

# ETABS MATE

Concrete Structure Detailing Software

**New Update**

VERSION  
1.3.590

## ETABS MATE

Concrete Structure Detailing Software

**ETABS MATE** version **1.3.590**  
with a lot of New Advanced Features

- **Compatibility with ETABS 21 and all previous versions of the software.**
- **Automatic calculation of Joint Shear Ratio based on Detailing Rebar and ACI 318-2019.**
- **Displaying calculation details of Joint Shear ratio by clicking on each Joint.**
- **Providing a printable report of the calculation details for Joint Shear ratio**
- **Ability to configure calculation parameters for automatic Joint Shear ratio calculating.**
- **Easy definition of console and edge beams in Joint Shear ratio calculation.**
- **Capability to identify the High-Shear Beams of structure according to ACI 318-2019.**
- **Calculation of specific ties for portion of beams that identified as High-Shear beams.**
- **Calculation of specific ties at the location of beam typical bar splice in special moment frame.**
- **Ability to define diameter, spacing and number of crossties separately for ends and middle of beam.**
- **Adding a user interface to view and edit information of structure stories.**
- **Ability to define and edit the Groups for Similar Stories of the structure.**
- **Addition the object selection modes: single story, all stories, and similar stories.**
- **Insert schematic ties image that indicating the number of tie legs in beam drawings.**
- **Adding a user interface to define or edit the grid line informations of project.**
- **Changes to the software's user interface for improved user convenience.**
- **Improvement of certain software procedures and algorithms.**



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**Compatibility with ETABS 21  
and all previous versions of ETABS**





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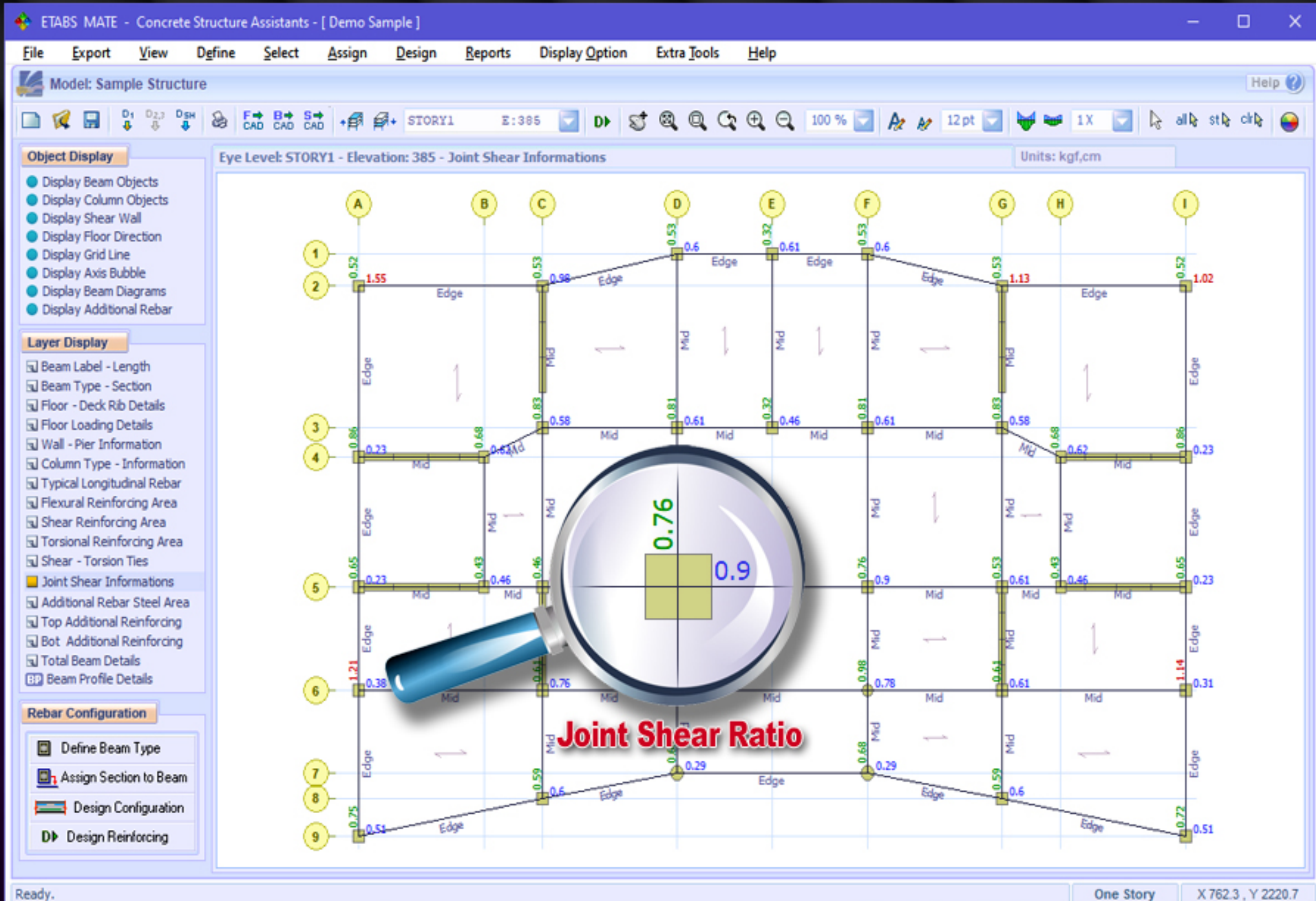
**New Update**

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**Version 1.3.590**

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## Calculation of the Joint Shear Ratio based on ACI318-2019





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**View details of Joint Shear calculations  
by clicking on any joint**

ETABS MATE - Joint Shear Calculation Details

Joint Shear Information Calculation Config

### The Joint Shear Calculation Details in Direction 2

»» General Information of the Studied Joint:  
Column Label: C180 Story: ST1, Elevation: -842 Cm  
X Coordinate = 1097.5 Cm, Y Coordinate = -1753.8 Cm  
Joint Shear Calculation Direction: 2 (Blue)

»» General Information of Project:  
Type of the Earthquake Resistance: Special Moment Frame  
 $F_y = 4000 \text{ Kgf/Cm}^2$ ,  $f_c = 200 \text{ Kgf/Cm}^2$   
Alfa = 1.25, Phi = 0.85

»» Columns Informations:

#Bot Column Label: C180	Section: C90104428
Column Height: 368 Cm	Angle: 60°
Section Height: 100 Cm	Section Width: 90 Cm

#Top Column Label: C180 Section: C90104428  
Column Height: 306 Cm Angle: 60°  
Section Height: 100 Cm Section Width: 90 Cm

»» Connected Beam Number: 4

#1. Label: B479, Section: B6031, Angle=330°, Cantilever: No  
Direction of Connection to Column: Parallel, Position:Middle  
Section.Height: 31 Cm, Section.Width: 60 Cm  
Ast.TYP.Top: 8.04 Cm<sup>2</sup>, Ast.TYP.Bot: 8.04 Cm<sup>2</sup>  
Ast.ADD.Top: 0 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 8.04 Cm<sup>2</sup>, Ast.TOT.Bot: 8.04 Cm<sup>2</sup>

#2. Label: B480, Section: B6031, Angle=160.92°, Cantilever: No  
Direction of Connection to Column: Diagonal, Position:Middle  
Section.Height: 31 Cm, Section.Width: 60 Cm  
Ast.TYP.Top: 8.04 Cm<sup>2</sup>, Ast.TYP.Bot: 8.04 Cm<sup>2</sup>  
Ast.ADD.Top: 0 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 8.04 Cm<sup>2</sup>, Ast.TOT.Bot: 8.04 Cm<sup>2</sup>

#3. Label: B484, Section: B6031, Angle=240°, Cantilever: No  
Direction of Connection to Column: Perpendicular, Position:Middle

### Beams Affecting on Joint Shear in Direction 2

Direction 1  Direction 2

**Joint Shear Ratio = 0.24**  
Below Column Height: 368 Cm, Above Column Height: 306 Cm  
Column Continuity Condition: True  
Beam Continuity Condition: True  
Joint Confinement Condition: False  
Effective Joint Area ( $A_j$ ) = 9000 Cm<sup>2</sup>  
 $V_t = 109852.96$ ,  $V_{col} = 9372.24$ ,  $V_u = V_t - V_{col} = 100480.73 \text{ kgf}$   
 $(\Phi)V_n = 0.85 * 487728.82 = 414569.49 \text{ kgf}$



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## Concrete Structure Detailing Software

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# Providing a printable detail report of Joint Shear calculation

#### General Information of the Studied Joint:

Column Label: C3 Story: Story1, Elevation: 300 Cm  
X Coordinate = 0 Cm, Y Coordinate = 1100 Cm  
Joint Shear Calculation Direction: 1 (Green)

#### General Information of Project:

Type of the Earthquake Resistance: Intermediate Moment Frame  
Fy = 4000 Kgf/Cm<sup>2</sup>, Fc = 200 Kgf/Cm<sup>2</sup>  
Alfa = 1, Phi = 0.75

#### Columns Informations:

#Bot Column Label: C3 Section: R501620  
Column Height: 300 Cm Angle: 0°  
Section Height: 50 Cm Section Width: 50 Cm

#Top Column Label: C3 Section: R501620  
Column Height: 300 Cm Angle: 0°  
Section Height: 50 Cm Section Width: 50 Cm

#### Connected Beam Number: 3

#1. Label: B2, Section: B3030, Angle=270°, Cantilever: No  
Direction of Connection to Column: Perpendicular, Position: Edge  
Section Height: 30 Cm, Section Width: 30 Cm  
Ast.TYP.Top: 6.03 Cm<sup>2</sup>, Ast.TYP.Bot: 6.03 Cm<sup>2</sup>  
Ast.ADD.Top: 6.28 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 12.31 Cm<sup>2</sup>, Ast.TOT.Bot: 6.03 Cm<sup>2</sup>

#2. Label: B3, Section: B3030, Angle=90°, Cantilever: No  
Direction of Connection to Column: Perpendicular, Position: Edge  
Section Height: 30 Cm, Section Width: 30 Cm  
Ast.TYP.Top: 6.03 Cm<sup>2</sup>, Ast.TYP.Bot: 6.03 Cm<sup>2</sup>  
Ast.ADD.Top: 6.28 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 12.31 Cm<sup>2</sup>, Ast.TOT.Bot: 6.03 Cm<sup>2</sup>

#3. Label: B19, Section: B3030, Angle=0°, Cantilever: No  
Direction of Connection to Column: Parallel, Position: Middle  
Section Height: 30 Cm, Section Width: 30 Cm  
Ast.TYP.Top: 6.03 Cm<sup>2</sup>, Ast.TYP.Bot: 6.03 Cm<sup>2</sup>  
Ast.ADD.Top: 4.02 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 10.05 Cm<sup>2</sup>, Ast.TOT.Bot: 6.03 Cm<sup>2</sup>

- Number of Not Cantilever Perpendicular Beam: 2
- Minimum Width of Perpendicular Beams: 30 Cm
- $0.75 * \text{Column Height} = 0.75 * 50 = 37.5 \text{ Cm}$
- Then Joint Confinement Condition: False

- Beam Continuity Condition: False
- Column Continuity Condition: True

Beam Ast.Top Left: 0 Cm<sup>2</sup>, Beam Ast.Top Right: 10.05 Cm<sup>2</sup>  
Beam Ast.Bot Left: 0 Cm<sup>2</sup>, Beam Ast.Bot Right: 6.03 Cm<sup>2</sup>

Beam Depth Left: 0 Cm, Beam Depth Right: 30 Cm  
Beam Width Left: 0 Cm, Beam Width Right: 30 Cm

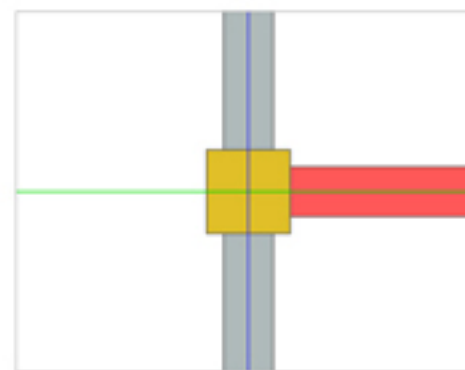
Edge Condition Left: No Beam, Edge Condition Right: Middle Beam

Effective Width: 50 Cm, Effective Height: 50 Cm  
Effective Joint Area (Aj) = 2500 Cm<sup>2</sup>

Mpr.Top Left: 0 Kgf/Cm, Mpr.Top Right: 1047347.25 Kgf/Cm  
Mpr.Bot Left: 0 Kgf/Cm, Mpr.Bot Right: 666561.9 Kgf/Cm

T1= 24126.72 kgf, T2= 40211.67 kgf  
Vt=Max(T1,T2)= 40211.67 kgf  
Vcol= 3491.16 kgf  
Vu= Vt-Vcol=36720.51 kgf  
Vn=112900.19 kgf  
eVn=0.75 \* 112900.19 = 84675.14 kgf

Joint Shear Ratio = Vu / eVn = 0.43



#### General Information of the Studied Joint:

Column Label: C3 Story: Story1, Elevation: 300 Cm  
X Coordinate = 0 Cm, Y Coordinate = 1100 Cm  
Joint Shear Calculation Direction: 2 (Blue)

#### General Information of Project:

Type of the Earthquake Resistance: Intermediate Moment Frame  
Fy = 4000 Kgf/Cm<sup>2</sup>, Fc = 200 Kgf/Cm<sup>2</sup>  
Alfa = 1, Phi = 0.75

#### Columns Informations:

#Bot Column Label: C3 Section: R501620  
Column Height: 300 Cm Angle: 0°  
Section Height: 50 Cm Section Width: 50 Cm

#Top Column Label: C3 Section: R501620  
Column Height: 300 Cm Angle: 0°  
Section Height: 50 Cm Section Width: 50 Cm

#### Connected Beam Number: 3

#1. Label: B2, Section: B3030, Angle=270°, Cantilever: No  
Direction of Connection to Column: Parallel, Position: Edge  
Section Height: 30 Cm, Section Width: 30 Cm  
Ast.TYP.Top: 6.03 Cm<sup>2</sup>, Ast.TYP.Bot: 6.03 Cm<sup>2</sup>  
Ast.ADD.Top: 6.28 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 12.31 Cm<sup>2</sup>, Ast.TOT.Bot: 6.03 Cm<sup>2</sup>

#2. Label: B3, Section: B3030, Angle=90°, Cantilever: No  
Direction of Connection to Column: Parallel, Position: Edge  
Section Height: 30 Cm, Section Width: 30 Cm  
Ast.TYP.Top: 6.03 Cm<sup>2</sup>, Ast.TYP.Bot: 6.03 Cm<sup>2</sup>  
Ast.ADD.Top: 6.28 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 12.31 Cm<sup>2</sup>, Ast.TOT.Bot: 6.03 Cm<sup>2</sup>

#3. Label: B19, Section: B3030, Angle=0°, Cantilever: No  
Direction of Connection to Column: Perpendicular, Position: Middle  
Section Height: 30 Cm, Section Width: 30 Cm  
Ast.TYP.Top: 6.03 Cm<sup>2</sup>, Ast.TYP.Bot: 6.03 Cm<sup>2</sup>  
Ast.ADD.Top: 4.02 Cm<sup>2</sup>, Ast.ADD.Bot: 0 Cm<sup>2</sup>  
Ast.TOT.Top: 10.05 Cm<sup>2</sup>, Ast.TOT.Bot: 6.03 Cm<sup>2</sup>

- Number of Not Cantilever Perpendicular Beam: 1
- Minimum Width of Perpendicular Beams: 30 Cm
- $0.75 * \text{Column Height} = 0.75 * 50 = 37.5 \text{ Cm}$
- Then Joint Confinement Condition: False

- Beam Continuity Condition: True
- Column Continuity Condition: True

Beam Ast.Top Left: 12.31 Cm<sup>2</sup>, Beam Ast.Top Right: 12.31 Cm<sup>2</sup>  
Beam Ast.Bot Left: 6.03 Cm<sup>2</sup>, Beam Ast.Bot Right: 6.03 Cm<sup>2</sup>

Beam Depth Left: 30 Cm, Beam Depth Right: 30 Cm  
Beam Width Left: 30 Cm, Beam Width Right: 30 Cm

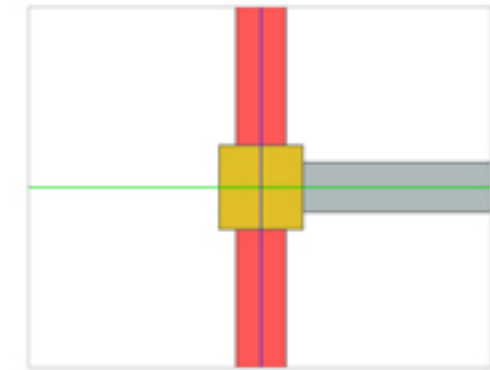
Edge Condition Left: Edge Beam, Edge Condition Right: Edge Beam

Effective Width: 30 Cm, Effective Height: 50 Cm  
Effective Joint Area (Aj) = 1500 Cm<sup>2</sup>

Mpr.Top Left: 1239178.44 Kgf/Cm, Mpr.Top Right: 1239178.44 Kgf/Cm  
Mpr.Bot Left: 666561.9 Kgf/Cm, Mpr.Bot Right: 666561.9 Kgf/Cm

T1= 73386.18 kgf, T2= 73386.18 kgf  
Vt=Max(T1,T2)= 73386.18 kgf  
Vcol= 6352.47 kgf  
Vu= Vt-Vcol=67033.71 kgf  
Vn=81288.14 kgf  
eVn=0.75 \* 81288.14 = 60966.1 kgf

Joint Shear Ratio = Vu / eVn = 1.1





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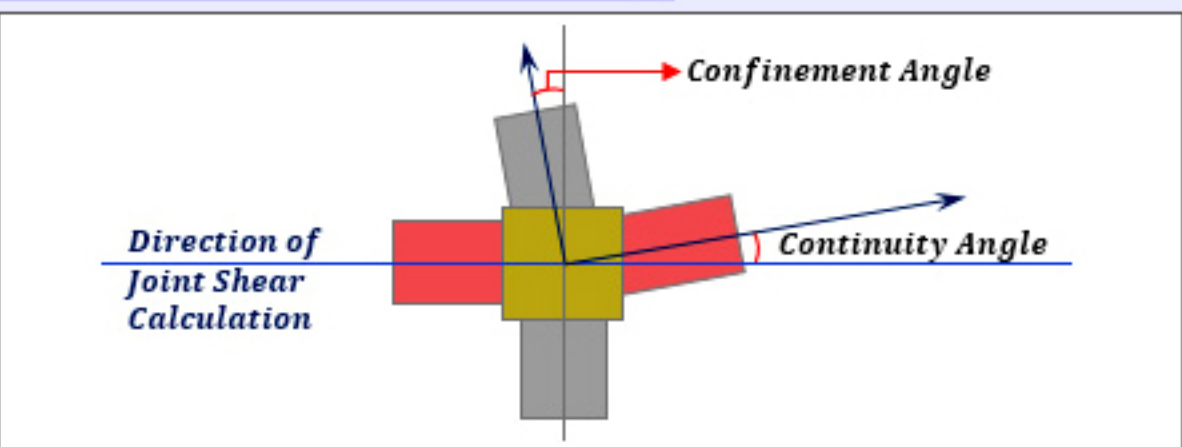
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## Ability to configure parameters of Joint Shear calculation by software

Joint Shear Calculation Configuration

Configuration Settings

**Parameters of Confinement and Continuity**



Continuity Angle; The maximum angle that the continuity of beam is satisfied:  DEG

Confinement Angle; The maximum beam angle that can confinement the joint:  DEG

**Parameters for Calculation of the  $V_n$**

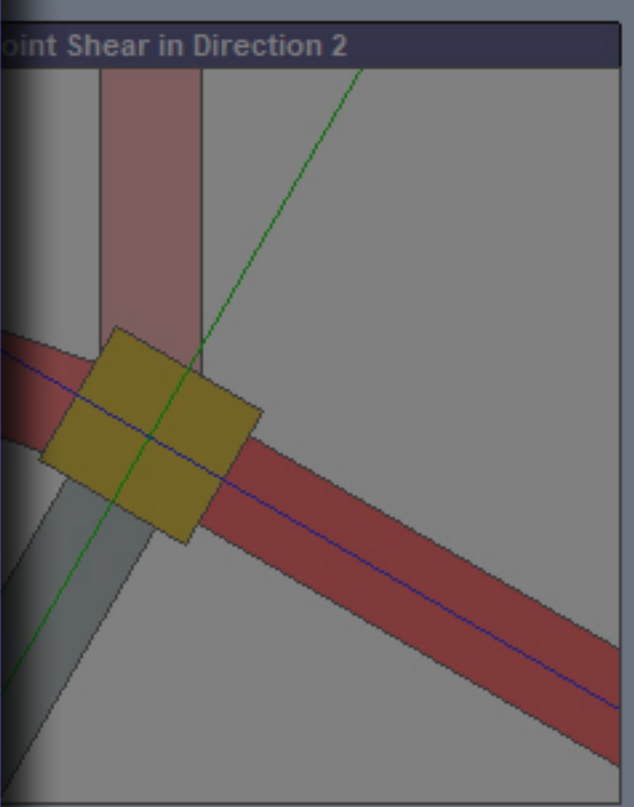
Column	Beam in direction of $V_n$	Joint Confinement	$V_n, N$
Continuous	Continuous	Confined	<input type="text" value="1.7"/> $\lambda \sqrt{f'_c} A_j$
		Not confined	<input type="text" value="1.2"/> $\lambda \sqrt{f'_c} A_j$
	Not Continuous	Confined	<input type="text" value="1.2"/> $\lambda \sqrt{f'_c} A_j$
		Not confined	<input type="text" value="1"/> $\lambda \sqrt{f'_c} A_j$
Not Continuous	Continuous	Confined	<input type="text" value="1.2"/> $\lambda \sqrt{f'_c} A_j$
		Not confined	<input type="text" value="1"/> $\lambda \sqrt{f'_c} A_j$
	Not Continuous	Confined	<input type="text" value="1"/> $\lambda \sqrt{f'_c} A_j$
		Not confined	<input type="text" value="0.7"/> $\lambda \sqrt{f'_c} A_j$

$\lambda$ ; shall be 0.75 for lightweight concrete and 1.0 for normalweight concrete:

Apply Changes and Close      Close

Calculation Config

Joint Shear in Direction 2



Direction 2

0.24

68 Cm, Above Column Height: 306 Cm

Position: True

Position: True

Position: False

$A_j = 9000 \text{ Cm}^2$

$V_n = 9372.24, V_u = V_t - V_{col} = 100480.73 \text{ kgf}$

$V_n = 414569.49 \text{ kgf}$

Print Report      Close



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**Ability to define cantilever and edge beams for Joint Shear calculation**

The screenshot displays the ETABS MATE software interface. The main window shows a grid of beams with joint shear information. A magnifying glass is positioned over a specific joint, highlighting the value '1' and the label 'Edge'. The software interface includes a menu bar with options like File, Export, View, Define, Select, Assign, Design, Reports, Display Option, Extra Tools, and Help. The 'Assign' menu is open, showing options for 'Section of Beam' (F7) and 'Condition of Beam'. The 'Condition of Beam' dropdown menu is expanded, showing options: Middle Beam, Edge Beam, Cantilever Beam, and Non-Cantilever Beam. The 'Edge Beam' option is selected. The main window displays a grid of beams with joint shear information. The 'Eye Level: ST7 - Elevation: 1250 - Joint Shear Inform' is visible. The software interface also includes a toolbar with various icons and a status bar showing '150 %' and '12 pt'. The left sidebar contains 'Object Display' and 'Layer Display' sections. The 'Object Display' section includes options like 'Display Beam Objects', 'Display Column Objects', 'Display Shear Wall', 'Display Floor Direction', 'Display Grid Line', 'Display Axis Bubble', 'Display Beam Diagrams', and 'Display Additional Rebar'. The 'Layer Display' section includes options like 'Beam Label - Length', 'Beam Type - Section', 'Floor - Deck Rib Details', 'Floor Loading Details', 'Wall - Pier Information', 'Column Type - Information', 'Typical Longitudinal Rebar', 'Flexural Reinforcing Area', 'Shear Reinforcing Area', 'Torsional Reinforcing Area', 'Shear - Torsion Ties', 'Joint Shear Informations', 'Additional Rebar Steel Area', 'Top Additional Reinforcing', 'Bot Additional Reinforcing', 'Total Beam Details', and 'Beam Profile Details'. The 'Rebar Configuration' section includes the option 'Define Beam Type'.



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## Detection of High-Shear beams of Structure in based on ACI318-2019

ETABS MATE - Detect High Shear Beams

Detecting High Shear Beams of Structure

 **Number of Detected High Shear Beams: 7**  
Total Number of Beams in Structure: 163

Reading Beam Design Data  
100%

Detecting High Shear Beams  
100%

**NOTE:** If the shear force of any beam is greater than the  $0.33(F'c^{1/2})b.d$ , the software will consider it as a High Shear Beam and then will add a star sign to the  $A_v/s$  value of the corresponding part of beam to mark it and will apply the relevant rules.

Delete all High Shear Details from Beams      Apply and Close

**Detected High Shear Beams Informations**

Story	Beam	Vs (kgf)	Vm (kgf)	Ve (kgf)	$0.33F'c^{1/2}b.d$
ST4	B10	38306	38537	39868	29392
ST3	B6	39847	38699	38019	35990
ST3	B10	45910	45899	47230	29392
ST2	B6	43984	42859	42373	35990
ST2	B10	47539	47270	48601	29392
ST1	B6	38235	37110	37920	35990
ST1	B10	38564	38615	39946	29392



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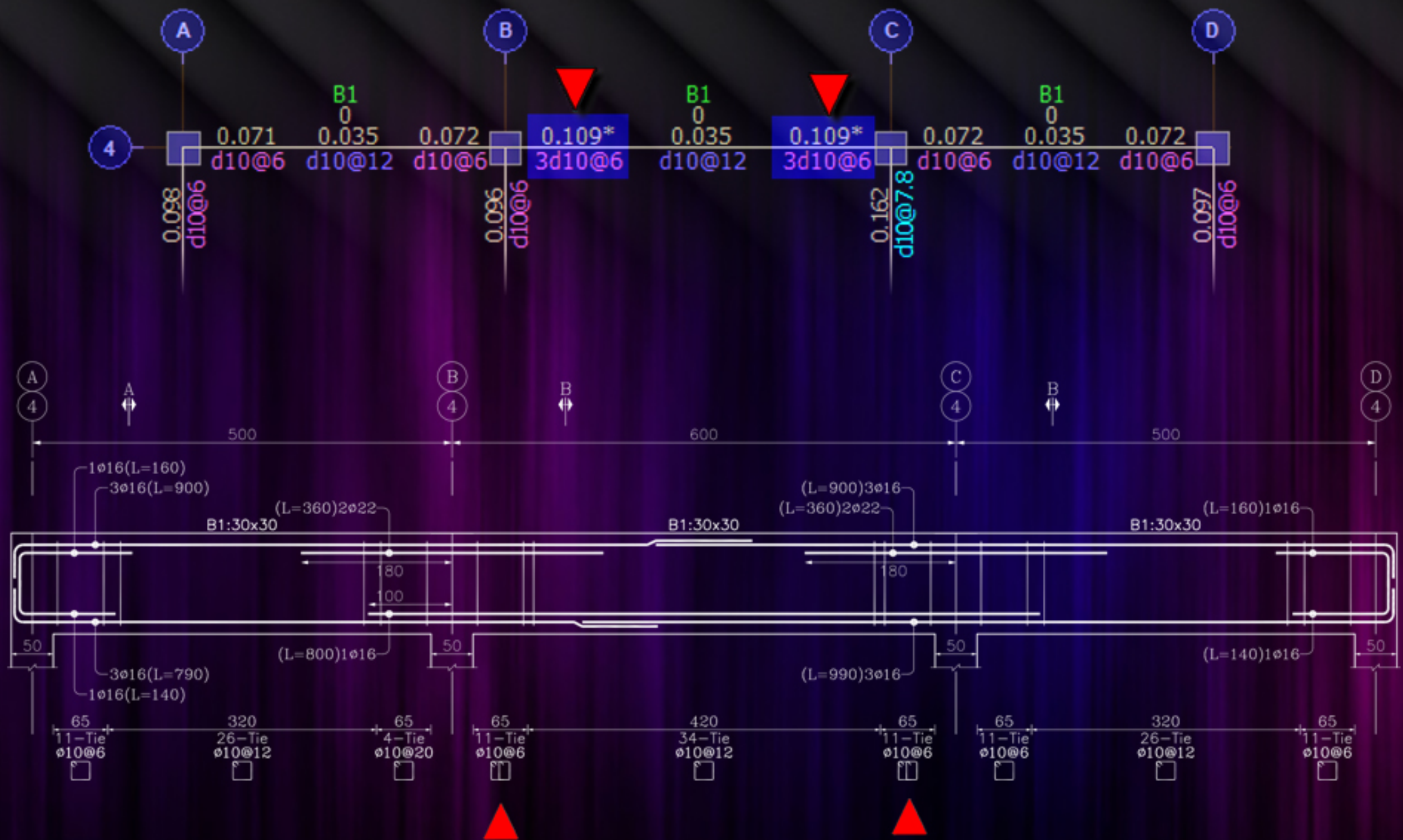
**New Update**

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## Calculation of transverse bars details for High-Shear Beams based on ACI 318-2019





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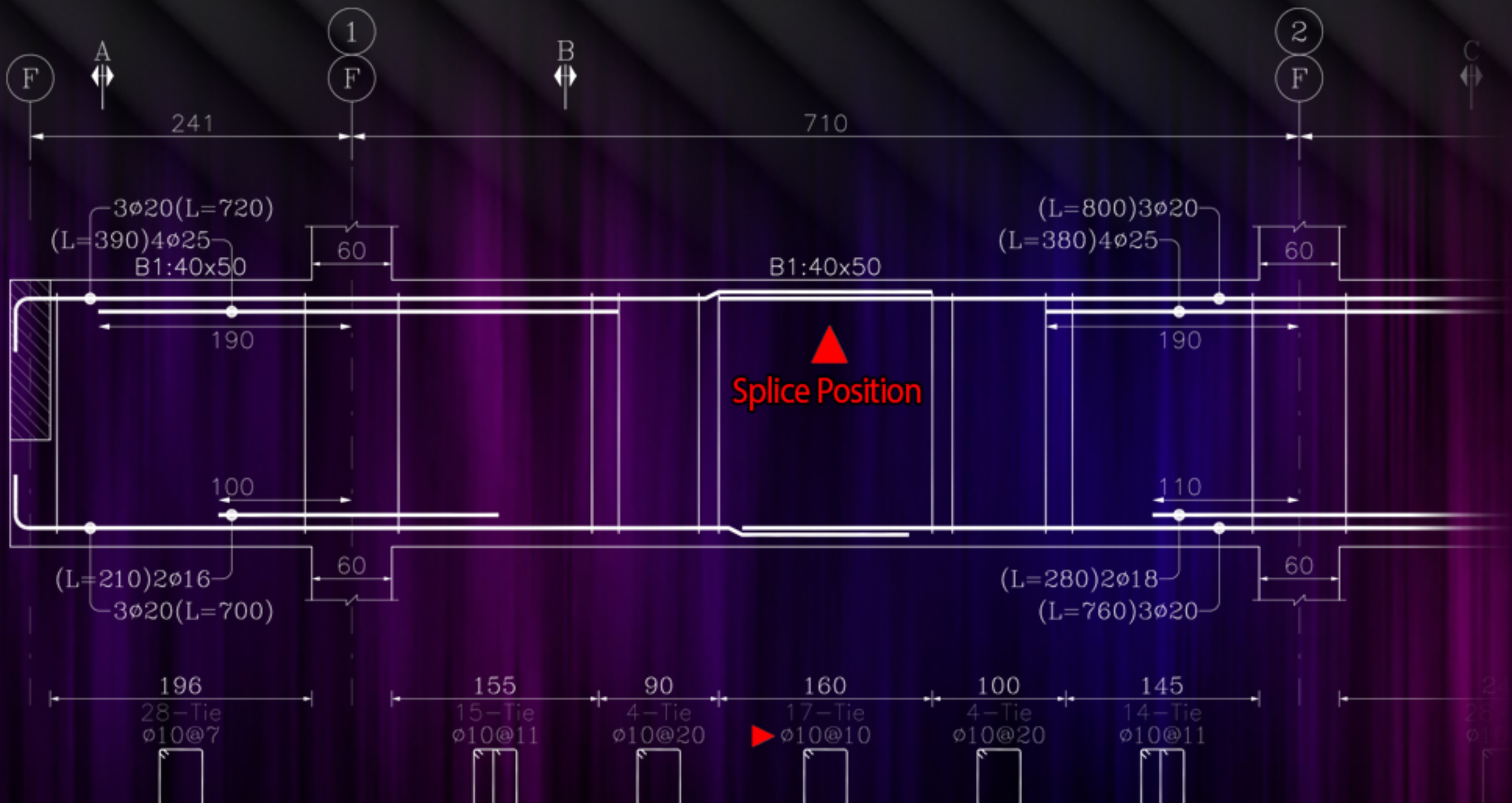
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## Insert Special Ties at the Splice Position of the Typical Rebars in Special Moment Frame





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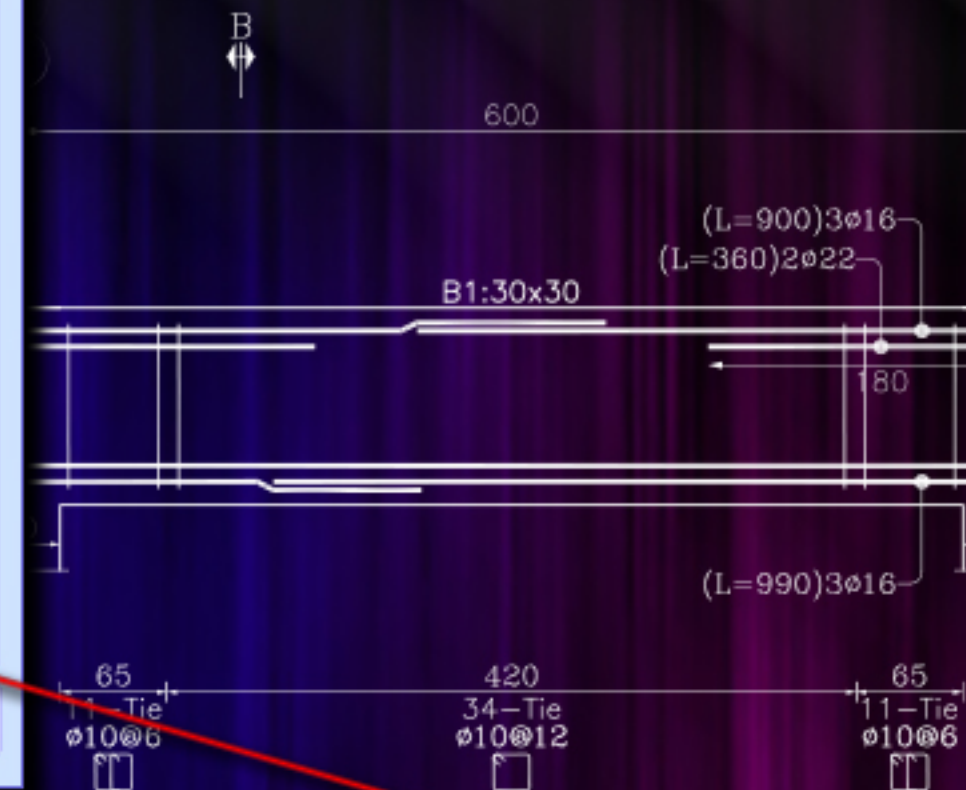
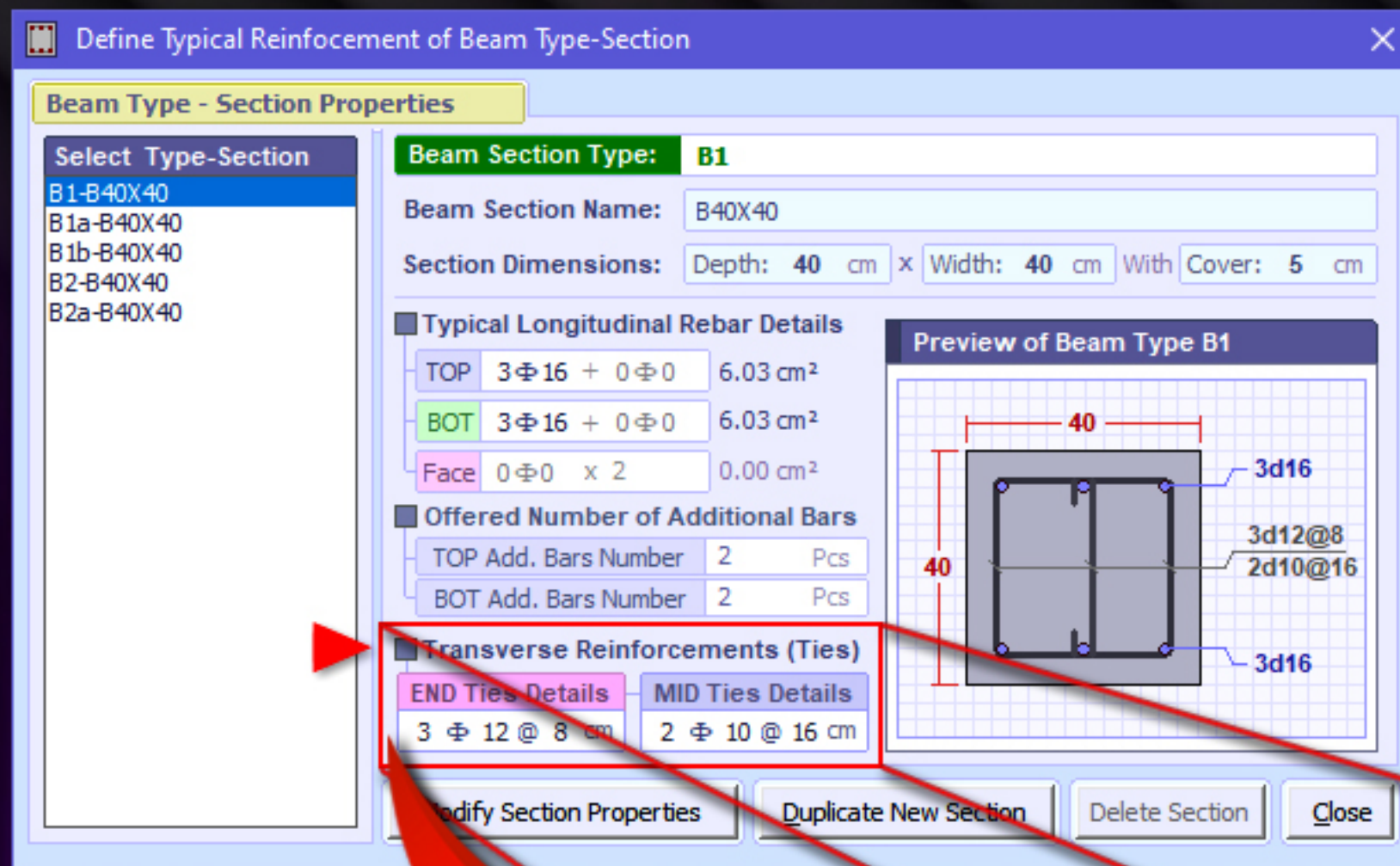
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**Ability to define diameter, spacing and number of crossties separately for ends and middle of beam**



## Transverse Reinforcements (Ties)

END Ties Details

3 Φ 12 @ 8 cm

MID Ties Details

2 Φ 10 @ 16 cm



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**View and edit the informations of the Stories of the structure**

Stories Data

File Edit

Edit Stories Data of Project

Stories Data of Project

No.	Story	Height (cm)	Elevation	Group
1	HELIPAD	365	9960	G31
2	RF	425	9595	G30
3	ST29	360	9170	G29
4	ST28	360	8810	G28
5	ST27	360	8450	G27
6	ST26	360	8090	G26
7	ST25	360	7730	G25
8	ST24	360	7370	G24
9	ST23	360	7010	G23
10	ST22	360	6650	G22
11	ST21	360	6290	G21
12	ST20	360	5930	G20
13	ST19	360	5570	G19
14	ST18	360	5210	G18
15	ST17	360	4850	G17
16	ST16	360	4490	G16

Define Group of the Similar Stories

Select Stories to Make Group

To: Select Up Story

From: Select Down Story

Caption:

Make Group

Reset All Stories Group

Save Stories Data Text for ETABS 9

Save Stories Data Text for ETABS 16,...

Note: You can click on the lower story and then shift+click on the higher story respectively to define the group of similar stories.

Apply Changes and Close Roll Back Changes Cancel



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## Ability to define Groups for the Similar Stories of the structure

The screenshot shows the 'Stories Data' dialog box in ETABS MATE. The main table lists 16 stories with their respective heights and elevations. A red box highlights the 'Define Group of the Similar Stories' panel on the right, which includes a 'Select Stories to Make Group' section with 'To' and 'From' dropdowns set to ST25 and ST21, a 'Caption' field with 'ST21 to ST25', and 'Make Group' and 'Reset All Stories Group' buttons. A red arrow points from the 'Make Group' button back to the table. Below the table, a note explains that users can click on the lower story and then shift-click on the higher story to define the group. At the bottom, there are buttons for 'Apply Changes and Close', 'Roll Back Changes', and 'Cancel'.

No.	Story	Height (cm)	Elevation	Group
1	HELIPAD	365	9960	G19
2	RF	425	9595	G18
3	ST29	360	9170	G17
4	ST28	360	8810	G17
5	ST27	360	8450	G17
6	ST26	360	8090	G17
7	ST25	360	7730	G16
8	ST24	360	7370	G16
9	ST23	360	7010	G16
10	ST22	360	6650	G16
11	ST21	360	6290	G16
12	ST20	360	5930	G15
13	ST19	360	5570	G15
14	ST18	360	5210	G15
15	ST17	360	4850	G15
16	ST16	360	4490	G15

**Note:** You can click on the lower story and then shift+click on the higher story respectively to define the group of similar stories.



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**Addition the object selection modes:**  
**One Story, All Stories, Similar Stories**

The screenshot displays the ETABS MATE software interface. The main window shows a floor plan titled "Eye90 - Floor Uniform Loading Details (kg/m<sup>2</sup>)" with various rebar labels such as "RL:300 D:450 EV:63" and "RL:200 D:520". The interface includes a menu bar (File, Export, View, Define Design, Reports, Display Option, Extra Tools, Help), a toolbar with icons for file operations and viewing, and a status bar at the bottom showing "Ready." and coordinates "X 1548.0, Y -238.2".

On the left side, there are two panels: "Object Display" and "Layer Display". The "Object Display" panel has three options: "Display Axis Bubble" (unchecked), "Display Beam Diagrams" (checked), and "Display Additional Rebar" (checked). The "Layer Display" panel has a list of layers with checkboxes, including "Beam Label - Length", "Beam Type - Section", "Floor - Deck Rib Details", "Floor Loading Details" (checked), "Wall - Pier Information", "Column Type - Information", "Typical Longitudinal Rebar", "Flexural Reinforcing Area", "Shear Reinforcing Area", "Torsional Reinforcing Area", "Shear - Torsion Ties", "Joint Shear Informations", "Additional Rebar Steel Area", "Top Additional Reinforcing", "Bot Additional Reinforcing", "Total Beam Details", and "Beam Profile Details".

At the bottom right, a selection mode menu is visible with three options: "One Story" (selected), "All Stories", and "Similar Stories". A red arrow points from a text box to this menu. The text box contains the following text:

**You Can Change Selection Modes by clicking on the Select Mode Button**



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**ETABS MATE**  
Concrete Structure Detailing Software

**Version 1.3.590**

VERSION  
1.3.590

## User interface for viewing and editing the Project Grid Lines Data

GRID Lines Data

File Edit Sort and Relable Grid Lines

Edit Project Grid Lines Data

Project Grid Lines Data

X Direction Grid Lines			Y Direction Grid Lines		
No.	GRID ID	X Ordinate (cm)	No.	GRID ID	Y Ordinate (cm)
1	A	-140	1	9	0
2	B	320	2	8	130
3	C	535	3	7	215
4	D	1030	4	6	495
5	E	1380	5	5	845
6	F	1730	6	4	1285
7	G	2225	7	3	1385
8	H	2440	8	2	1865
9	I	2900	9	1	1975
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		

Project Grid Lines Preview

Delete Selected Grid Line

Insert Grid Line Before Selected Row

Regenerate Grid Lines Automatically

Apply Changes and Close

Roll Back Changes

Cancel



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## Generating and sorting the Grid Lines of project automatically

GRID Lines Data

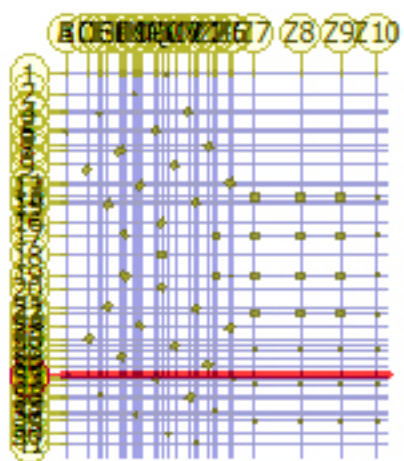
File Edit Sort and Relable Grid Lines

Edit Project Grid Lines Data

Project Grid Lines Data

X Direction Grid Lines			Y Direction Grid Lines		
No.	GRID ID	X Ordinate (cm)	No.	GRID ID	Y Ordinate (cm)
13	M	712.1	2	40	-3901.3
14	N	775	3	39	-3708.4
15	O	782.5	4	38	-3621.3
16	P	1004.6	5	37	-3567.8
17	Q	1024.6	6	36	-3360.1
18	R	1097.5	7	35	-3321.3
19	S	1178.9	8	34	-3163.4
20	T	1197.1	9	33	-3100.2
21	U	1294.6	10	32	-3080.1
22	V	1302.1	11	31	-3041.3
23	W	1489.6	12	30	-2892.4
24	X	1509.6	13	29	-2780.1
25	Y	1603.2	14	28	-2653.4
26	Z	1617.1	15	27	-2612.4
27	Z1	1779.6	16	26	-2500.1

Project Grid Lines Preview



Delete Selected Grid Line

Insert Grid Line Before Selected Row

Regenerate Grid Lines Automatically

Apply Changes and Close

Roll Back Changes

Cancel



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**Insert schematic ties image that indicating the number of tie legs in beam drawings**

