Verification example - FEAKalc 3D vs. ETABS

The frame was analysed in both FEAKalc 3D and ETABS using identical geometry, loading, member properties and support conditions. All members are 600 × 600 mm concrete sections, with fc =40 MPa and E=28,000 MPa.

The comparison shows very close agreement between the two programs:

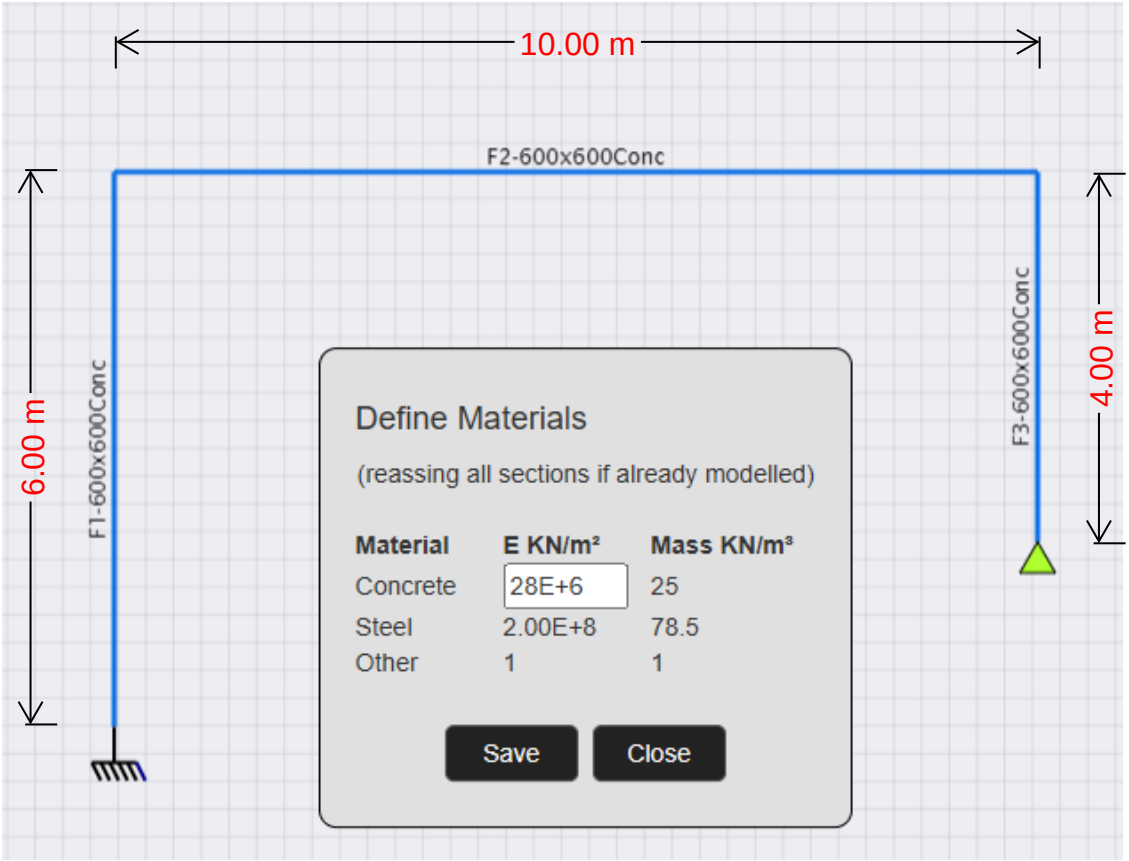
1- Bending moments, shear forces and axial forces are essentially identical throughout the frame.

2- The maximum beam sagging moment is 490.36 kNm in FEAKalc 3D, compared with 490.73 kNm in ETABS (agreement within 0.075 %)

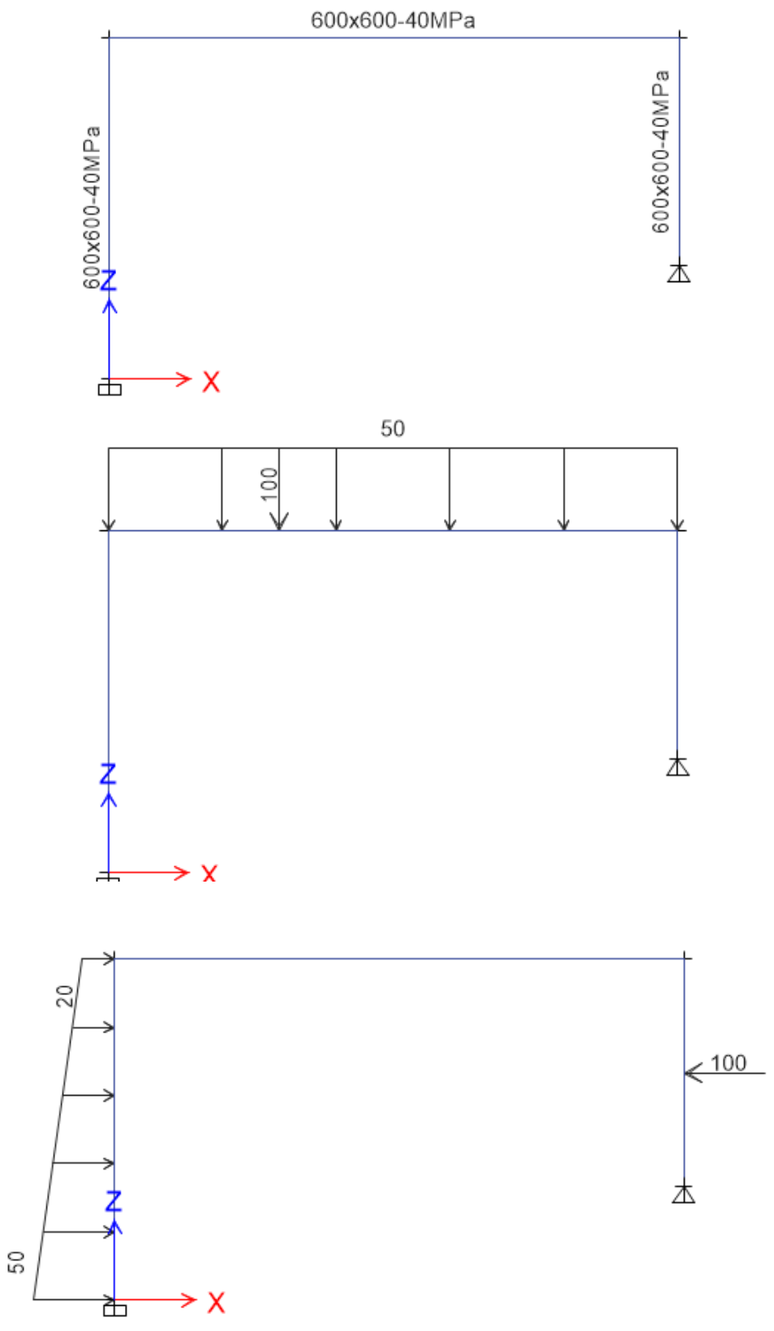
3- The principal joint and column forces generally match to the displayed precision.

4- At the upper-right joint, both programs calculate a horizontal displacement of 1.682 mm and a vertical displacement of -0.165 mm (identical)

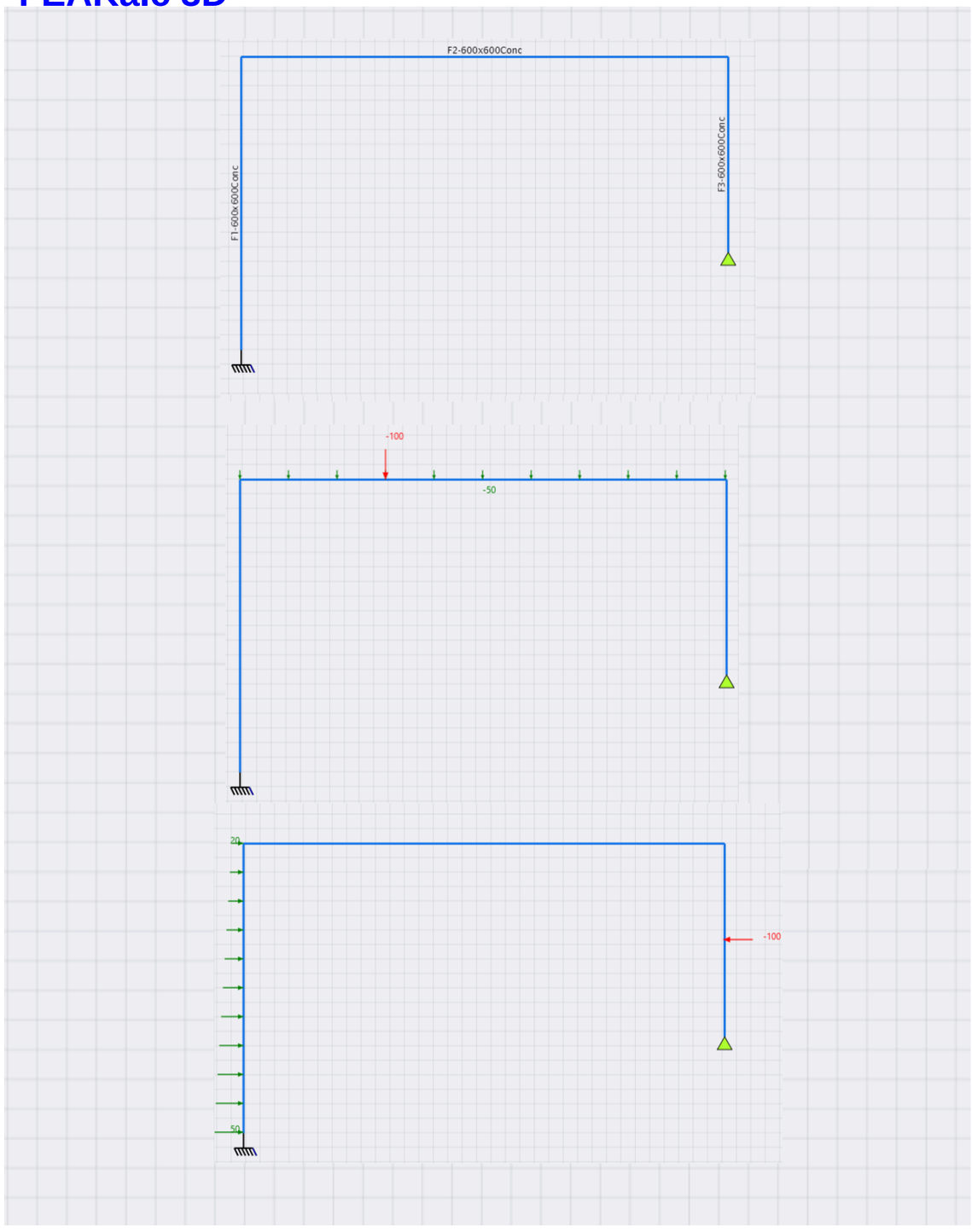
Overall, the example demonstrates excellent correlation between FEAKalc 3D and ETABS for frame actions and nodal displacements.



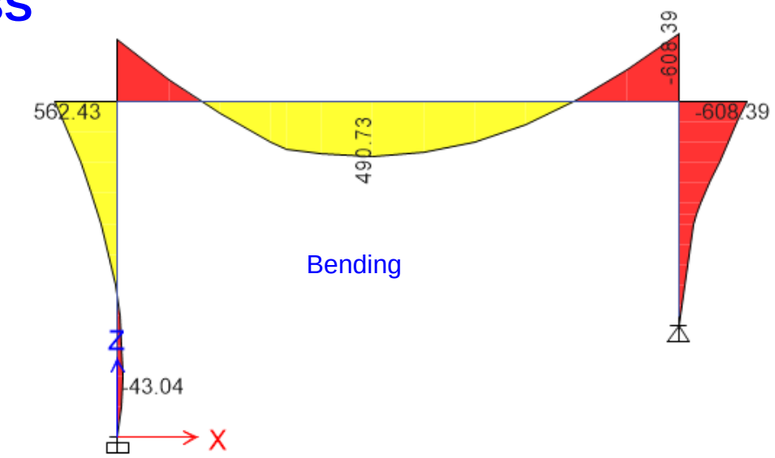
ETABS

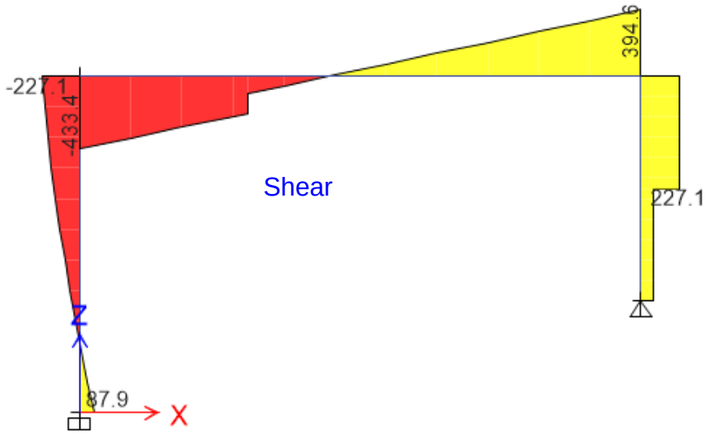


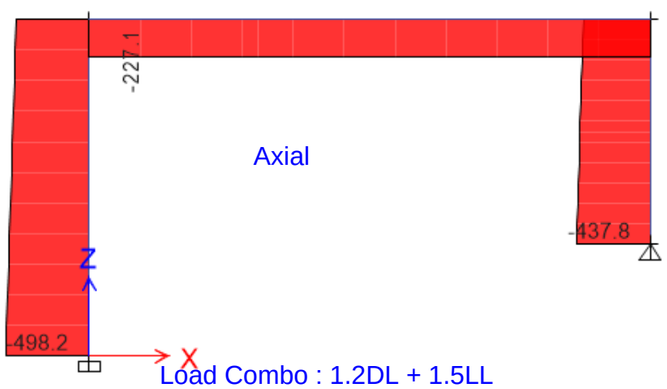
FEAKalc 3D



ETABS

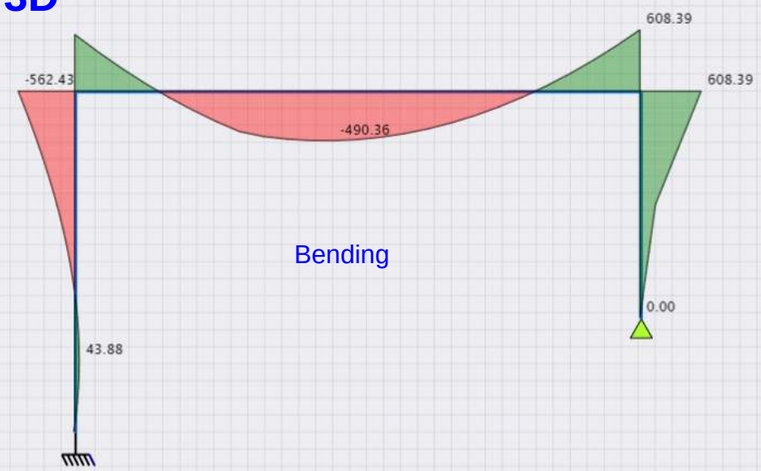


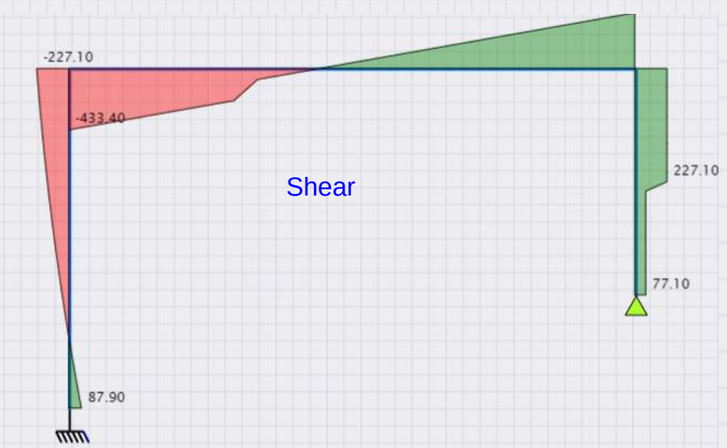




Load Combo : 1.2DL + 1.5LL

FEAKalc 3D

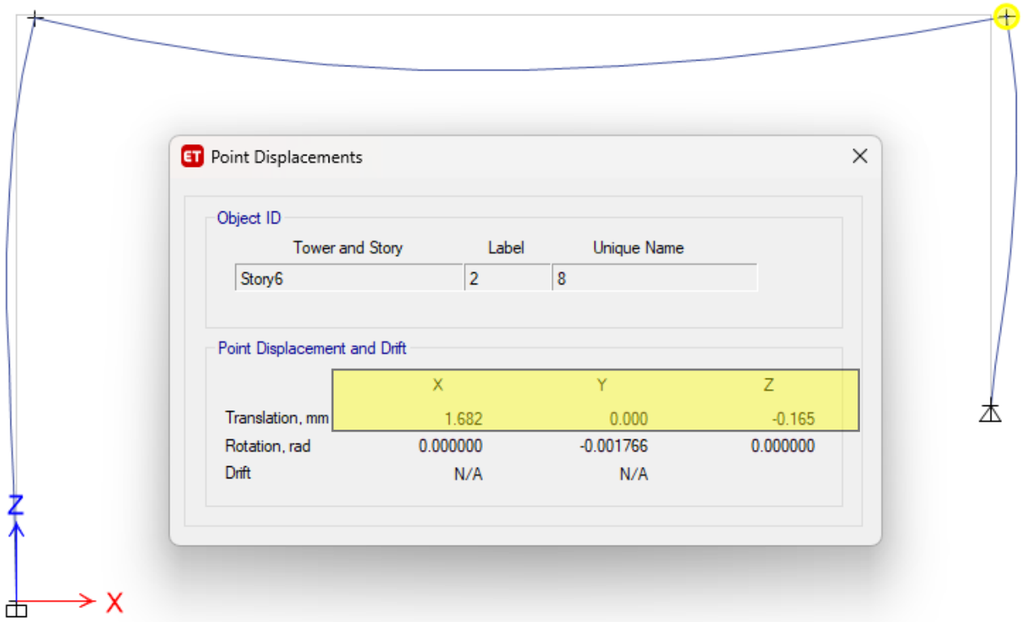




Load Combo : 1.2DL + 1.5LL

ETABS

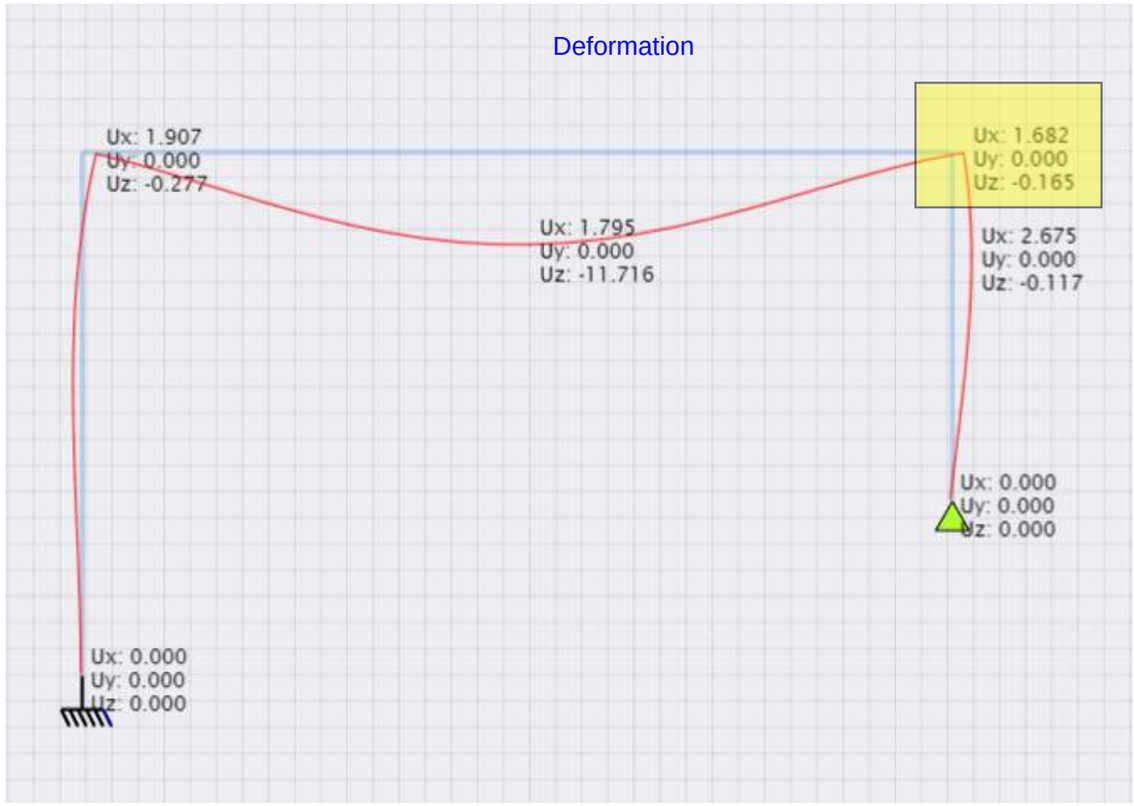
Deformation



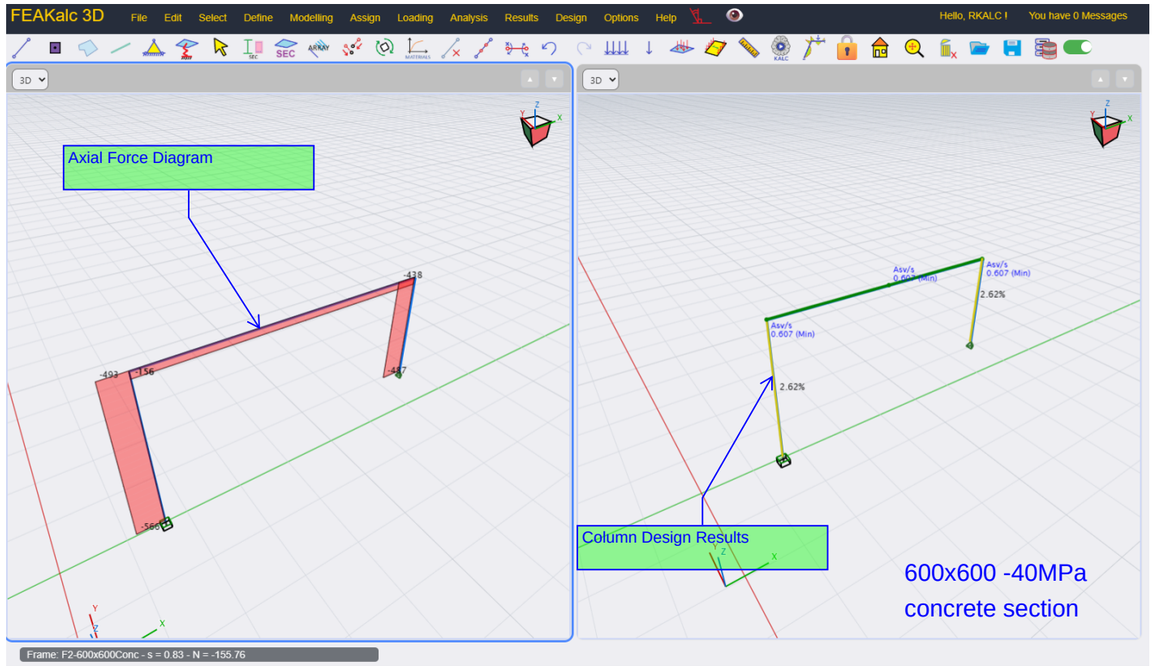
Load Combo : 1.2DL + 1.5LL

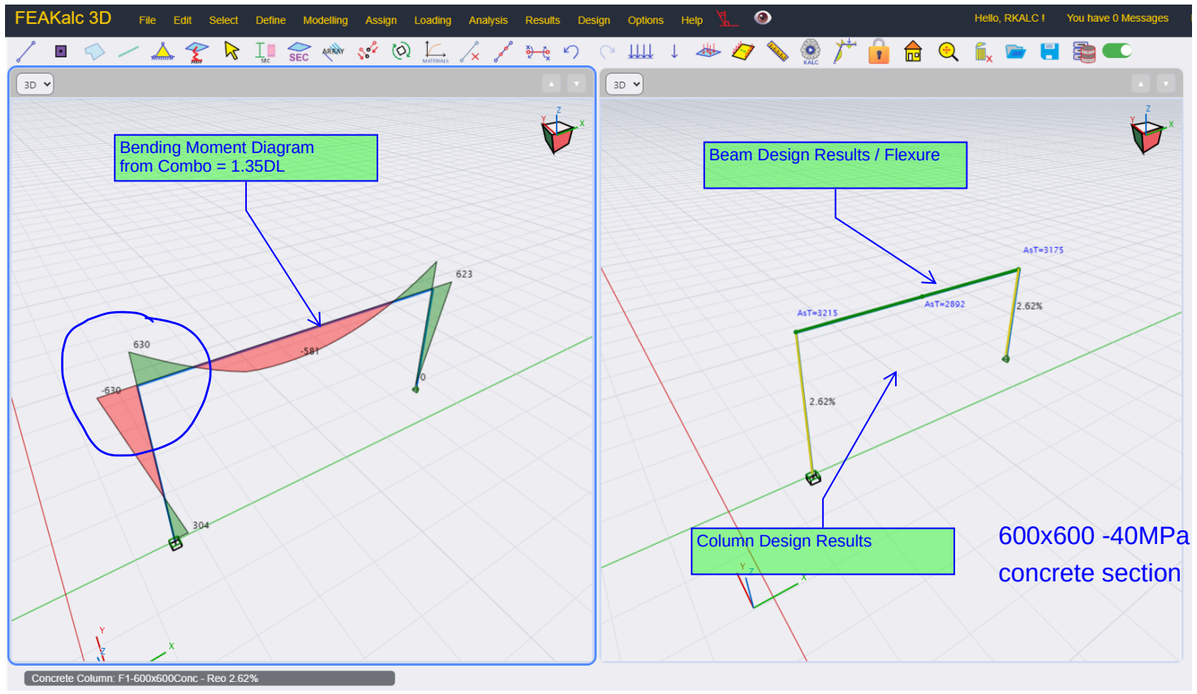
FEAKalc 3D

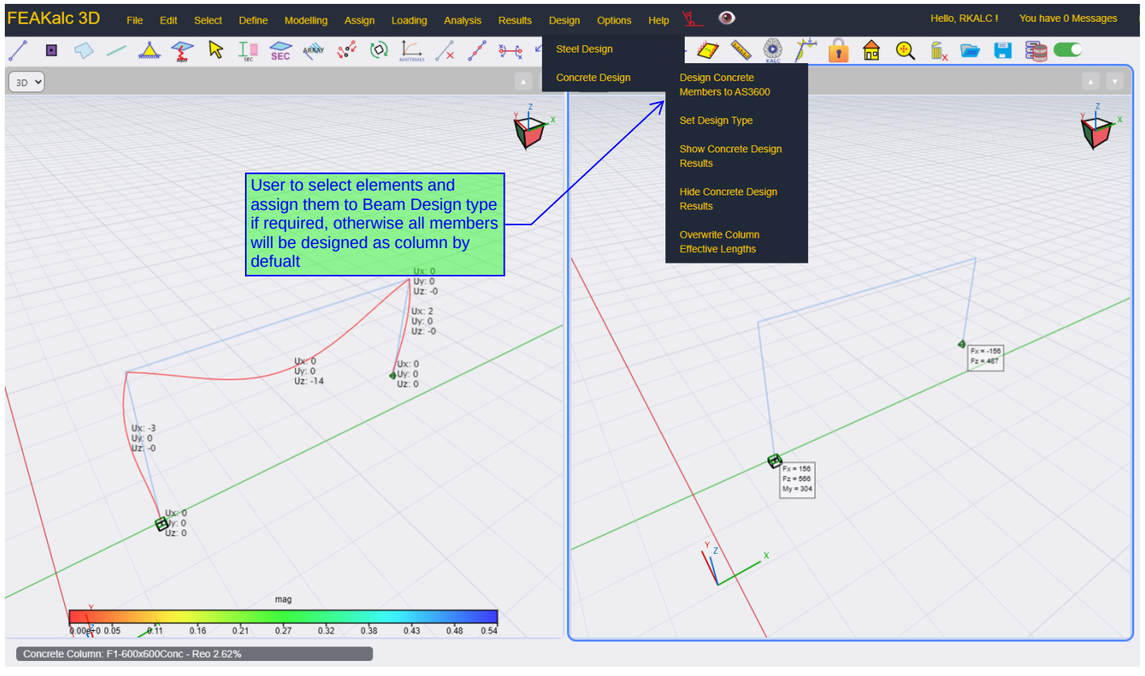
Deformation

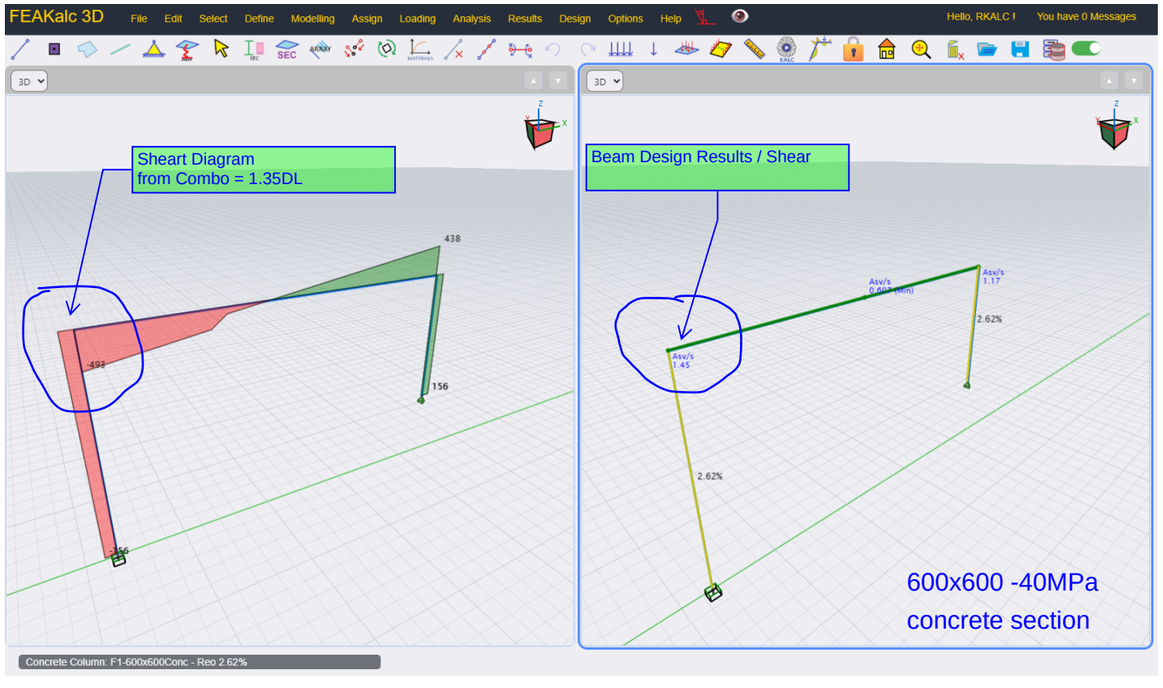


Load Combo : 1.2DL + 1.5LL


FEAKalc 3D
Axial Force Diagram
Column Design Results
600x600 -40MPa
concrete section
Frame: F2-600x600Conc - s = 0.83 - N = -155.76


FEAKalc 3D
Bending Moment Diagram
from Combo = 1.35DL
Beam Design Results / Flexure
Column Design Results
600x600 -40MPa
concrete section
Concrete Column: F1-600x600Conc - Reo 2.62%


FEAKalc 3D
Steel Design
Concrete Design
Design Concrete Members to AS3600
Set Design Type
Show Concrete Design Results
Hide Concrete Design Results
Overwrite Column Effective Lengths
User to select elements and assign them to Beam Design type if required, otherwise all members will be designed as column by defualt
Concrete Column: F1-600x600Conc - Reo 2.62%


FEAKalc 3D
Sheart Diagram
from Combo = 1.35DL
Beam Design Results / Shear
600x600 -40MPa
concrete section
Concrete Column: F1-600x600Conc - Reo 2.62%

Column Design Report

FEAKalc 3D Concrete Column Design Memo

AS 3600 RC Column Check

PASS

Member **F1**	Governing Load Case **LC-1.35DL**	Section **600 x 600**
f'c **40 MPa**	fy **500 MPa**	Cover to Reo Centre **54 mm**
Effective Length 22 **6000 mm**	Effective Length 33 **6000 mm**	Design Height **6000 mm**
Bars **7 x 10 N20**	Reinforcement **2.62 %**	Utilisation **85 %**

Governing

Design Height

Applied Design Actions

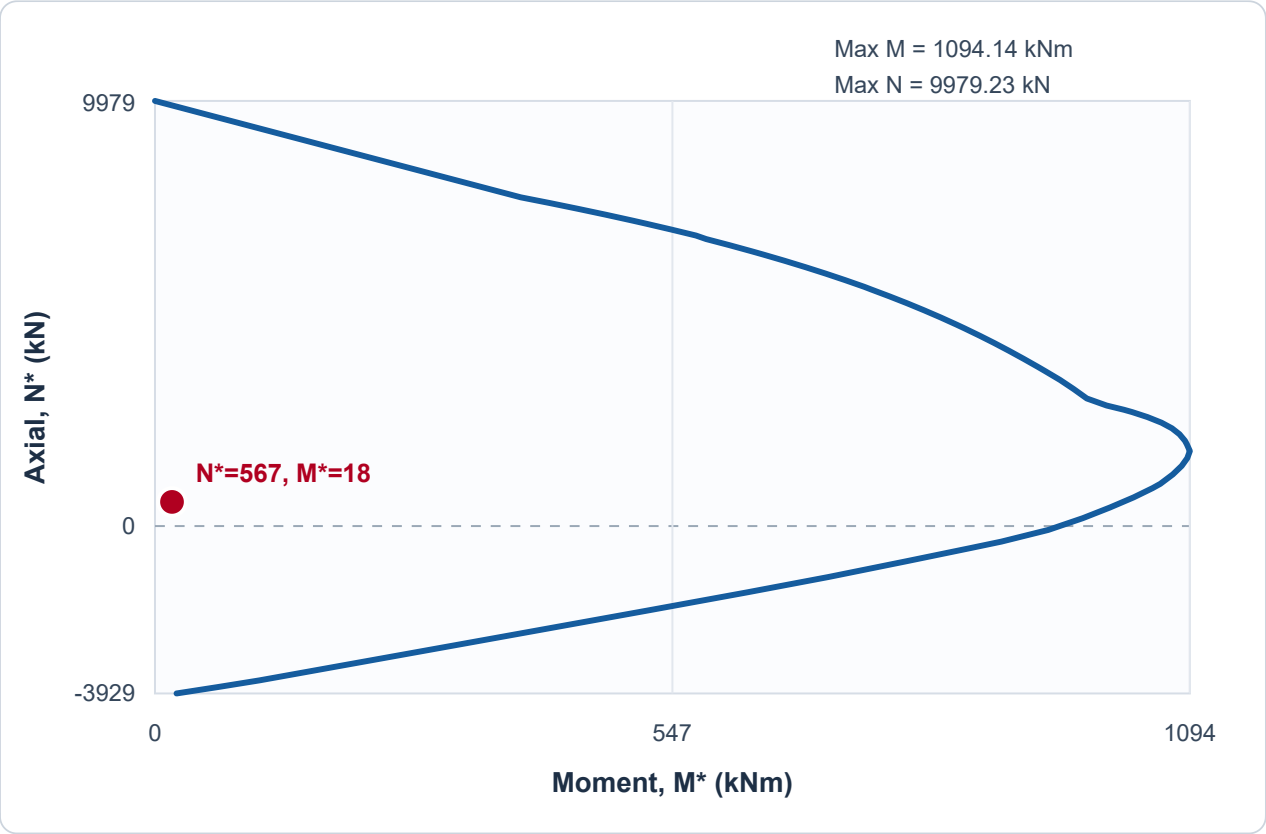
Item	Value
N*	567 kN
M22 top	16.99 kNm
M22 bottom	-16.99 kNm
M33 top	630.36 kNm
M33 bottom	-630.36 kNm

Design Height

Direction 22 Column Check

Item	Value
Balanced moment capacity	995 kNm
Euler buckling force, Ncr	14689 kN
Km	1.00
Moment magnifier, δb	1.04
Pure bending capacity	963.00 kNm
Design moment, M22*	18.00 kNm
N / bd index	1.58
M / bd² index	0.08
Utilisation	7.000000000000001%

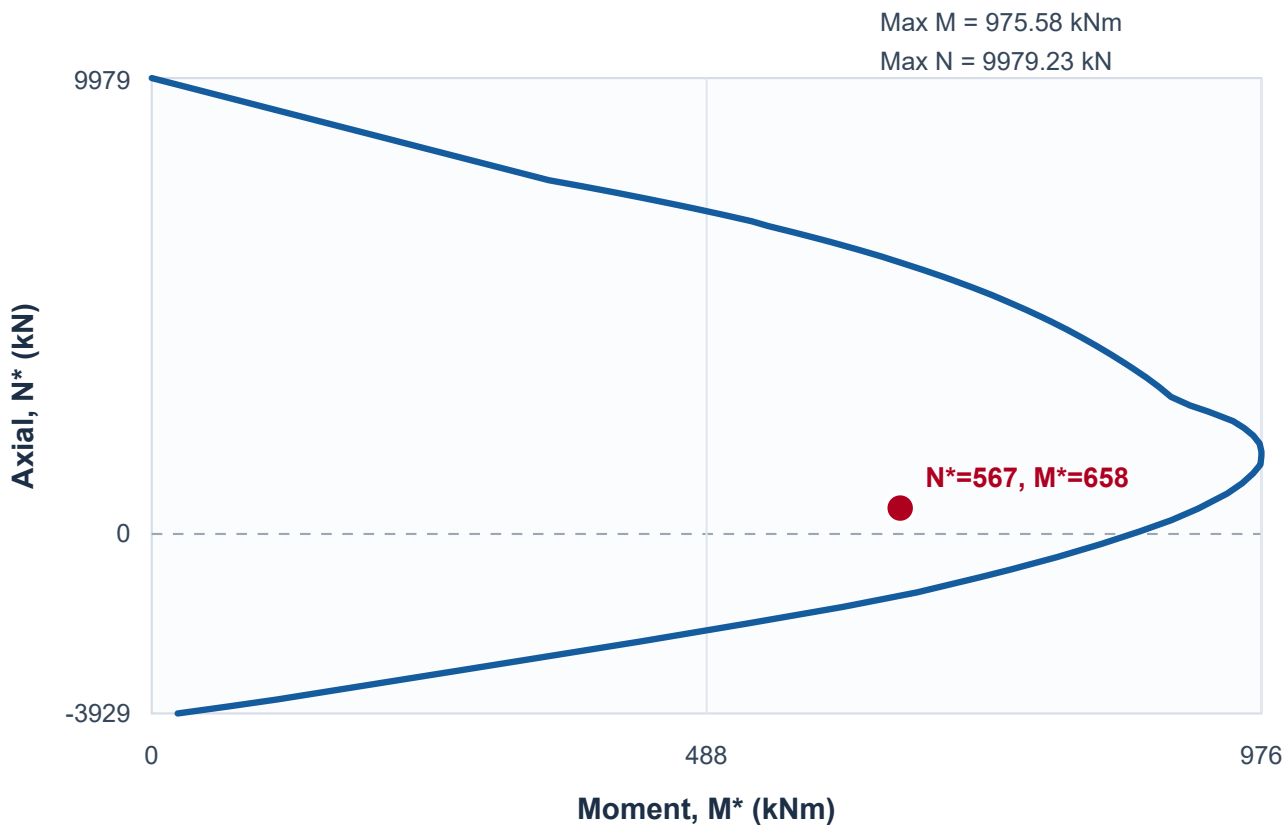
Interaction Diagram - Direction 22



Direction 33 Column Check

Item	Value
Balanced moment capacity	904.00 kNm
Euler buckling force, Ncr	13340 kN
Km	1.00
Moment magnifier, δb	1.04
Pure bending capacity	868.00 kNm
Design moment, M33*	658.00 kNm
N / bd index	1.58
M / bd² index	3.05
Utilisation	71%

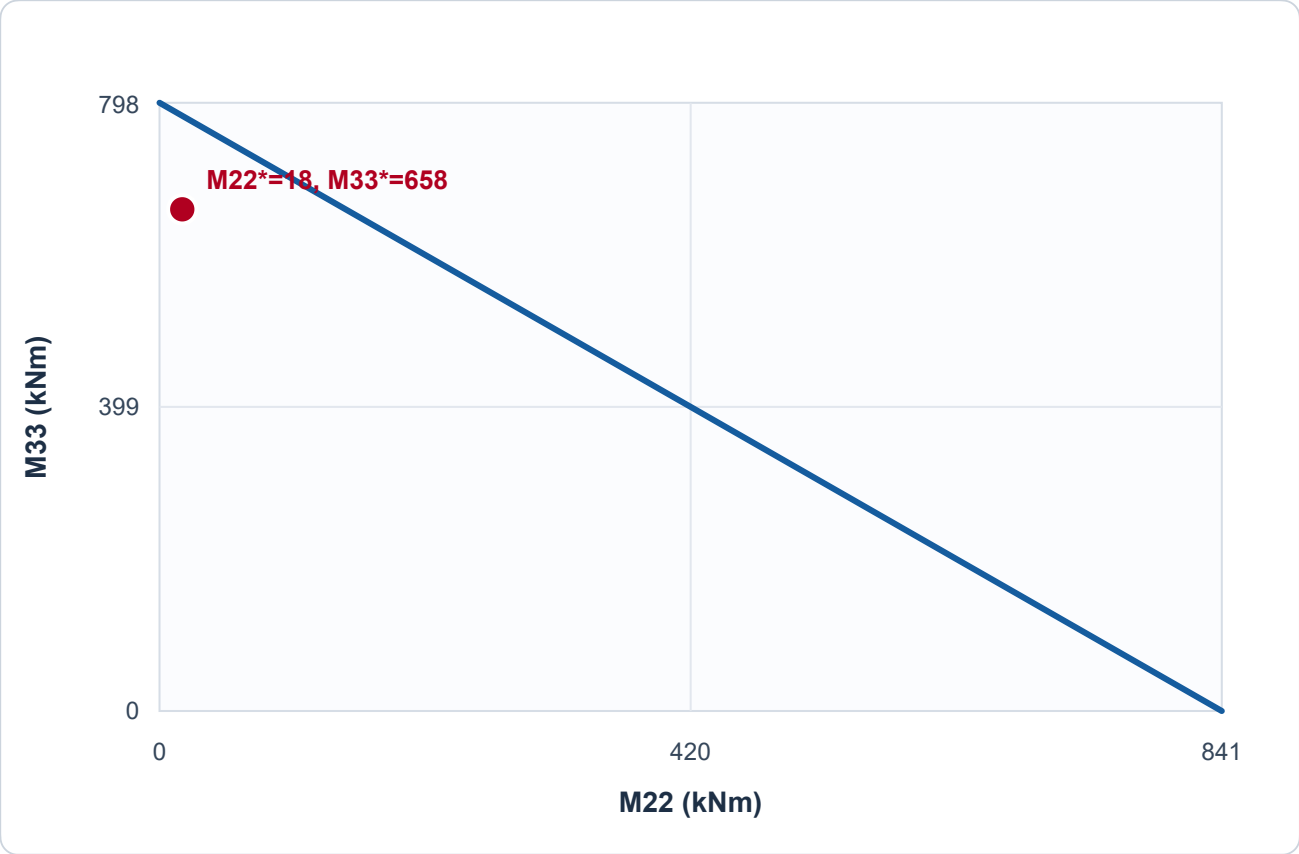
Interaction Diagrams- Direction 33



Axial and Biaxial Capacity

Item	Value
Squash load	9979 kN
Pure tension capacity	4006 kN
Muo 22	841.00 kNm
Muo 33	798.00 kNm
Biaxial power, αb	1.00
Biaxial utilisation	85%

Biaxial Interaction Diagram



Design Notes

Column reinforcement is selected from the concrete optimisation result.
The red marker represents the governing applied design action on each principal axis.

Following is a critical point cross check at corner (eave) of the frame where moment = 630 and co-existing shear = 493

Your Design Package is valid until 30/03/2030 10:44:38 PM

Inputs

Materials

f'c (N/mm²)	40
fy (N/mm²)	500
fys (N/mm²)	500
Flexural Rebar Dia mm	N12
Shear Rebar Dia mm	N12

α=0.79 / γ=0.87

Geometry (Units mm)

Width	600
Depth	600
Bot. Cover to Centre	54
Top Cover to Centre	54
Torsion Cover (clear)	54

Loads (KN , m)

Moment (ULS)	631
Moment (SLS)	1

M/bd²=3.53

Shear - Coexisting	493
Torsion - Coexisting	Negligible
Axial force - for Shear (-ve for compression)	0

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ShareKALC

RKALC Assistant New

NA d.=89 / Ku=0.1633 / Φ=0.85

Flexural Reo

As (mm²) - Required Bot.	2926
As - Adopted Bot **26N12**	2941
fs Mpa (tension Reo)	500
As' (mm²) - Required Top	Min
Adopted Top	as above
fs Mpa (comp Reo)	0
ΦMub (Max-Single)	1269
Flexural Capacity	634

Shear & Torsion

Veq (KN)	493
Shear Stress	1.67
Permitted Shear	8.1
ε =	0.001511
θv =	40
Kv=	0.122
ΦTcr (KN.m)	85
ΦVc (N/mm²)	0.58
Vs (N/mm²)	1.09
ΔFtd (KN)	402
Cl. 8.2.7 REO	946
Asw/S (mm²/mm)	0
Asv/S (mm²/mm)	1.44
Min Shear Legs	3
Required Spacing	236