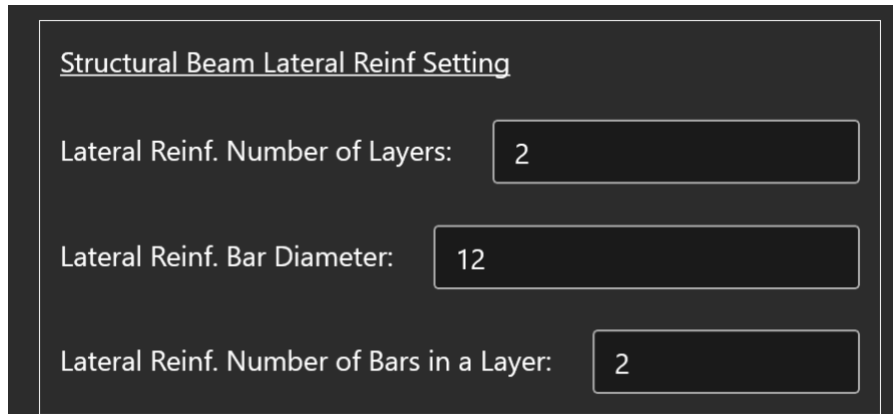
Upper Limit Bar Diameter:

Upper Limit Bar Spacing:

Beam Link Upper Limit Bar Specification: Y12 @ 250mm c/c

- You can set the lower limit and the upper limit of the beam link reinforcement spec. The setting is just like the slab upper limit. Almost all that I explained in the section applies to the beam link.
- Valid Link Spacing:
300,275,250,225,200,175,150,125,100,90, 85
- Valid Link Diameter: 6,8,10,12,16
- The software will not work with any values outside of these specified values.

11. Structural Beam Lateral Reinforcement Setting.

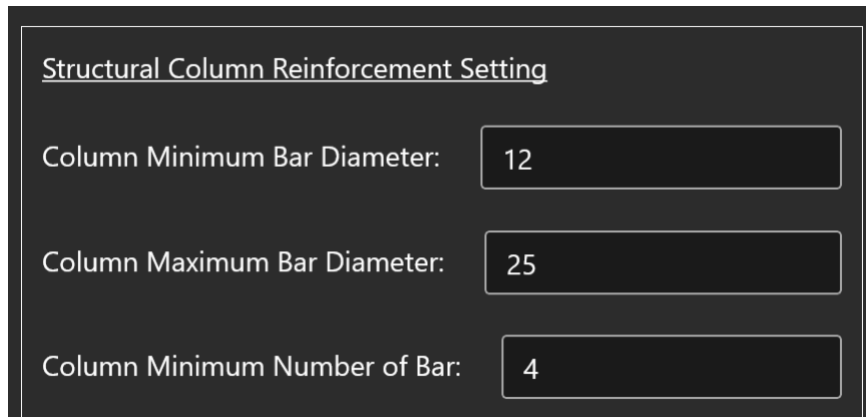


The image shows a software dialog box titled "Structural Beam Lateral Reinf Setting". It contains three input fields with the following values:

Parameter	Value
Lateral Reinf. Number of Layers:	2
Lateral Reinf. Bar Diameter:	12
Lateral Reinf. Number of Bars in a Layer:	2

- Use this to control Lateral Reinforcement setting. This is mainly used in raft foundation beam detailing.
- The lateral reinforcement is not designed by the software, so whatever these settings are is what it will use.

12. Structural Column Reinforcement Setting



The image shows a software dialog box titled "Structural Column Reinforcement Setting". It contains three input fields with labels and values:

Label	Value
Column Minimum Bar Diameter:	12
Column Maximum Bar Diameter:	25
Column Minimum Number of Bar:	4

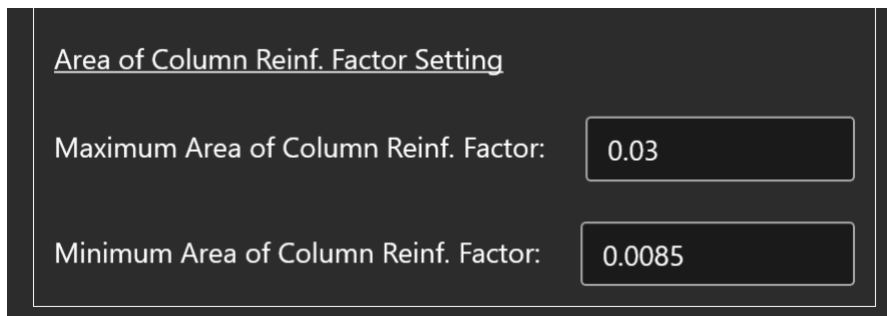
- Column minimum bar diameter sets the minimum bar diameter for the column design. That is the lower limit. The software starts design with this value.
- Column maximum bar diameter sets the maximum bar diameter of column design. It is the upper limit. This is a control measure. If the reinforcement design is higher than this value, the software will increase the size of the column.
- Column minimum number of bar sets the minimum number of bars for the column.
- For most columns this default setting will be ok.

13. Column how column bar diameter and number of bars are selected.

<u>Control How Column Bar Diameter and Number are selected</u>	
Column Maximum No Of 6mm Diameter Bar:	4
Column Maximum No Of 8mm Diameter Bar:	4
Column Maximum No Of 10mm Diameter Bar:	4
Column Maximum No Of 12mm Diameter Bar:	6
Column Maximum No Of 16mm Diameter Bar:	10
Column Maximum No Of 20mm Diameter Bar:	12
Column Maximum No Of 25mm Diameter Bar:	14
Column Maximum No Of 32mm Diameter Bar:	16
Column Maximum No Of 40mm Diameter Bar:	20

- This is a control measure. Use it to fine tune the outcome of the column design. You can easily control which diameter to use.
- Like with most of the settings, you don't have to change at the beginning of the design. You can run automatic design, look at the details and make changes if needed.

14. Area of column reinforcement factor setting



Area of Column Reinf. Factor Setting

Maximum Area of Column Reinf. Factor: 0.03

Minimum Area of Column Reinf. Factor: 0.0085

- This is a control measure
- The maximum area of column reinforcement factor controls the maximum amount of reinforcement in a particular cross section. If the maximum amount is reached, the software will increase the size of the column.
- Minimum area of column reinforcement factor controls the minimum amount of reinforcement in the column section.

15. Column Link Reinforcement Setting

Structural Column Link Reinforcement Setting

Column Link Lower Limit Bar Specification

Lower Limit Bar Diameter:

Lower Limit Bar Spacing:

Column Link Lower Limit Bar Specification: Y8 @ 200mm c/c

Column Link Upper Limit Bar Specification

Upper Limit Bar Diameter:

Upper Limit Bar Spacing:

Column Link Upper Limit Bar Specification: Y12 @ 200mm c/c

- Column link lower and upper limit work like the beam link we discussed above.
- The column link is not designed so the setting is used together with the control measures in the next step below.

16. Column minimum bar diameter

Column Minimum Bar Diameter
☒ Set Minimum Column Bar Diameter For Various Depths
Column Minimum Bar Diameter For Depth Below 300
Column Bar Diameter:
Column Link Bar Diameter:
Column Minimum Bar Diameter For Depth Between 300 - 450
Column Bar Diameter:
Column Link Bar Diameter:
Column Minimum Bar Diameter For Depth Between 450 - 600
Column Bar Diameter:
Column Link Bar Diameter:

- This is a control measure. You can use this to set the bar minimum diameter for various column sections.
- This is a starting guide for the software for the column section, the design reinforcement diameter could only go up and not below the value.

- For a start you don't need to set these values, you can leave them as they are and change if needed.
- This setting helps you to fine tune the outcome of the column design.

17. Pad Foundation Reinforcement Setting

Structural Pad Foundation Reinforcement Setting

Pad Foundation Lower Limit Bar Specification

Lower Limit Bar Diameter:

Lower Limit Bar Spacing:

Pad Foundation Lower Limit Bar Specification: Y12 @ 200mm c/c

Pad Foundation Upper Limit Bar Specification

Upper Limit Bar Diameter:

Upper Limit Bar Spacing:

Pad Foundation Upper Limit Bar Specification: Y25 @ 200mm c/c

- Pad foundation lower and upper limit is like the slab lower and upper limit.
- It is a control measure the software uses to control the reinforcement design of pad foundation.

18. Pad foundation minimum bar diameter

Pad Foundation Minimum Bar Diameter

☒ Set Minimum Bar Diameter For Various Base Thicknesses

Bar Diameter For Base Thickness Below 350:

Bar Diameter For Base Thickness Between 350-450:

Bar Diameter For Base Thickness Between 450-600:

Bar Diameter For Base Thickness Between 600-800:

Bar Diameter For Base Thickness Between 800-900:

Bar Diameter For Base Thickness Above 900:

- This is a control measure, use it to control the outcome of the pad foundation setting for various depth sections.

19. In summary:

- You don't need to change most of the reinforcement settings
- If you are to change the lower limit and the upper limits specs, make sure the lower limit specification is always lower or equal to the upper limit specification.

- If you made any changes to the settings is better to export it in a separate file so that you can import it later. The software will always start with the default settings, you can always import your settings into a new project.
- To fine tune the settings, it is better to set them in blocks and try it out and make sure you are ok with the outcome before you continue. You can start with the slab reinforcement setting and run automatic design and check to see you get the result you want and then move on from there.
- Once you have finished fine tuning the setting you can save or export it. We have discussed saving the settings in a different manual.