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Piano Operativo Ambiente

MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

PROGETTO ESECUTIVO

TITOLO COMMESSA

ADEGUAMENTO DEL DEPURATORE DI GRAVELLONA TOCE ALLE DIRETTIVE COMUNITARIE

Via Trattati di Roma in Comune di Gravellona Toce (VB)

Rif. N° Commessa: W01M - 10030635
CUP: D49E17000030002
RUP: Dott. Ing Barbara Dell'Edera

Data: Maggio 2022	Rif. archivio: 002.19
Scala	ELABORATO: ST.01.004 D

Rev.	AGGIORNAMENTI	DATA

OGGETTO

FASCICOLO DEI CALCOLI – MANUFATTO DI DISINFEZIONE

Il Responsabile Dott. Ing. Riccardo ISOLA	Visto

* Riservato all'Amministrazione

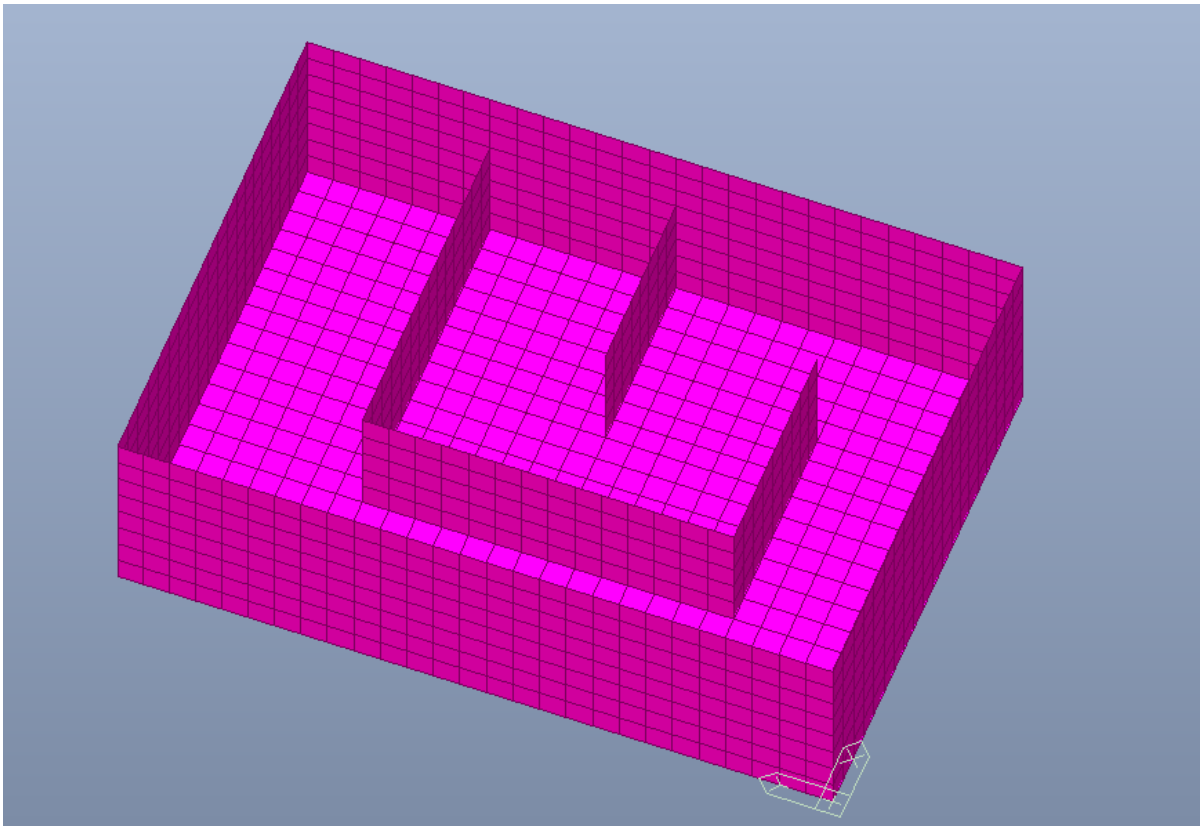
Sommario

1 Fascicolo dei calcoli Manufatto di disinfezione

1.1 Dati della modellazione

Nelle immagini seguenti viene riportato il modello di calcolo agli elementi finiti, realizzato con Midas Gen, con evidenziati i vari spessori degli elementi strutturali.
Gli elementi finiti adottati sono di tipo plate per le pareti.
In particolare, gli spessori adottati per gli elementi plate sono i seguenti:

- Platea di fondazione sp.40 cm;
- Pareti esterne sp.40 cm;
- Pareti interne sp.40 cm.



Modello di Calcolo agli elementi finiti

L'interazione terreno struttura a livello del piano di fondazione è stata modellata con delle molle alla Winkler con costante di sottofondo media pari a circa 9600 kN/m^3, ricavata dalle caratteristiche geotecniche del terreno con la formula di Vesic.
L'analisi sismica è stata effettuata mediante analisi statica equivalente, attribuendo agli elementi strutturali i valori delle sovra spinte sismiche sia del terreno che del liquame; per i calcoli di queste sovraspinte si rimanda all'apposito capitolo della relazione strutturale.

1.2 Carichi e combinazioni di carico

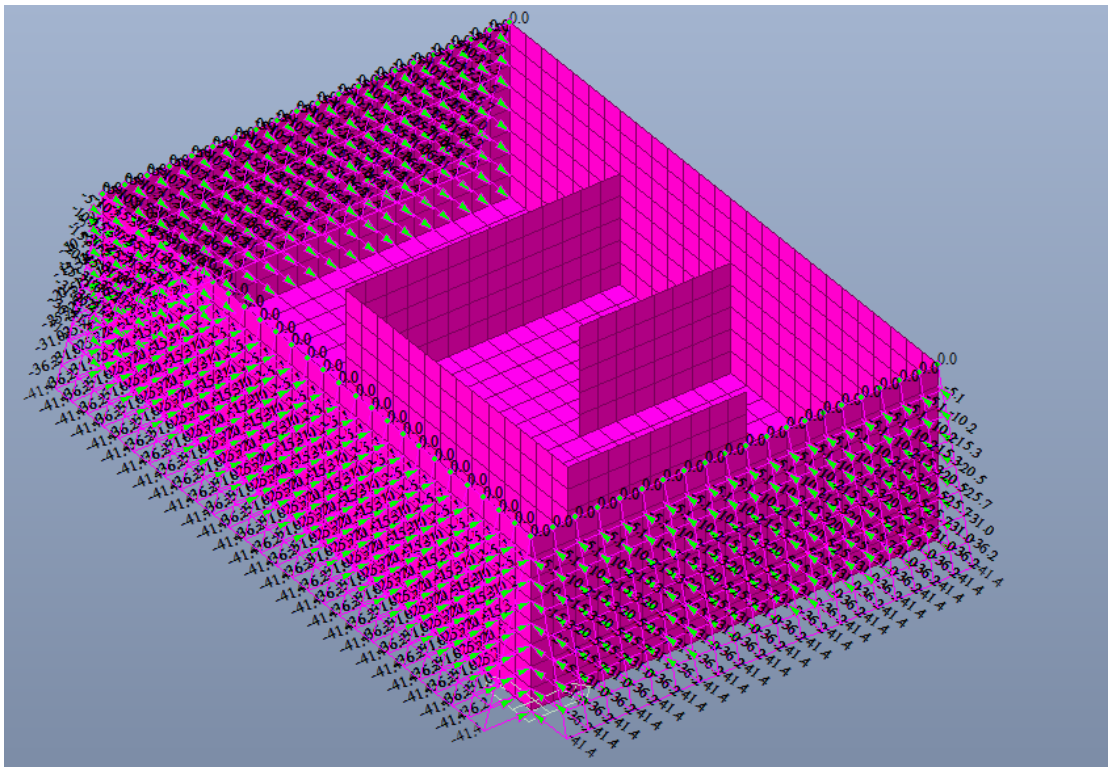
Per la determinazione delle azioni sul manufatto si faccia riferimento alla relazione strutturale.
Nel presente paragrafo vengono riportati i carichi assegnati ai vari elementi strutturali, le condizioni di carico elementari considerate e le combinazioni di carico.
Le condizioni di carico adottate nella modellazione della struttura sono le seguenti:

No	Name	Type	Description
1	DL	Dead Load (D)	Peso Proprio
2	SST	Dead Load (D)	Spinta Statica Terreno
3	SSTF	Dead Load (D)	Spinta Statica Terreno con Falda
4	SSS	Live Load (L)	Spinta Statica Sovraccarico
5	SSL	Dead Load (D)	Spinta Statica Liquame
6	S GAL	Dead Load (D)	Spinta Galleggiamento
7	ET X	Earthquake (E)	Sovraspinta Sismica Terreno X
8	ET Y	Earthquake (E)	Sovraspinta Sismica Terreno Y
9	EL X	Earthquake (E)	Sovraspinta Sismica Liquame X
10	EL Y	Earthquake (E)	Sovraspinta Sismica Liquame Y

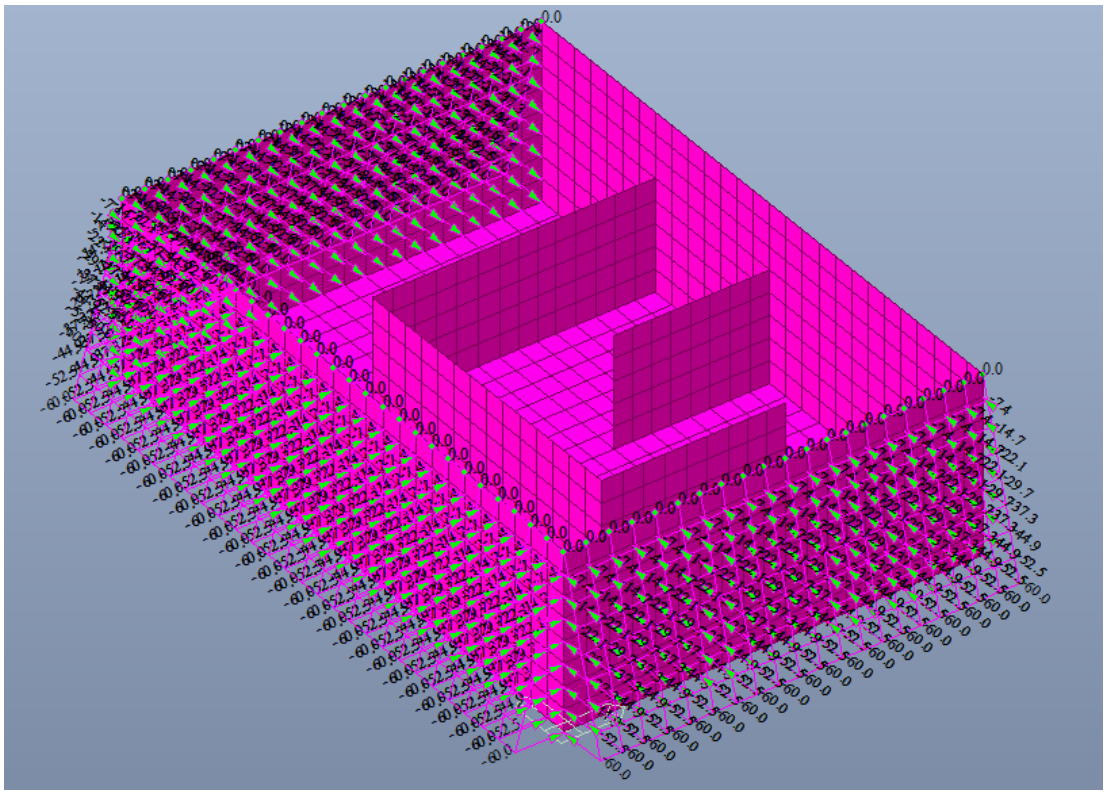
Le combinazioni delle condizioni di carico elementari, realizzate sulla base delle indicazioni del paragrafo 2.5.3 delle NTC 2018, sono le seguenti:

No	Name	Active	Type	DL(ST)	SST(ST)	SSTF(ST)	SSS(ST)	SSL(ST)	S GAL(ST)	ET X(ST)	ET Y(ST)	EL X(ST)	EL Y(ST)
1	SLU 1	Stren	Add	1.3000	1.3000		1.5000						
2	SLU 2	Stren	Add	1.3000		1.3000	1.5000						
3	SLU 3	Stren	Add	1.3000	1.3000			1.3000					
4	SLU 4	Stren	Add	1.3000		1.3000			1.3000				
5	SLU 5	Stren	Add	1.3000				1.3000					
6	SLV 1	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	1.0000	0.3000	1.0000	0.3000
7	SLV 2	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	1.0000	-0.3000	1.0000	-0.3000
8	SLV 3	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	0.3000	1.0000	0.3000	1.0000
9	SLV 4	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	-0.3000	1.0000	-0.3000	1.0000
10	SLV 5	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	-1.0000	-0.3000	-1.0000	-0.3000
11	SLV 6	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	-1.0000	0.3000	-1.0000	0.3000
12	SLV 7	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	-0.3000	-1.0000	-0.3000	-1.0000
13	SLV 8	Stren	Add	1.0000	1.0000	1.0000	0.3000	1.0000	1.0000	0.3000	-1.0000	0.3000	-1.0000
14	SLE R1	Servic	Add	1.0000	1.0000		1.0000						
15	SLE R2	Servic	Add	1.0000		1.0000	1.0000						
16	SLE R3	Servic	Add	1.0000	1.0000			1.0000					
17	SLE R4	Servic	Add	1.0000		1.0000			1.0000				
18	SLE R5	Servic	Add	1.0000				1.0000					
19	SLE F	Servic	Add	1.0000	1.0000		0.5000	1.0000					
20	SLE Qp	Servic	Add	1.0000	1.0000		0.3000	1.0000					

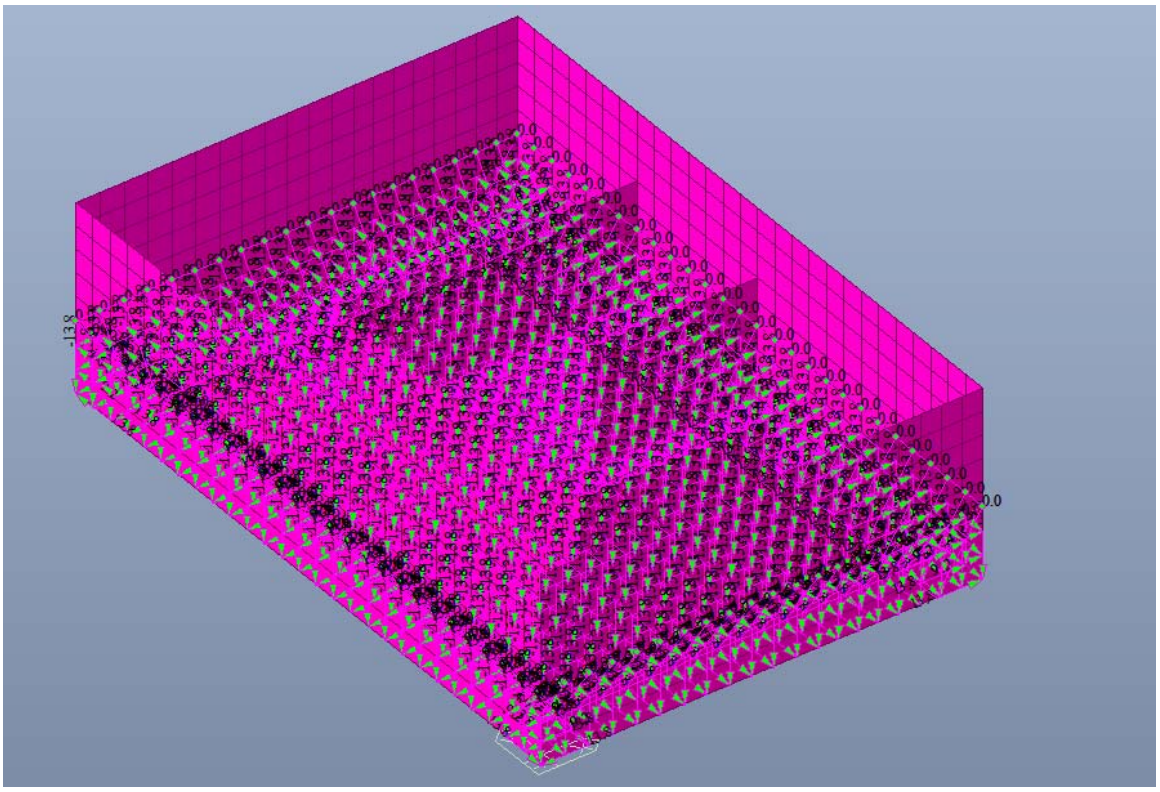
Nelle immagini seguenti si riportano le assegnazioni dei carichi:



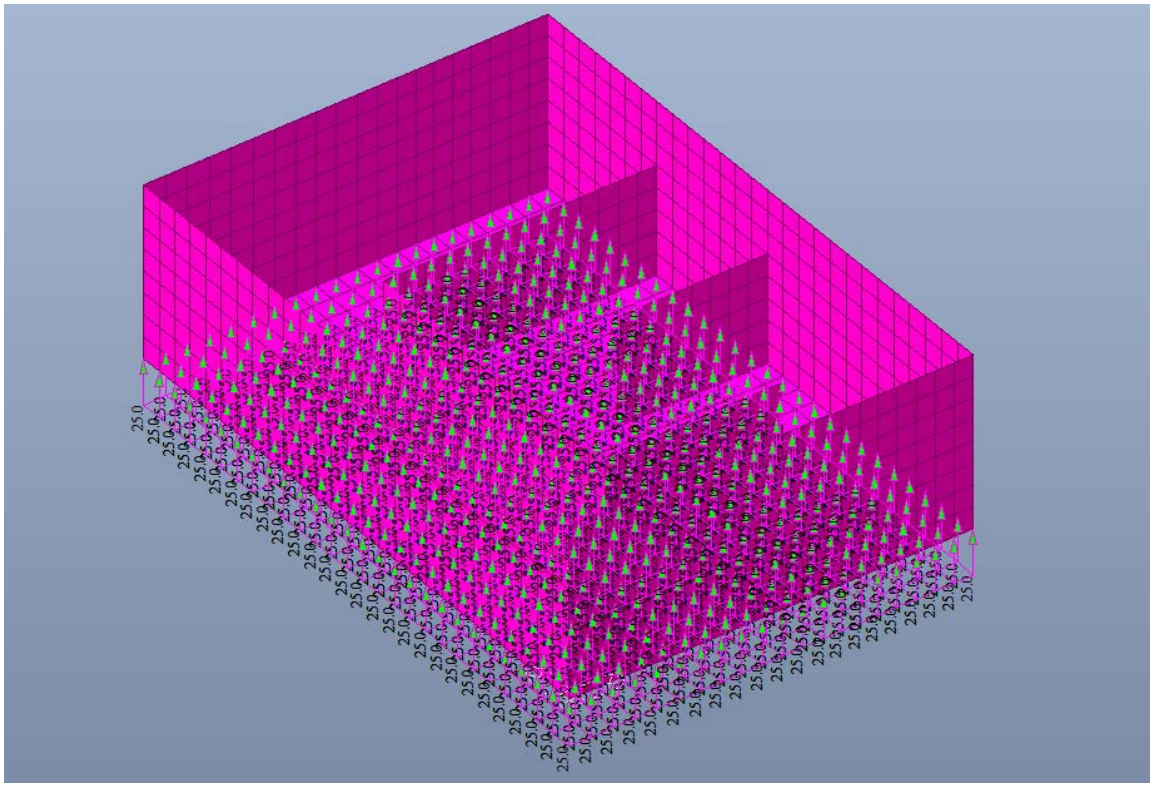
Assegnazione spinta statica del terreno (SST) - [kN/mq]



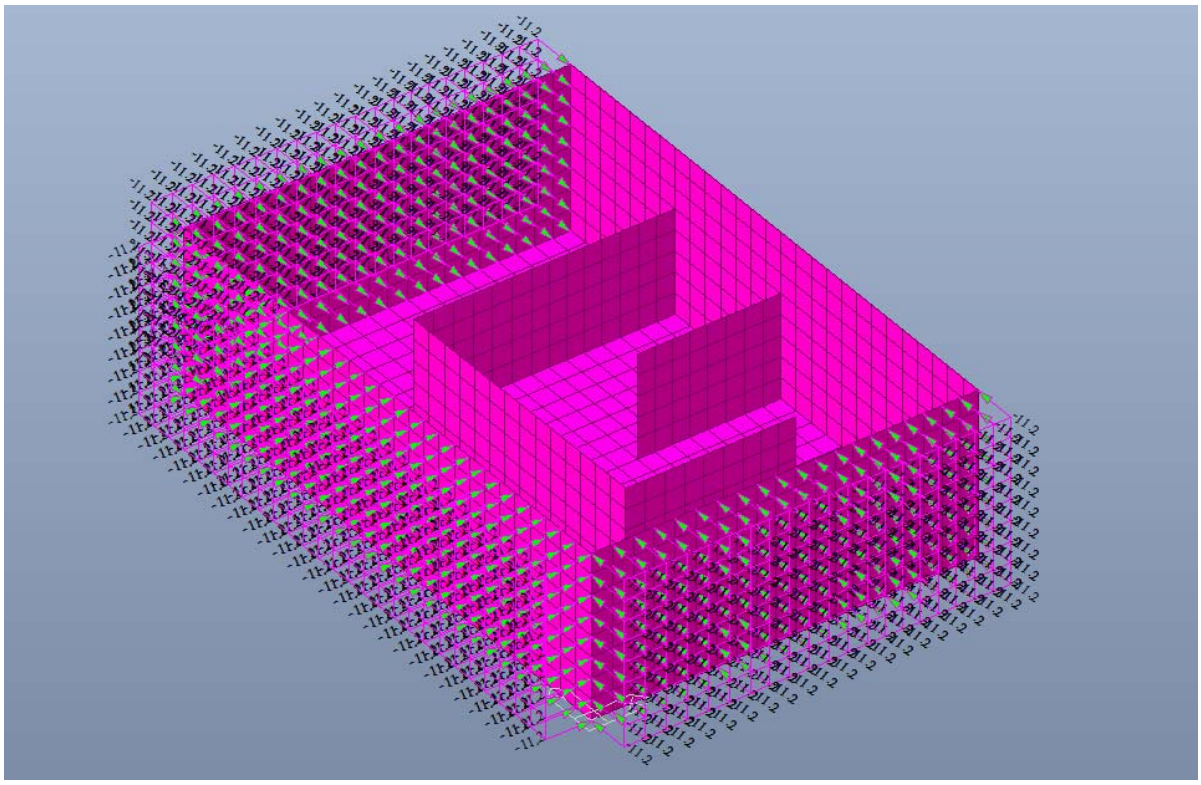
Assegnazione spinta statica del terreno con falda (SSTF) - [kN/mq]



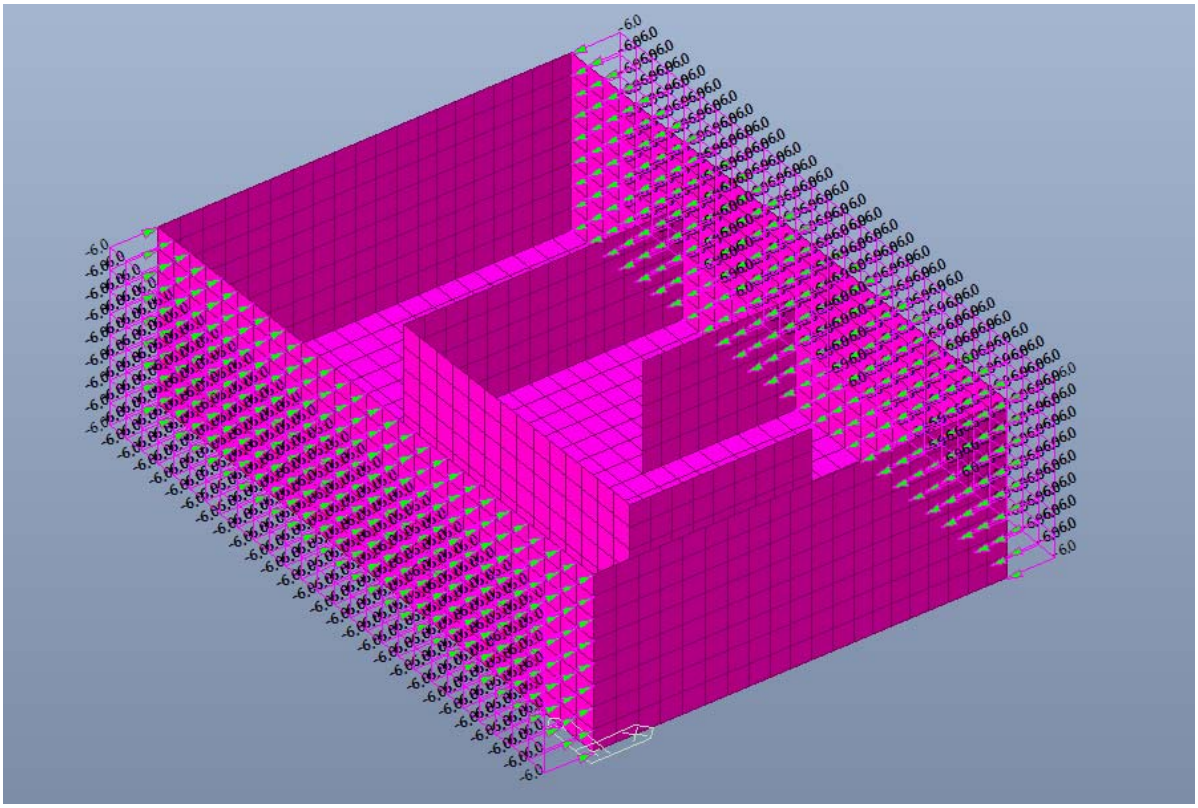
Assegnazione spinta statica liquame (SSL) - [kN/mq]



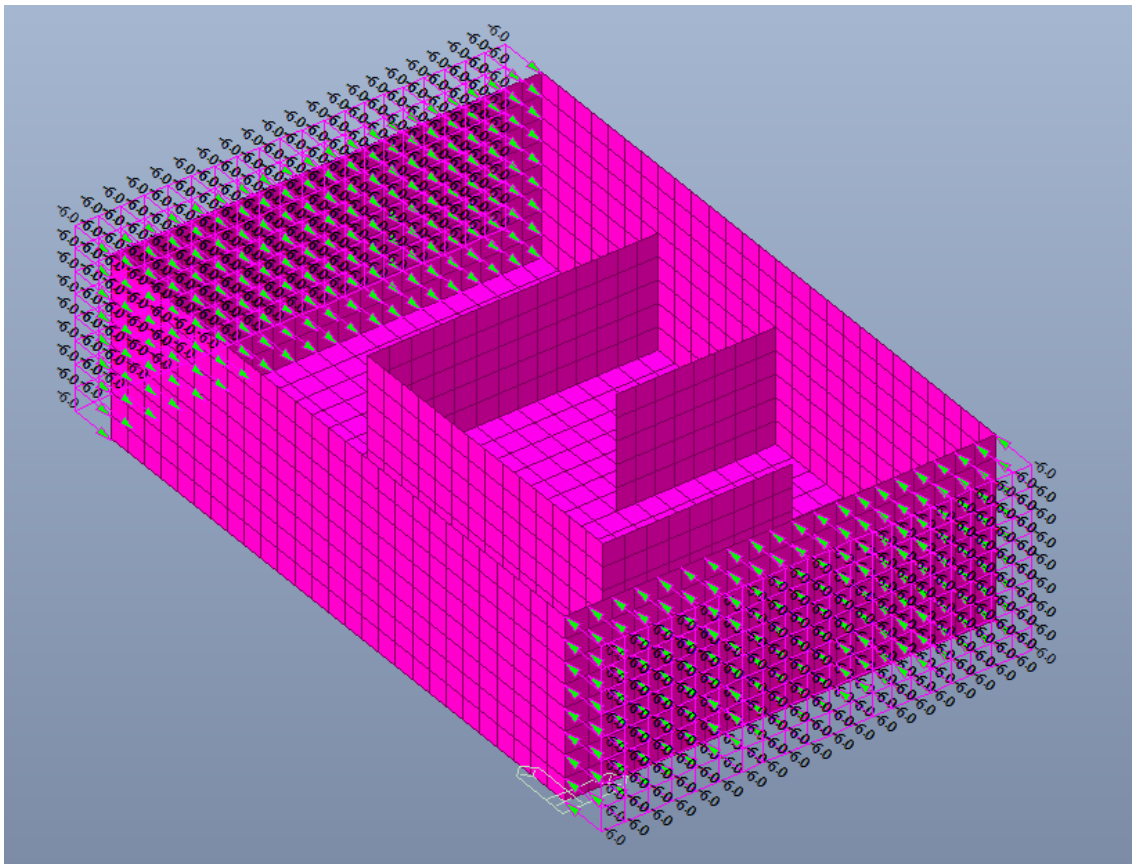
Assegnazione spinta galleggiamento (S GAL) - [kN/mq]



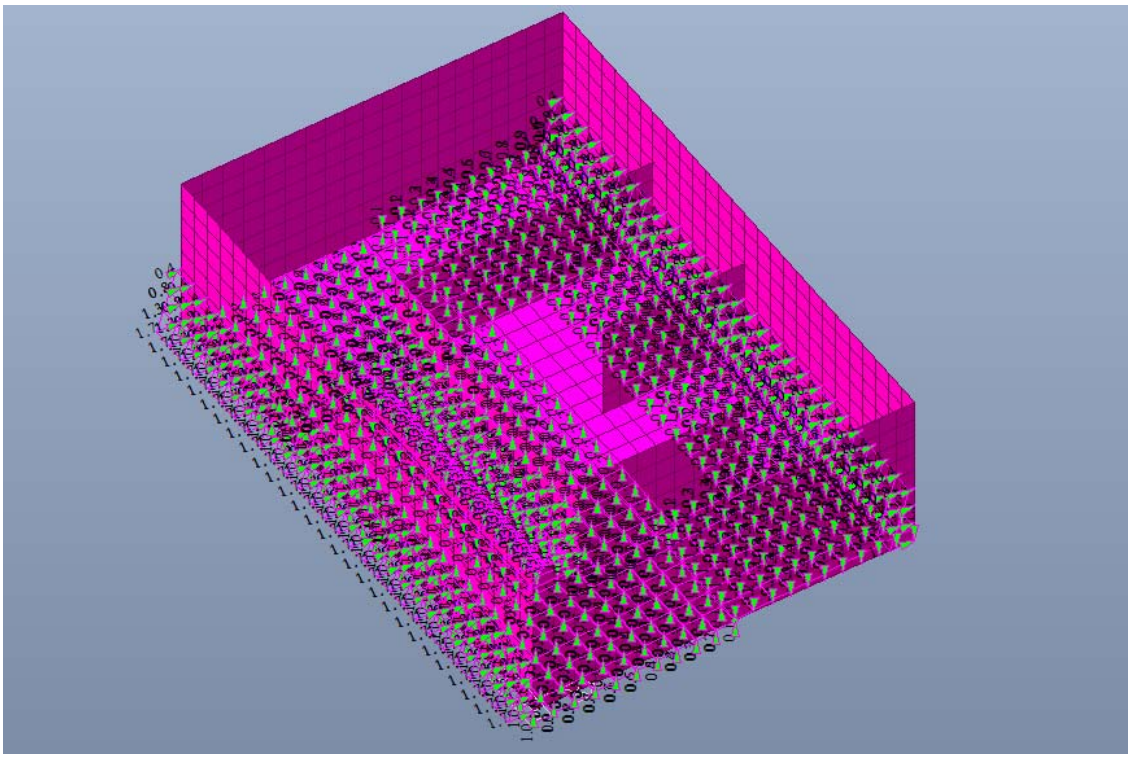
Assegnazione spinta statica sovraccarico (SSS) - [kN/mq]



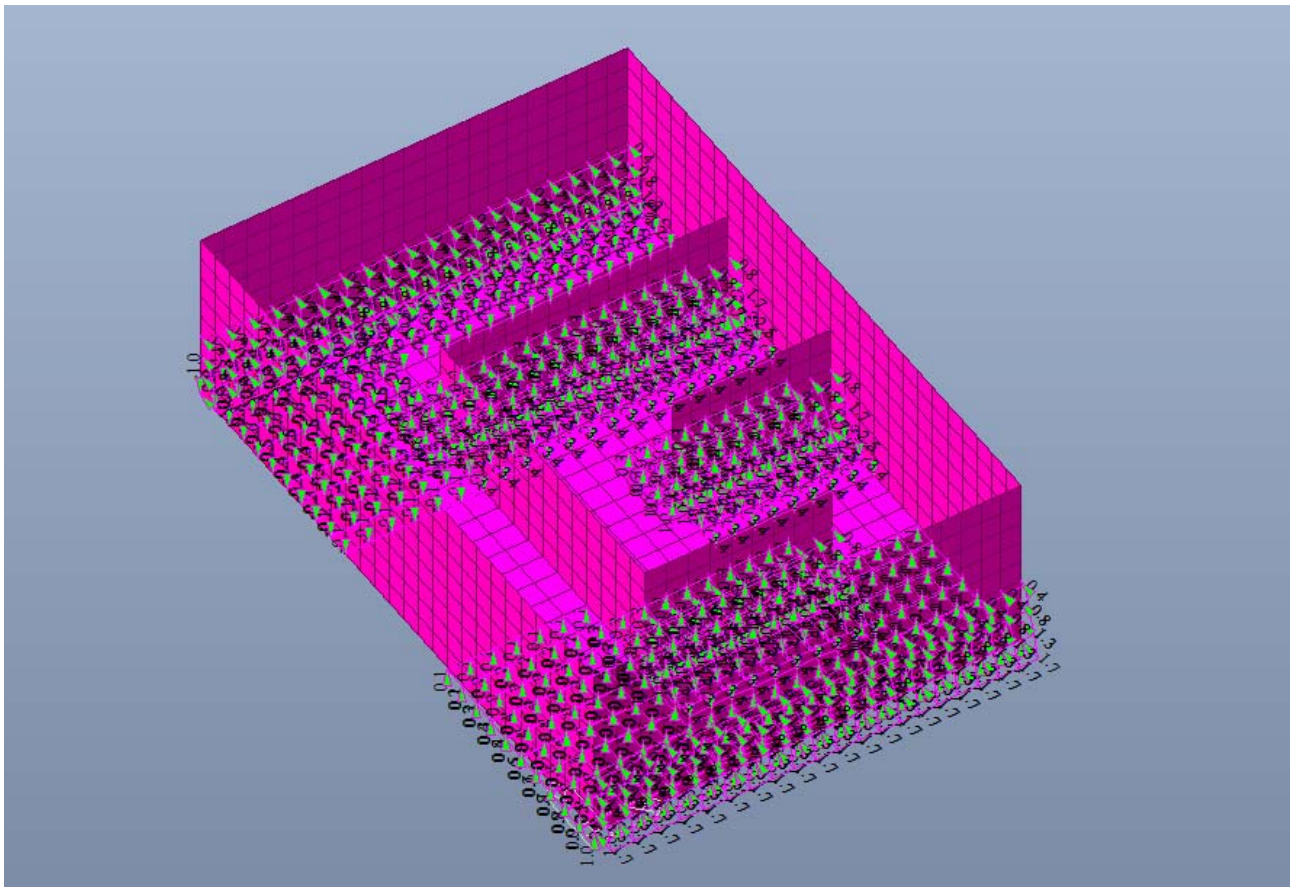
Assegnazione sovra spinta sismica terreno X (ET X) - [kN/mq]



Assegnazione sovra spinta sismica terreno Y (ET Y) - [kN/mq]



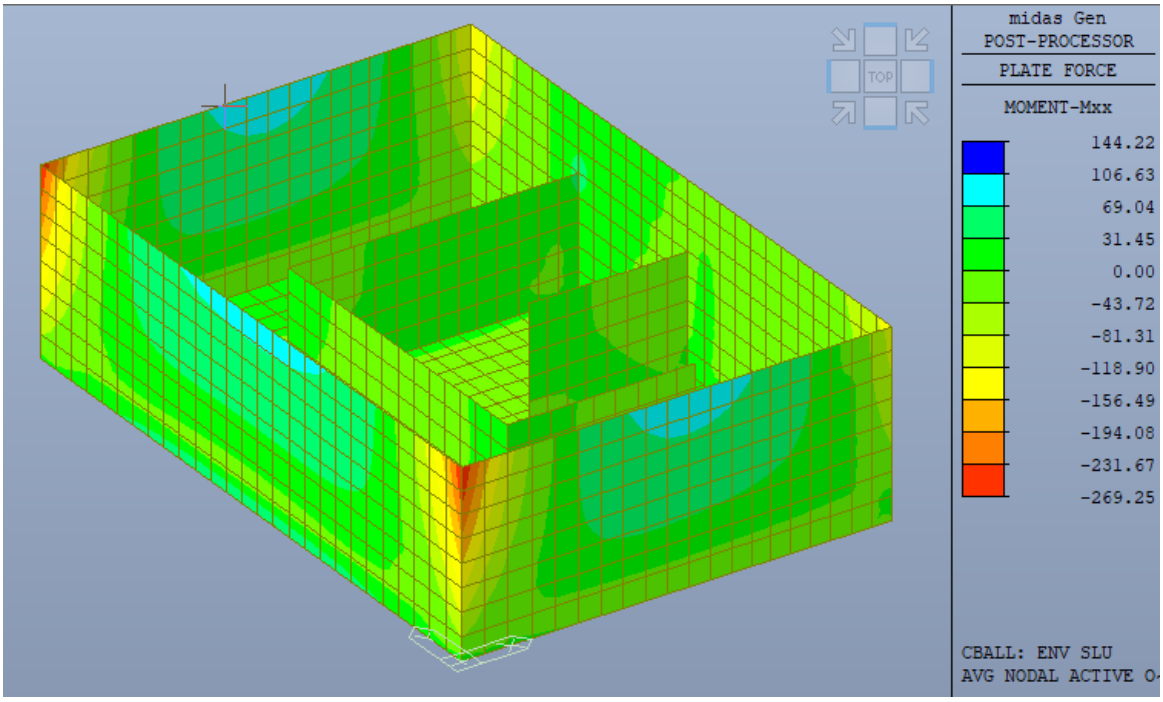
Assegnazione sovra spinta sismica liquame X (EL X) - [kN/mq]



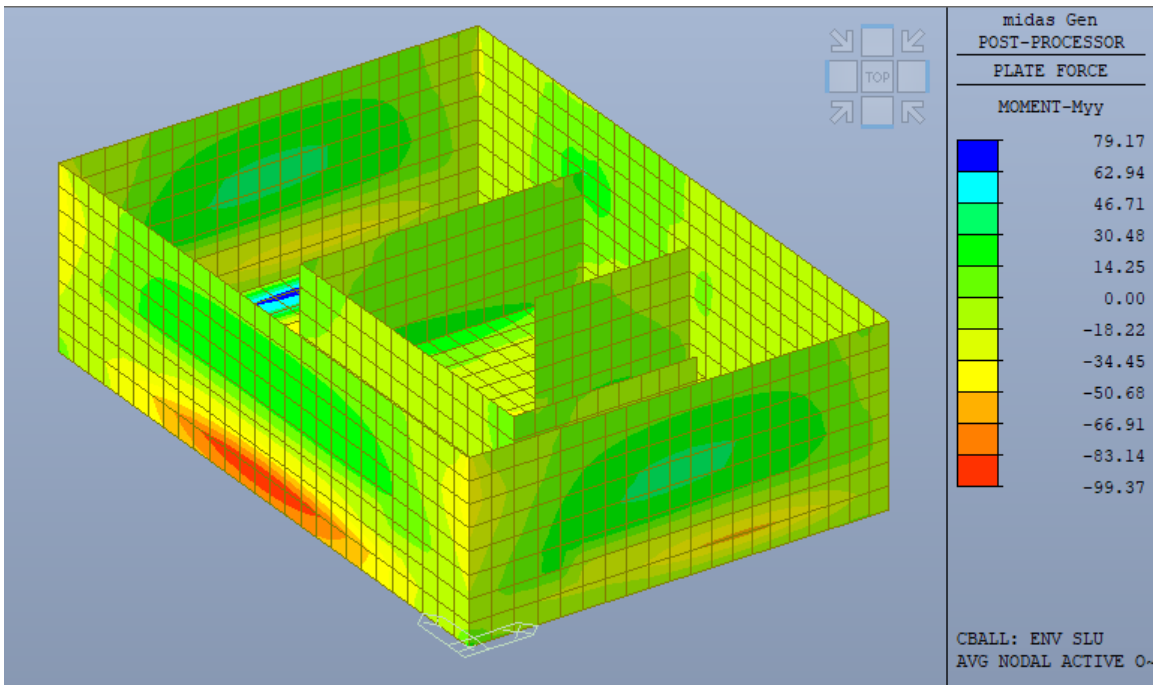
Assegnazione sovra spinta sismica liquame Y (EL Y) - [kN/mq]

1.3 Sollecitazioni

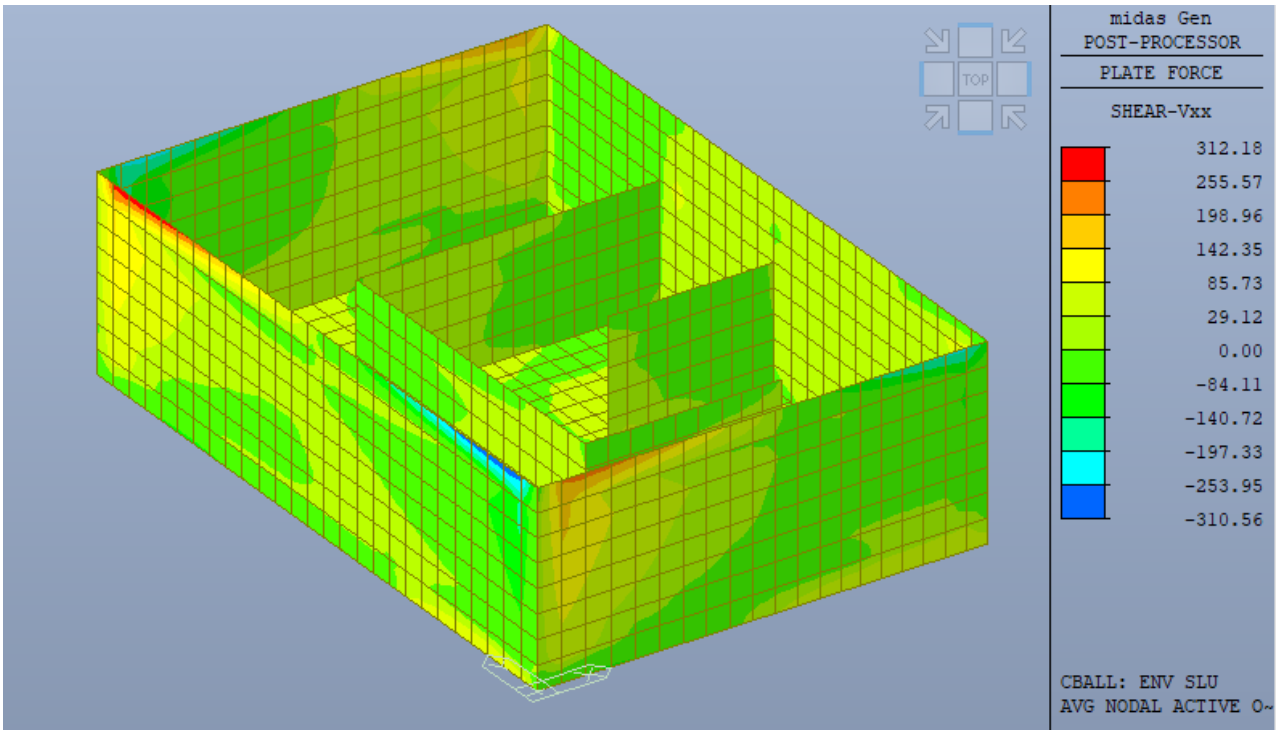
Nel presente paragrafo vengono riportate per via grafica le sollecitazioni sulla struttura indotte dai carichi applicati, per le varie combinazioni di carico statiche e sismiche.



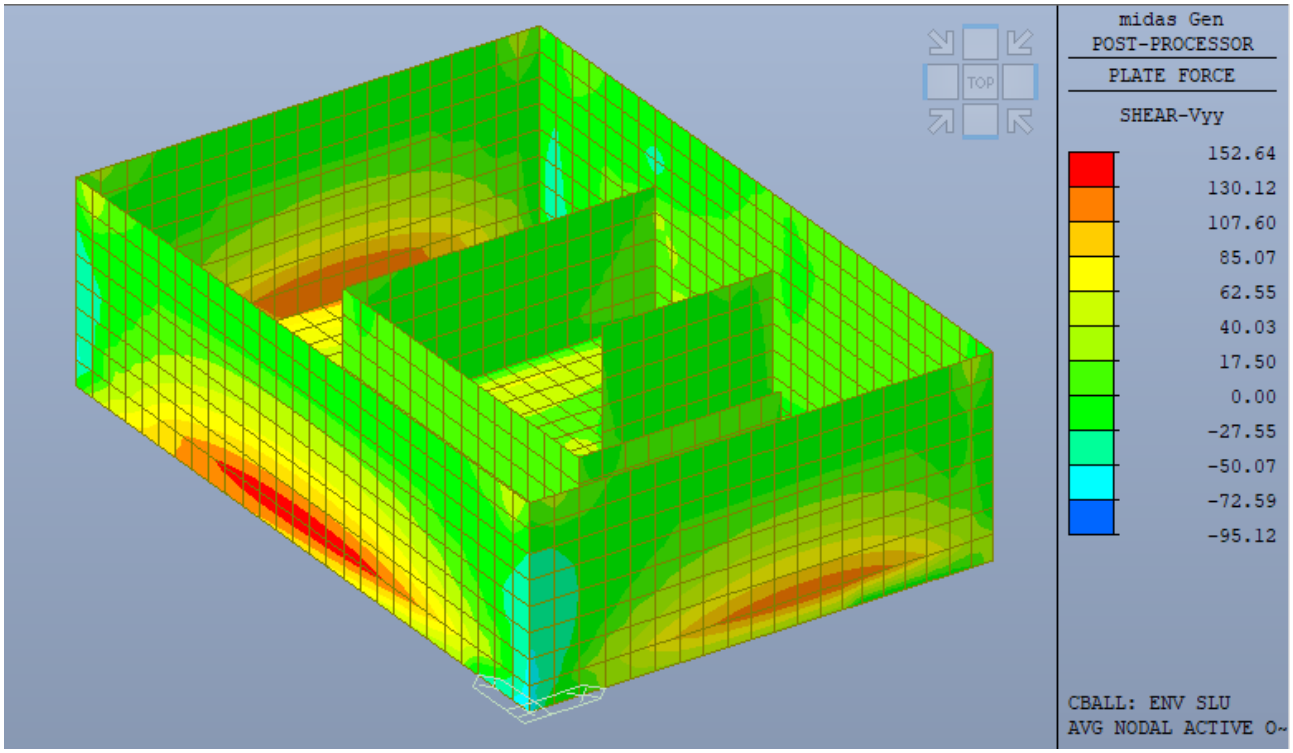
Momento flettente membranale Mxx – inviluppo SLU [kN*m/m]



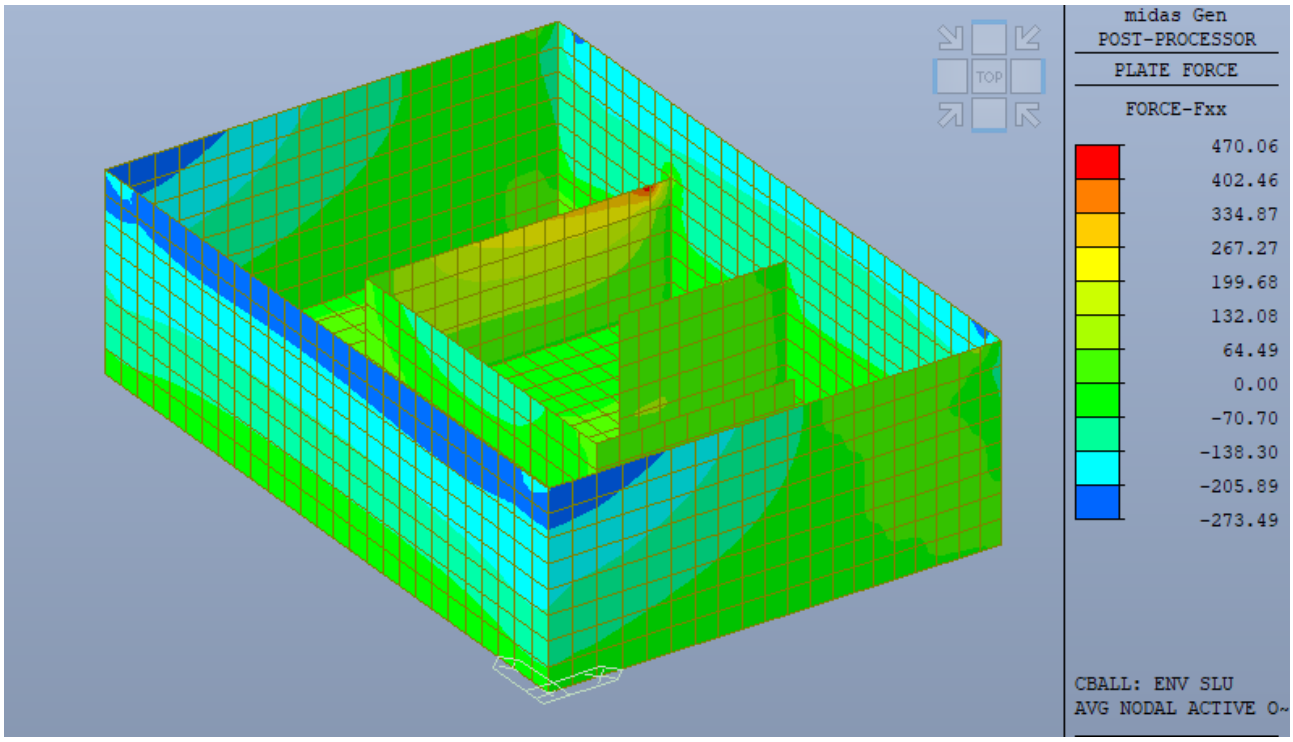
Momento flettente membranale Myy – inviluppo SLU [kN*m/m]



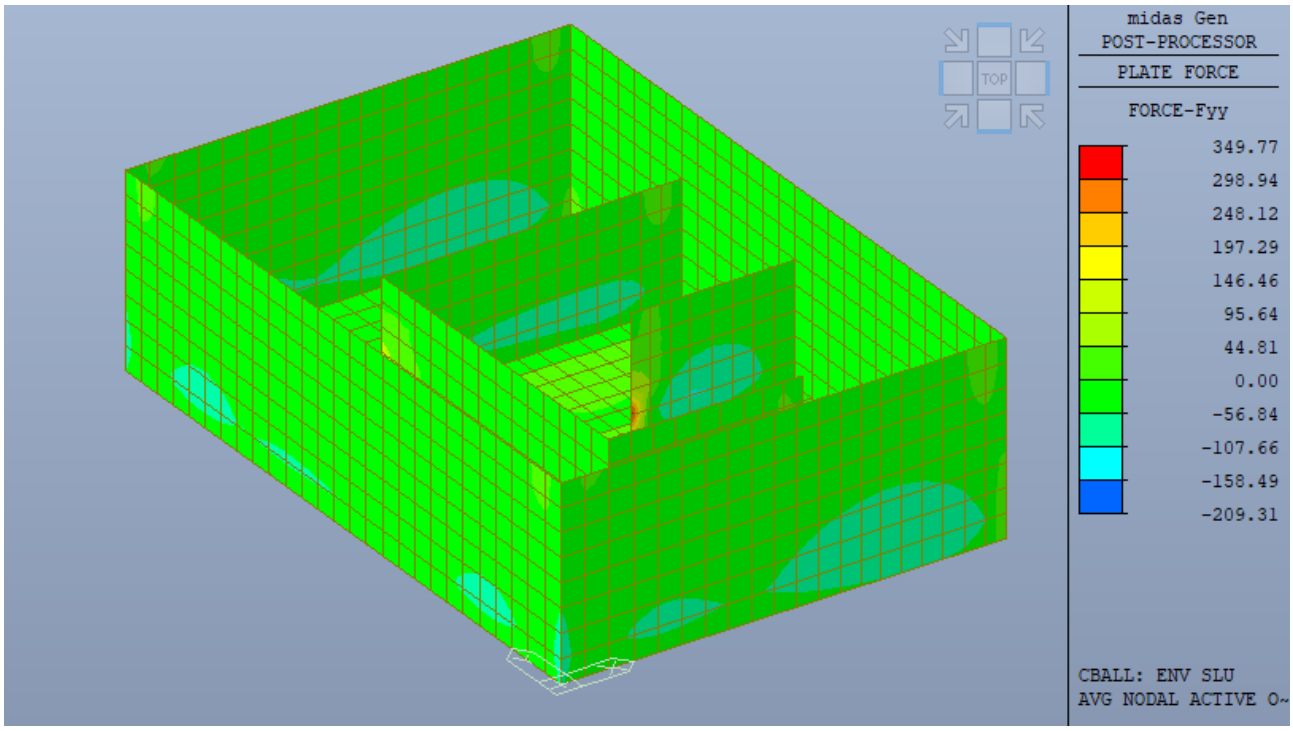
Sollecitazione tagliante Vxx – inviluppo SLU [kN/m]



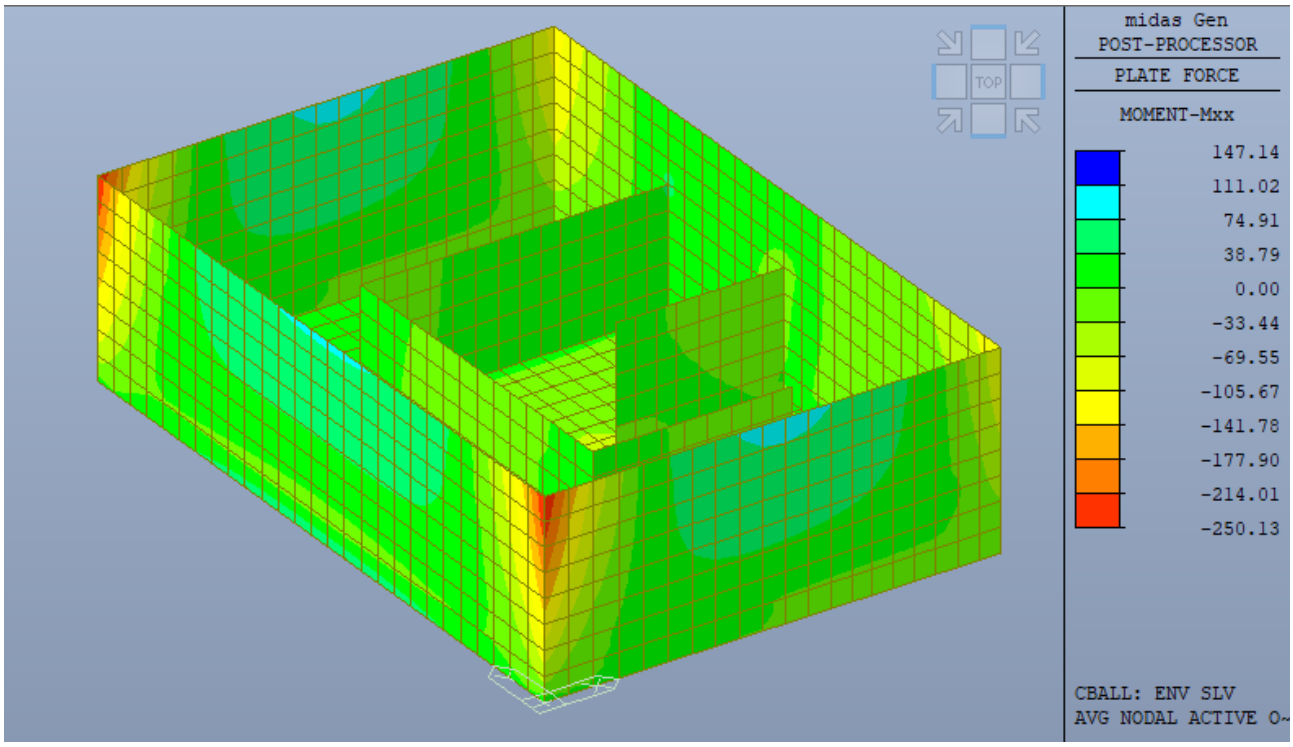
Sollecitazione tagliante Vyy – inviluppo SLU [kN/m]



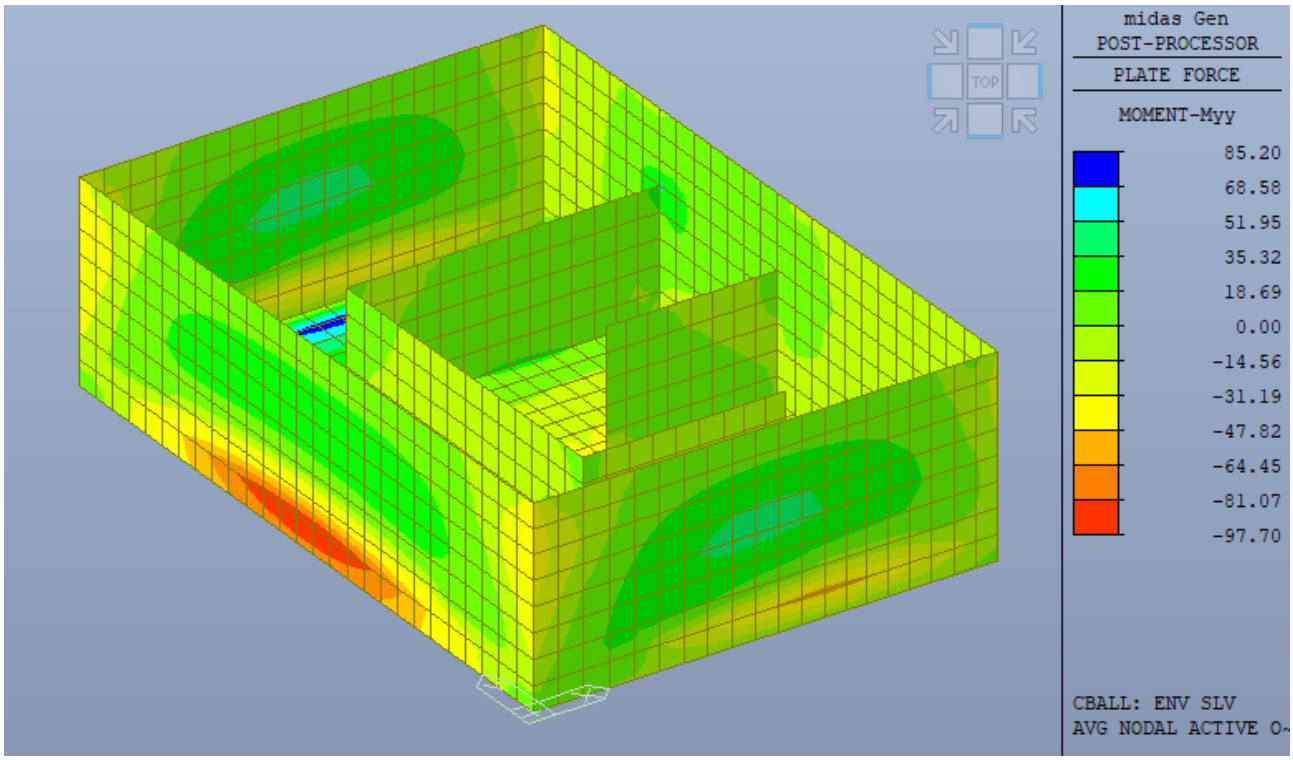
Sforzo Normale Fxx – inviluppo SLU [kN/m]



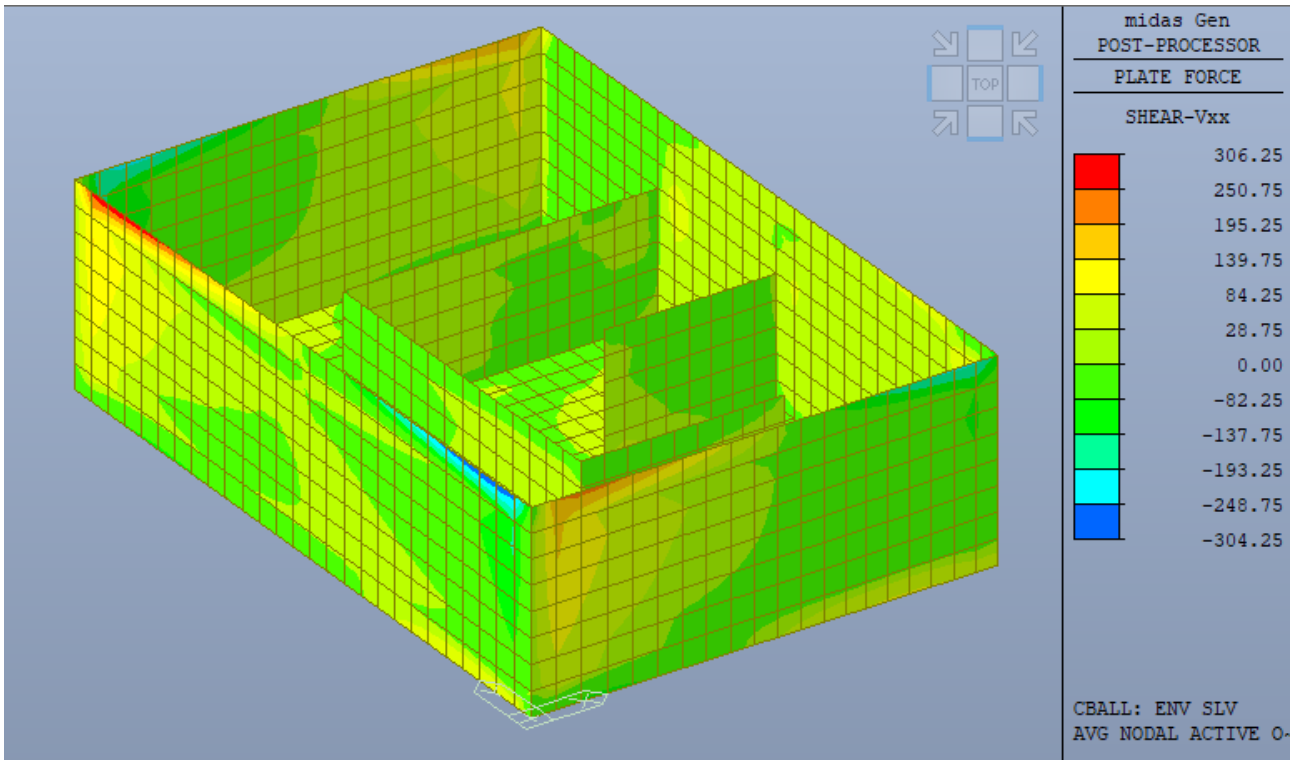
Sforzo Normale Fyy – inviluppo SLU [kN/m]



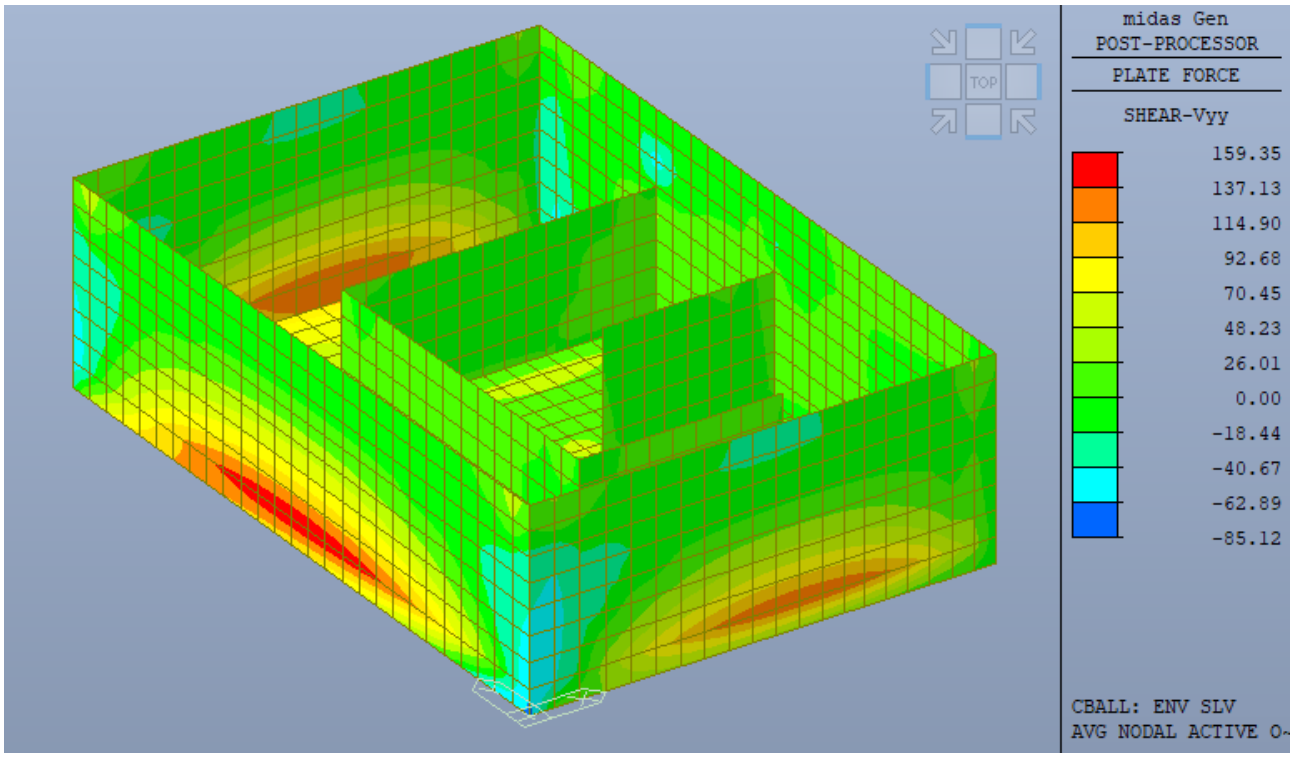
Momento flettente membranale Mxx – inviluppo SLV [kN*m/m]



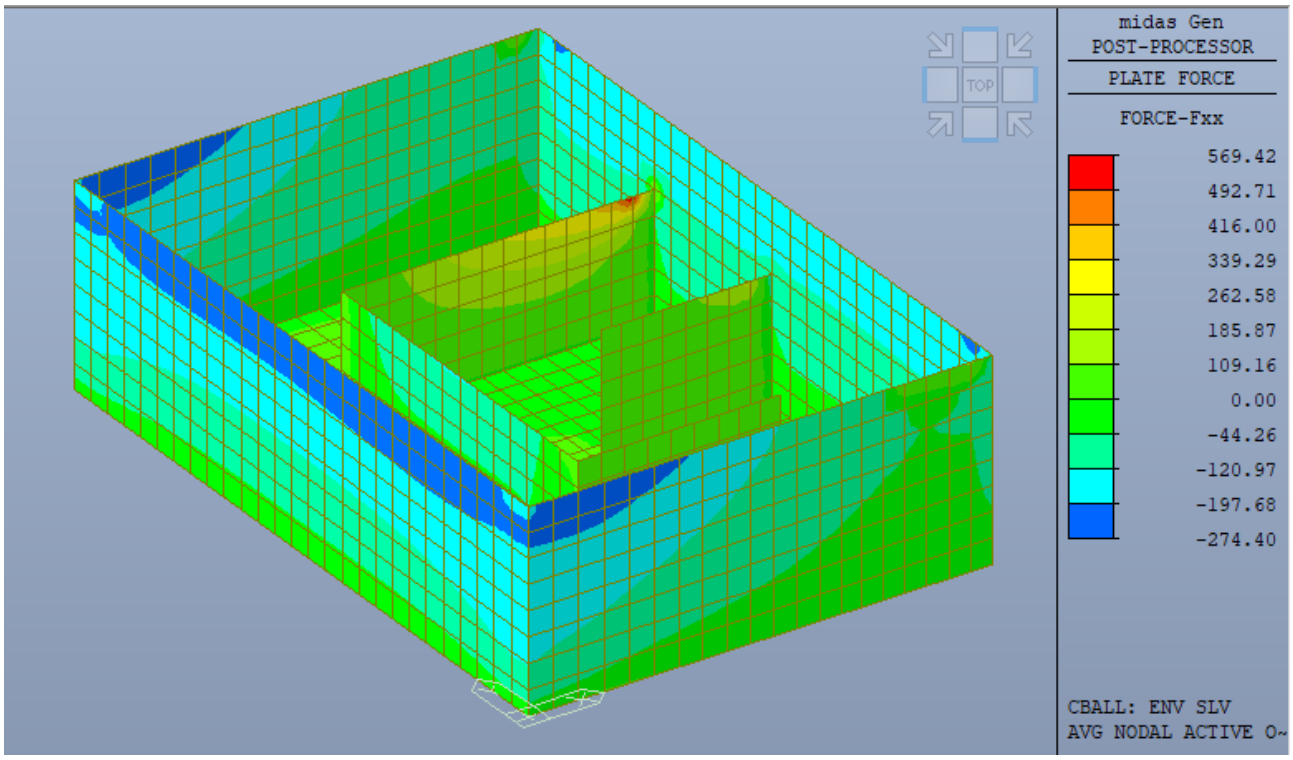
Momento flettente membranale Myy – inviluppo SLV [kN*m/m]



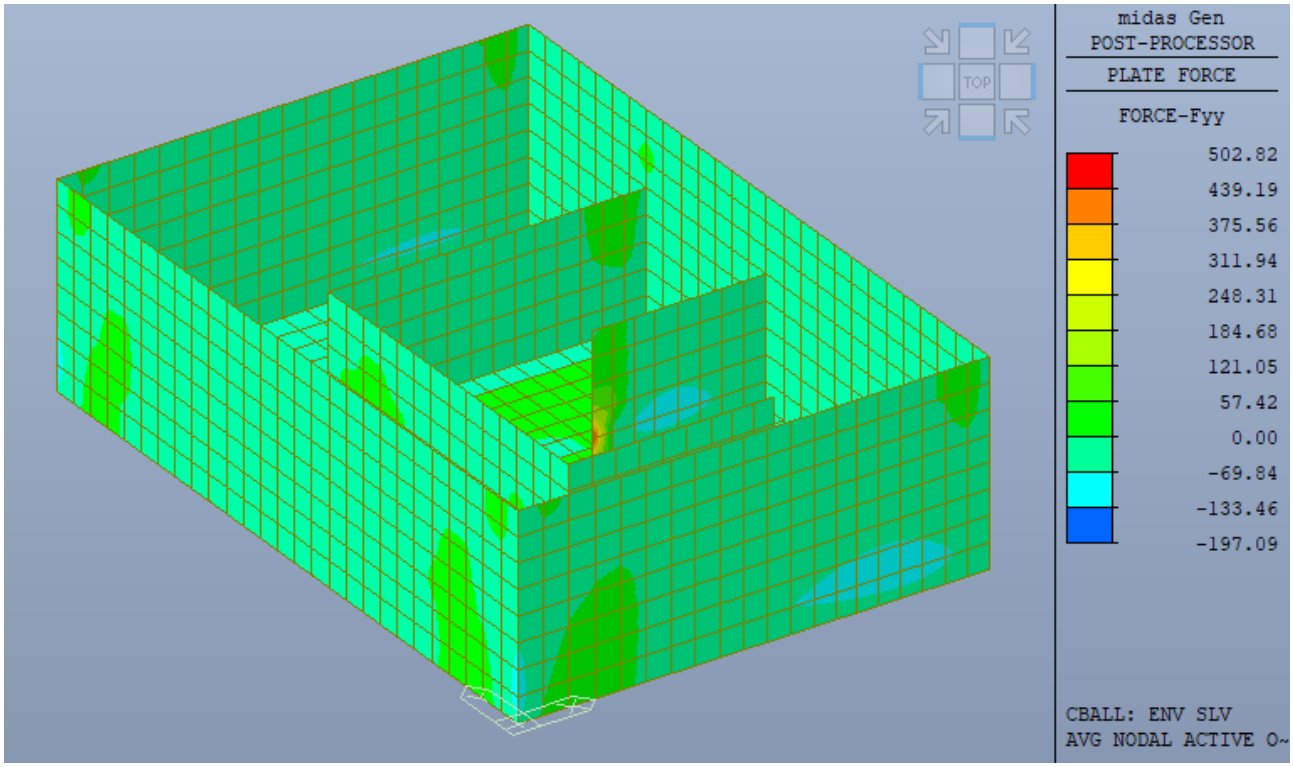
Sollecitazione tagliante Vxx – inviluppo SLV [kN/m]



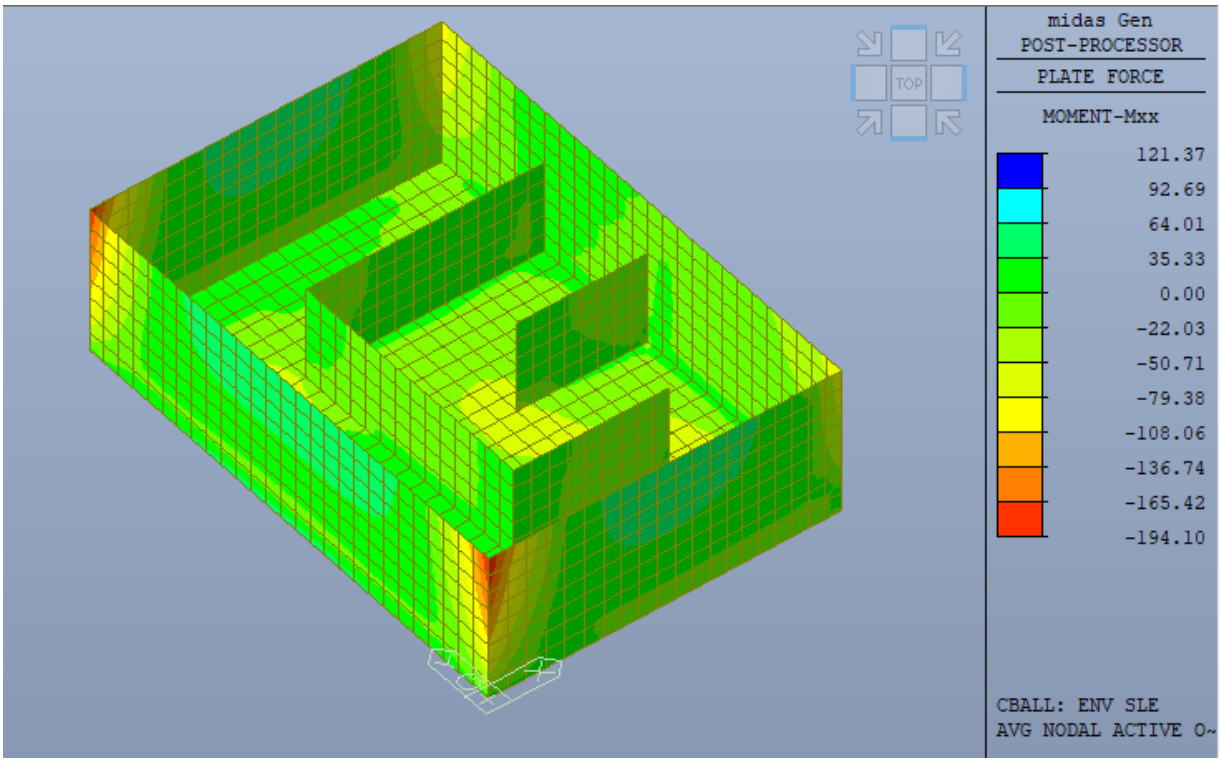
Sollecitazione tagliante Vyy – inviluppo SLV [kN/m]



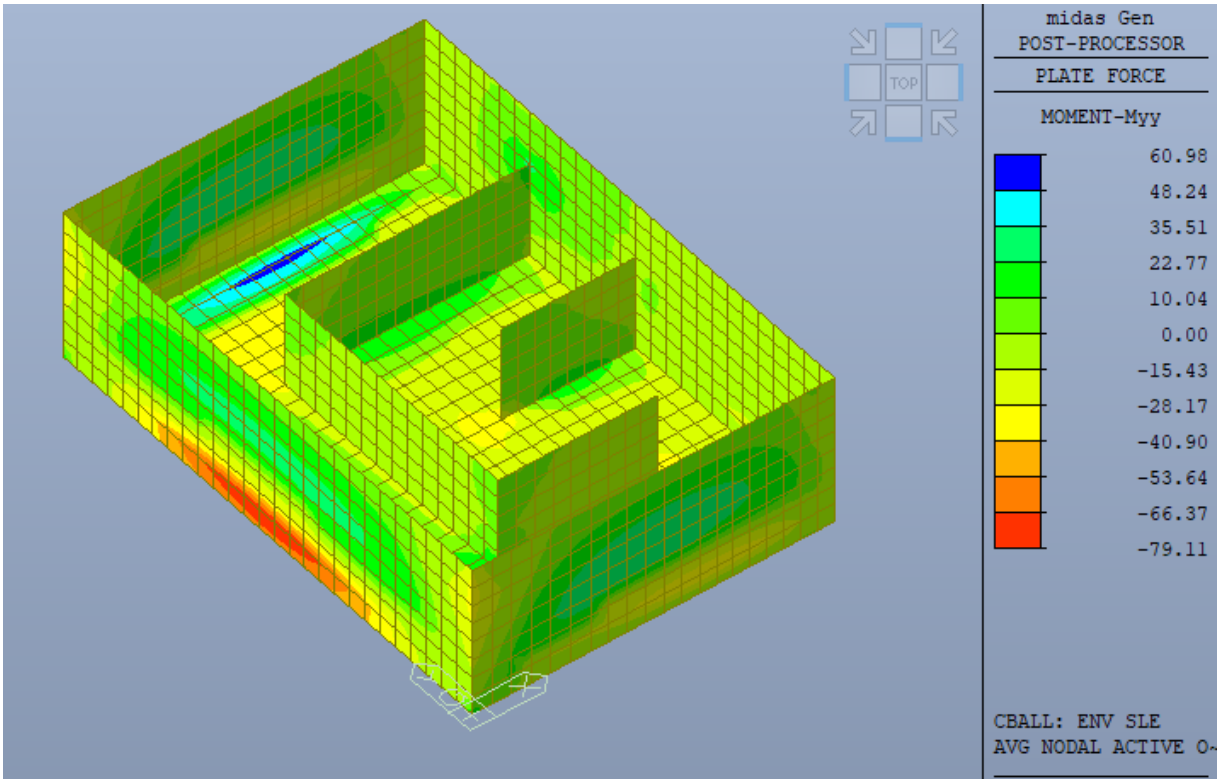
Sforzo Normale Fxx – inviluppo SLV [kN/m]



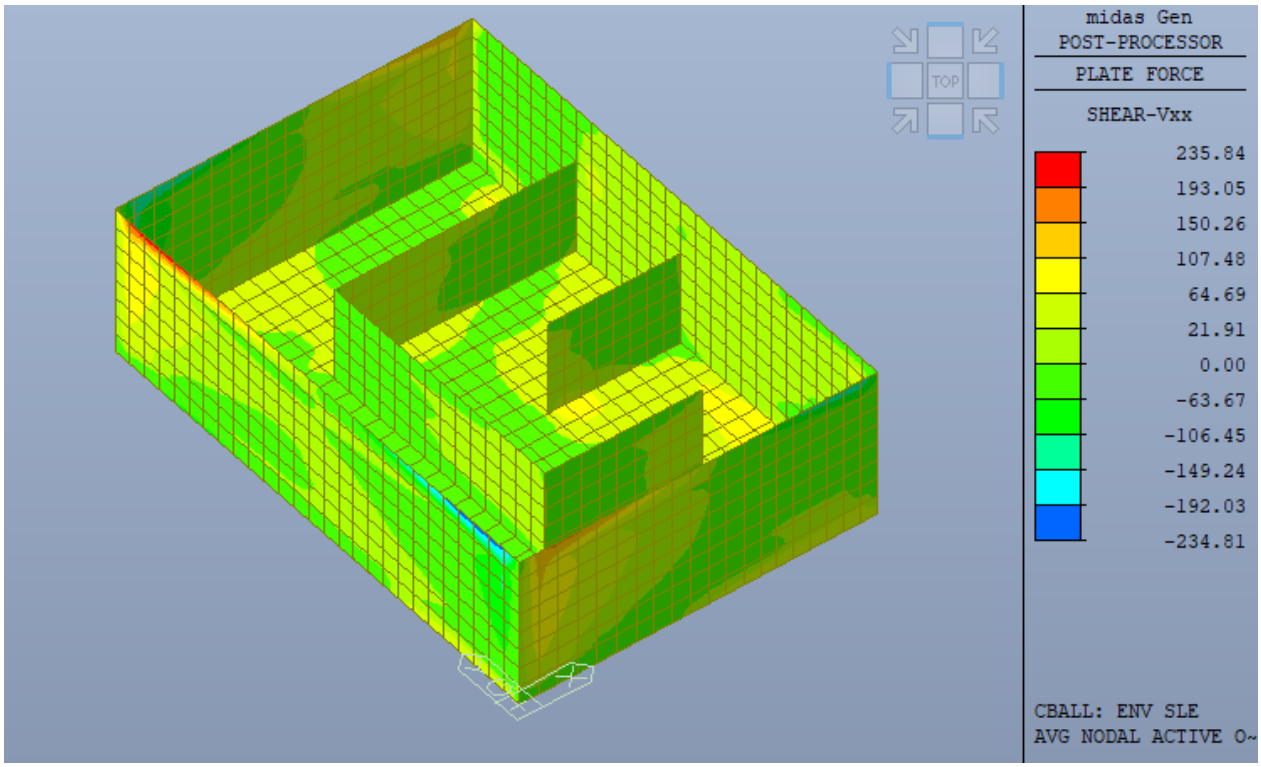
Sforzo Normale Fyy – inviluppo SLV [kN/m]



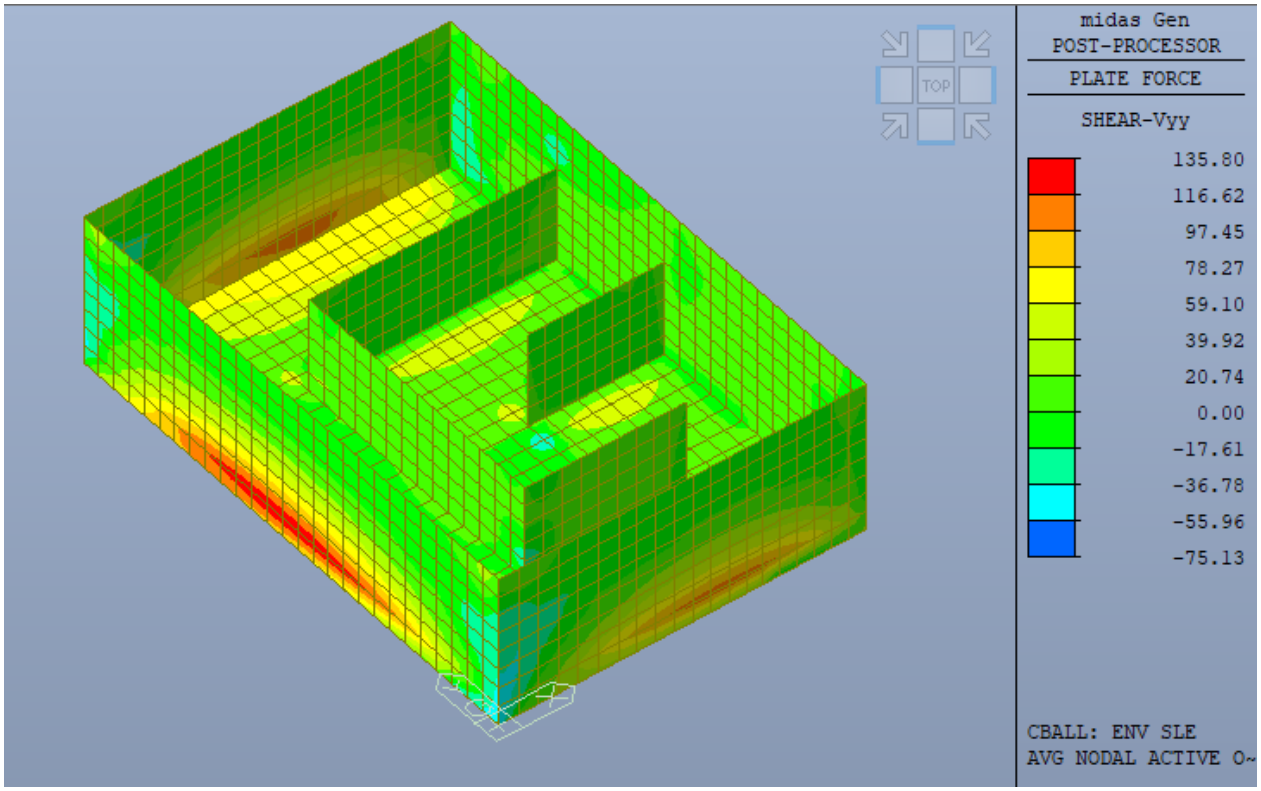
Momento flettente membranale Mxx – inviluppo SLE [kN*m/m]



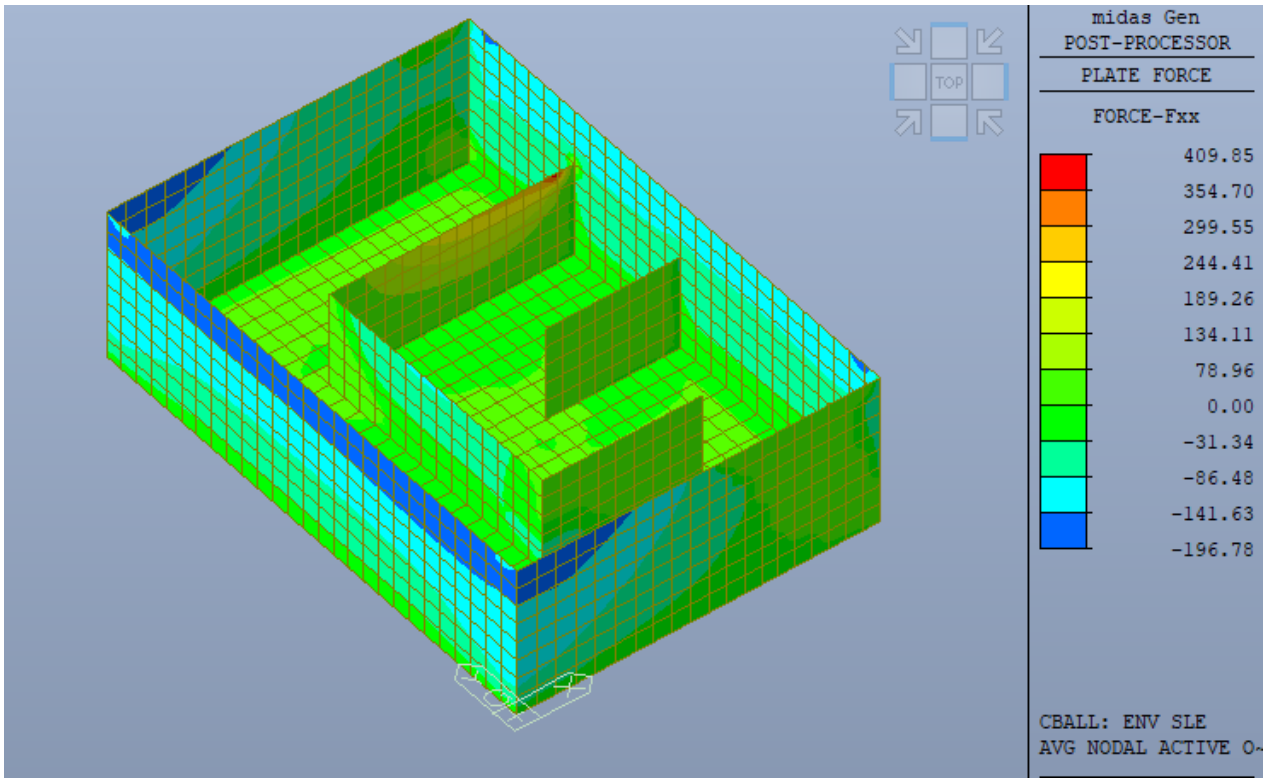
Momento flettente membranale Myy – inviluppo SLE [kN*m/m]



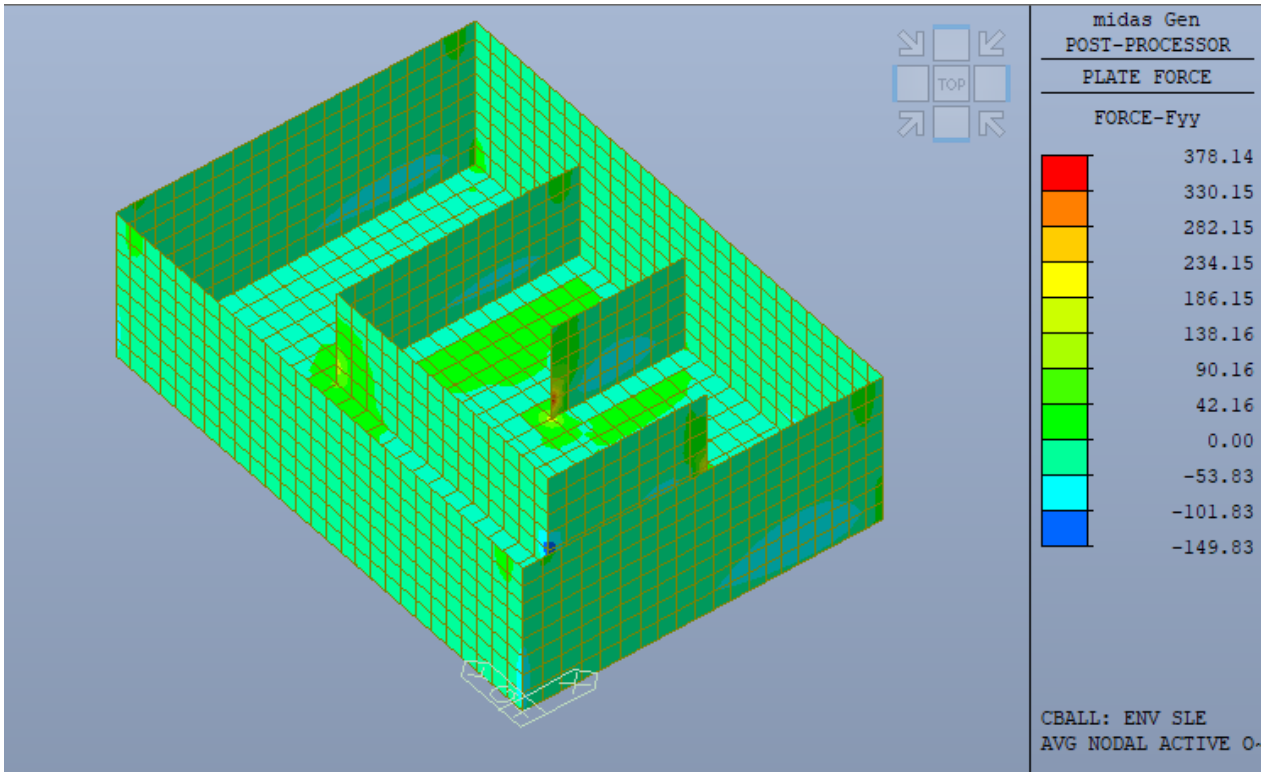
Sollecitazione tagliante Vxx – inviluppo SLE [kN/m]



Sollecitazione tagliante Vyy – inviluppo SLE [kN/m]



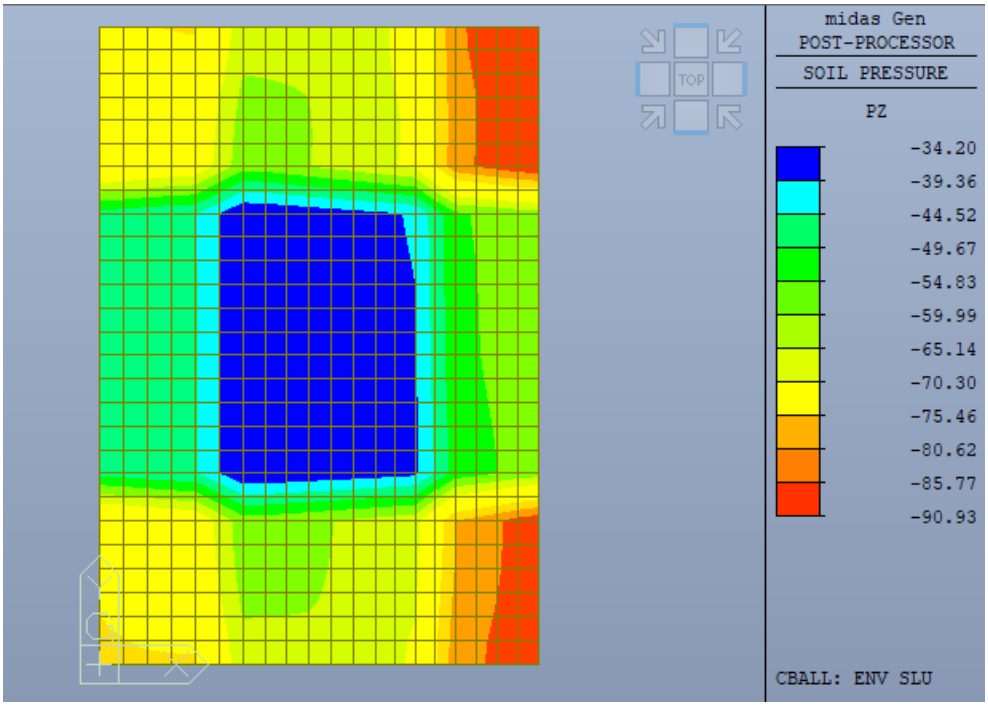
Sforzo Normale Fxx – inviluppo SLE [kN/m]



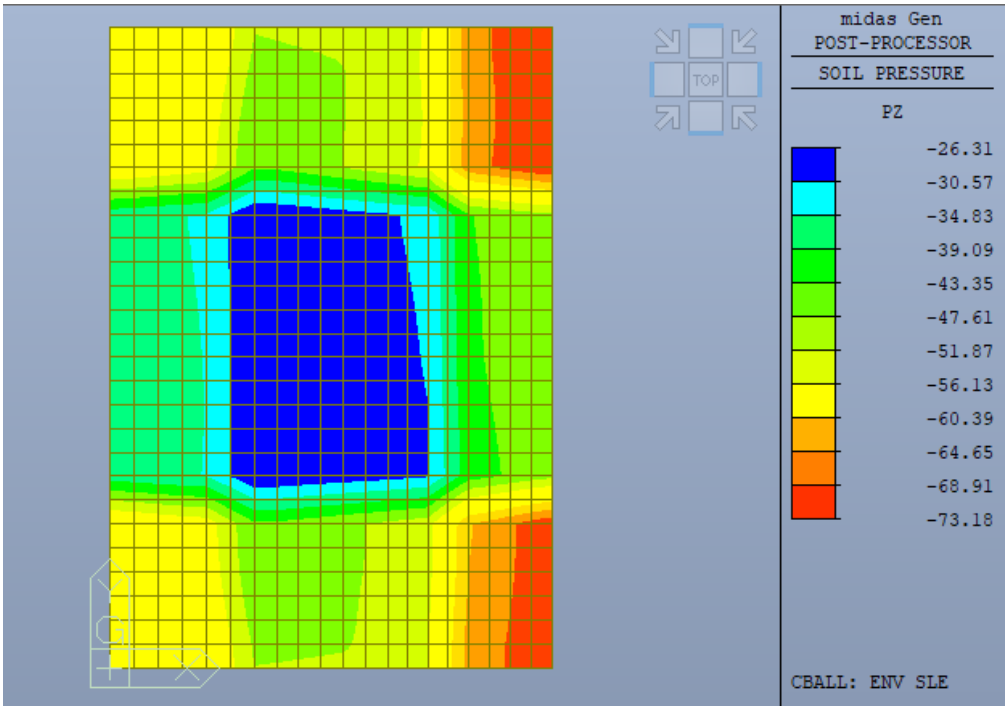
Sforzo Normale Fyy – inviluppo SLE [kN/m]

1.4 Reazioni vincolari e pressioni sul terreno

Nel presente paragrafo vengono riportate le reazioni vincolari e le pressioni sul terreno.



Pressioni sul terreno ENV SLU



Pressioni sul terreno ENV SLE

SUMMATION OF REACTION FORCES PRINTOUT							
	Load	FX (kN)	FY (kN)	FZ (kN)			
	SLU 1	-2143.301460	0.000000	4267.250000			
	SLU 2	-2736.590520	0.000000	4267.250000			
	SLU 3	-1319.765460	0.000000	6319.478750			
	SLU 4	-1913.054520	0.000000	535.925000			
	SLU 5	0.000000	0.000000	6319.478750			
	SLV 1	-2710.649304	-20.010931	1986.963707			
	SLV 2	-2710.649304	20.010931	1990.049293			
	SLV 3	-2669.239051	-66.703104	1985.030557			
	SLV 4	-2633.744549	-66.703104	1986.459157			
	SLV 5	-2592.334296	20.010931	1994.811293			
	SLV 6	-2592.334296	-20.010931	1991.725707			
	SLV 7	-2633.744549	66.703104	1996.744443			
	SLV 8	-2669.239051	66.703104	1995.315843			
	SLE R1	-1564.228200	0.000000	3282.500000			
	SLE R2	-2020.604400	0.000000	3282.500000			
	SLE R3	-1015.204200	0.000000	4861.137500			
	SLE R4	-1471.580400	0.000000	412.250000			
	SLE R5	0.000000	0.000000	4861.137500			
	SLE F	-1289.716200	0.000000	4861.137500			
	SLE Qp	-1179.911400	0.000000	4861.137500			

Reazioni vincolari

1.5 Deformazioni

Per le costruzioni ricadenti in classe d'uso III e IV si deve verificare che l'azione sismica di progetto non produca danni agli elementi costruttivi senza funzione strutturale tali da rendere temporaneamente non operativa la costruzione (rif §7.3.6.1 NTC 2018)

Nel caso delle costruzioni civili e industriali questa condizione si può ritenere soddisfatta quando gli spostamenti interpiano ottenuti dall'analisi in presenza dell'azione sismica di progetto relativa allo SLO siano inferiori ai 2/3 dei seguenti limiti:

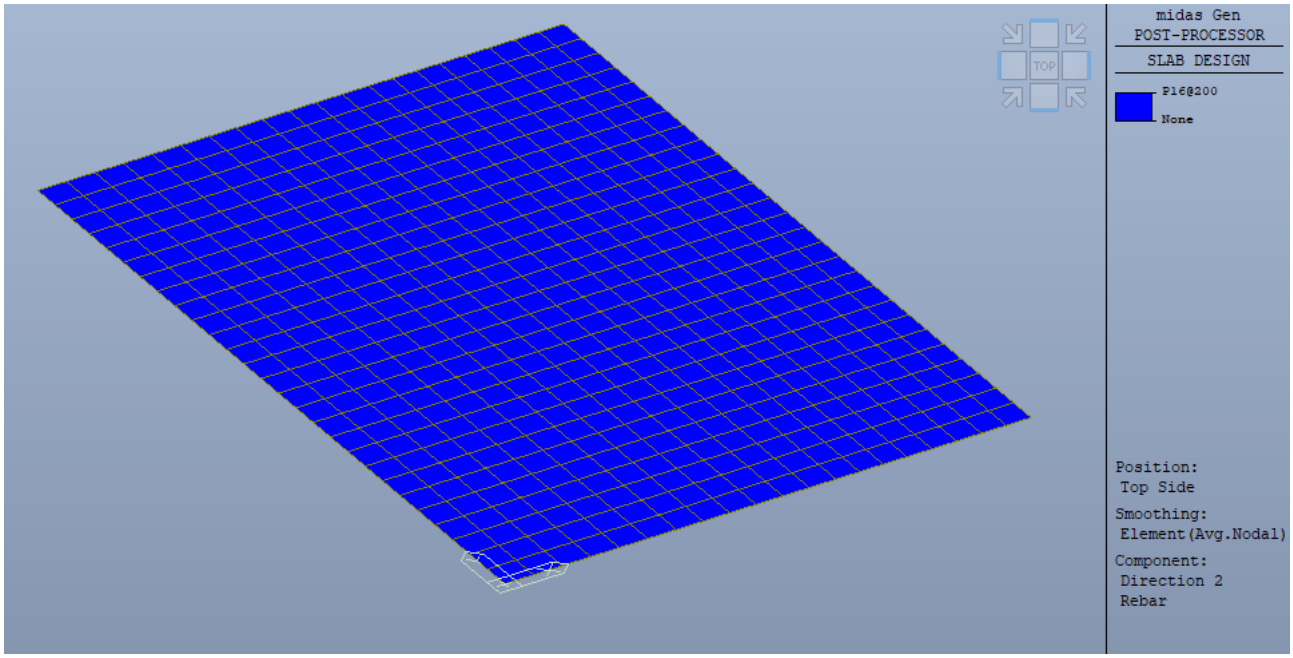
- per tamponamenti collegati rigidamente alla struttura che interferiscono con la deformabilità della stessa: $dr < 0{,}005\ h$
- per tamponamenti progettati in modo da non subire danni a seguito di spostamenti di interpiano drp, per effetto della loro deformabilità intrinseca ovvero dei collegamenti alla struttura: $dr \leq drp \leq 0{,}01\ h$
- per costruzioni con struttura portante in muratura ordinaria: $dr < 0{,}003\ h$
- per costruzioni con struttura portante in muratura armata: $dr < 0{,}004\ h$

Premesso che l'opera in oggetto è completamente in c.a. e che quindi anche il superamento di questi limiti non produrrebbe alcun effetto, dall'immagine seguente si evince che lo spostamento massimo sotto l'azione sismica a SLO è pari a 1.6 mm che corrisponde a circa 0,0004 h, quindi trascurabile.

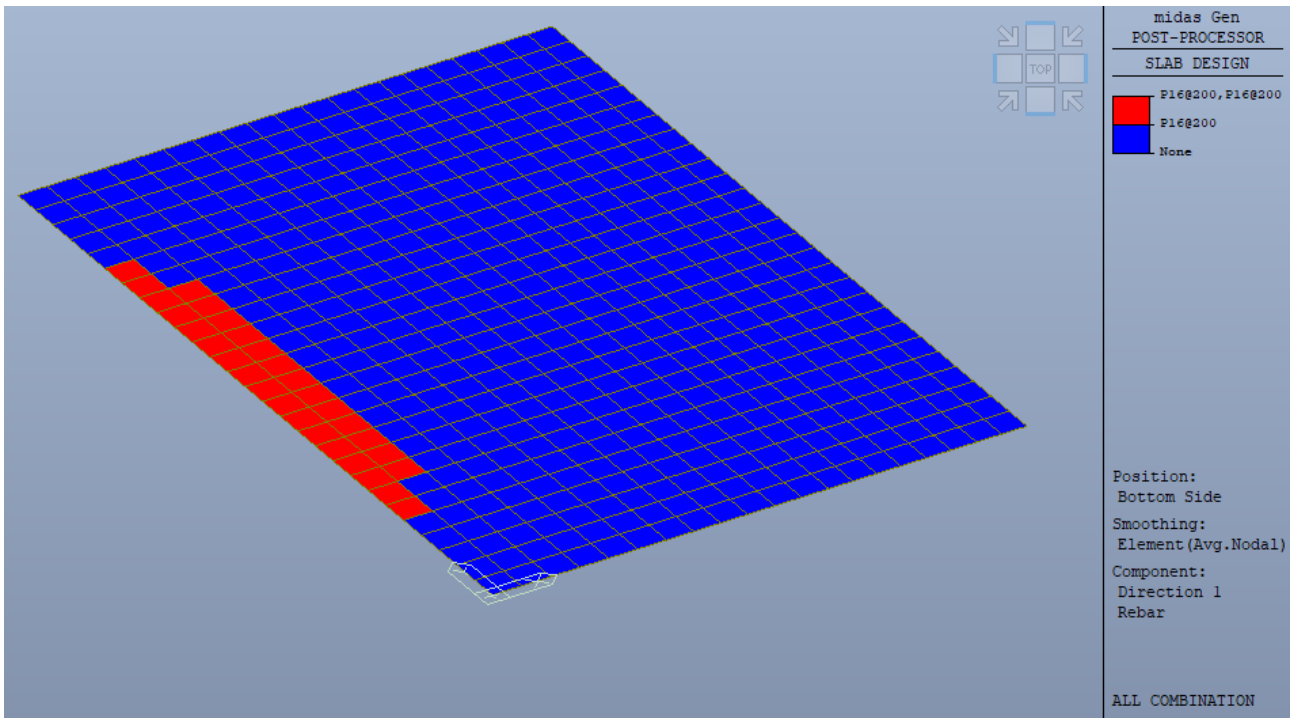
Massime deformazioni SLO combinata XY [cm]

1.6 Armature previste

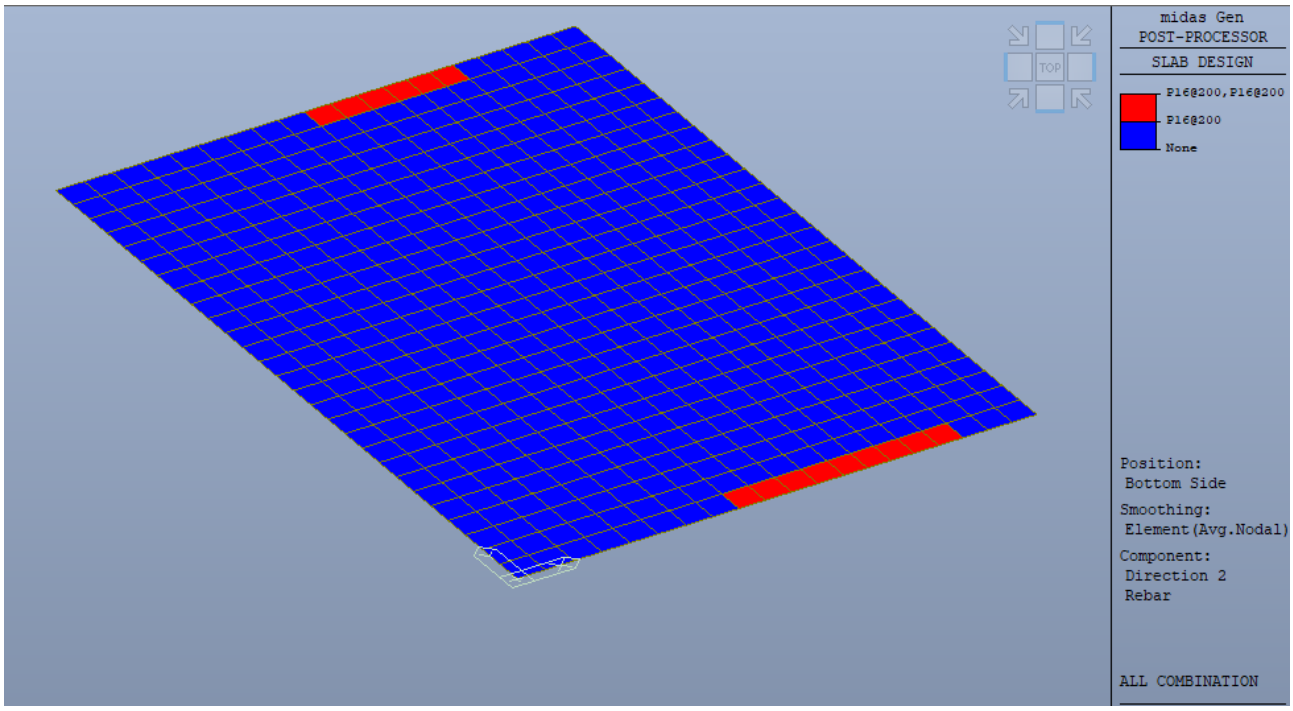
Nelle immagini seguenti vengono riportate le armature previste per i vari elementi strutturali.



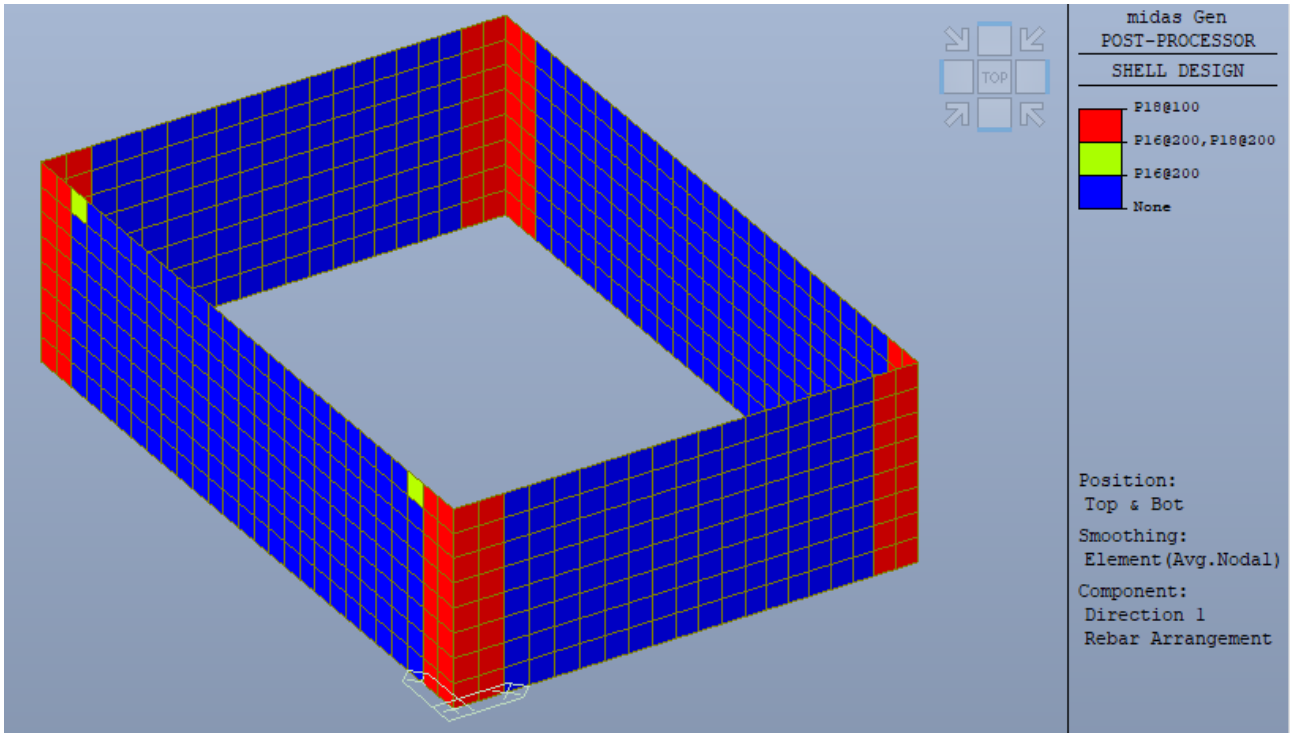
Platea – armature in direzione X e Y – lembo superiore



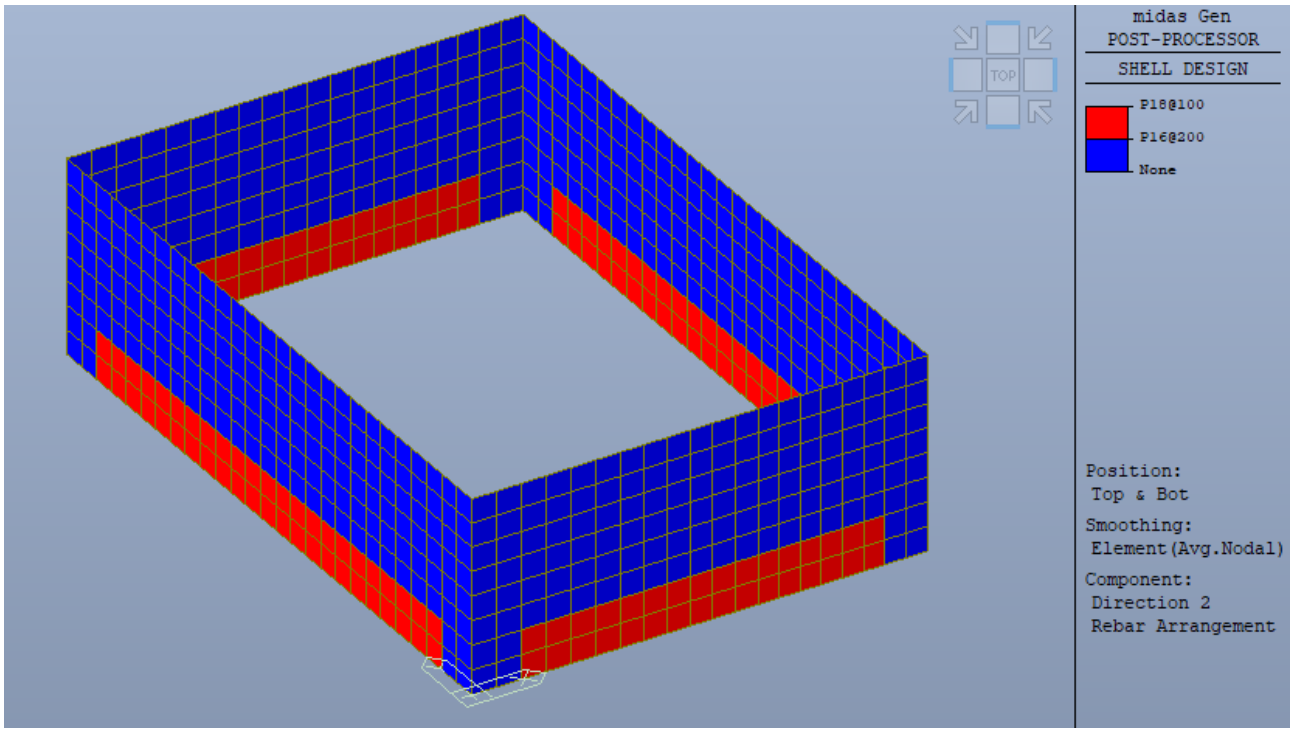
Platea – armature in direzione X – lembo inferiore



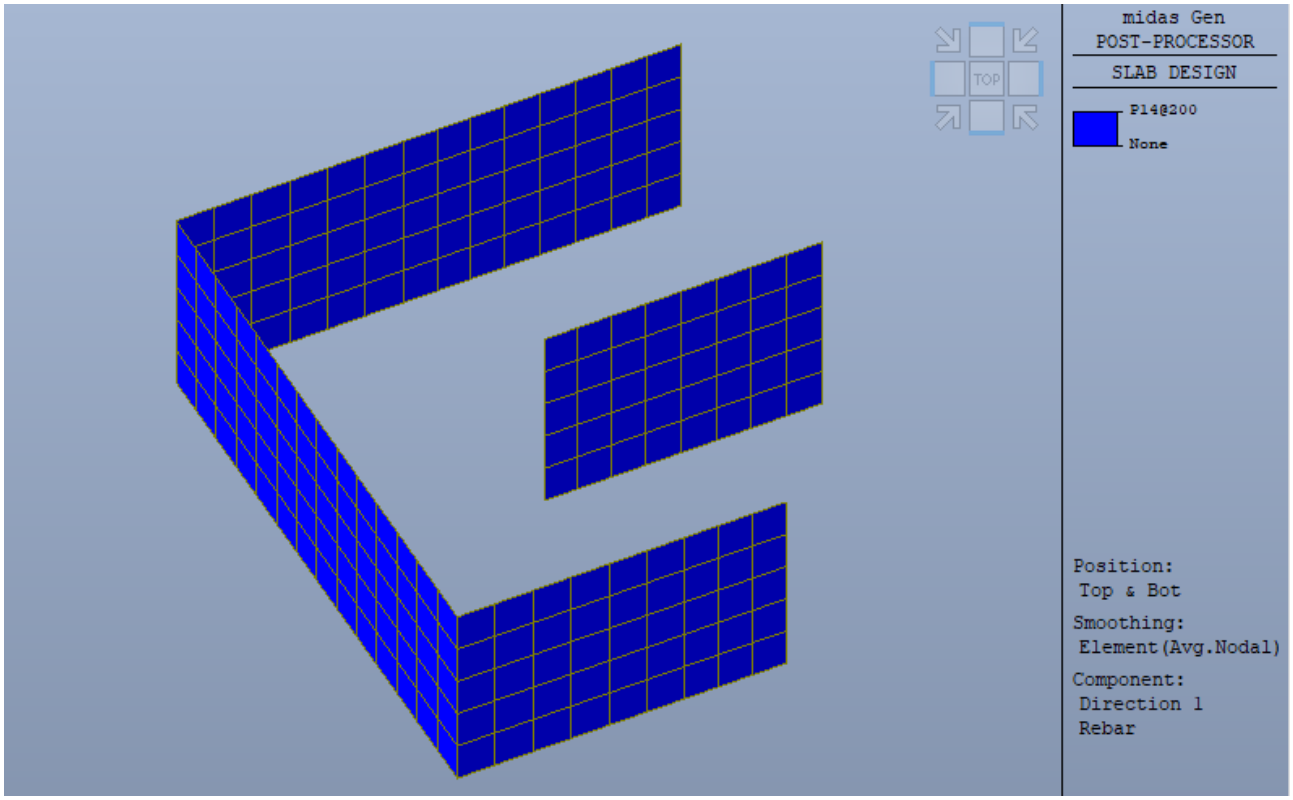
Platea – armature in direzione Y – lembo inferiore



Pareti esterne – armature in direzione orizzontale – ambo i lati



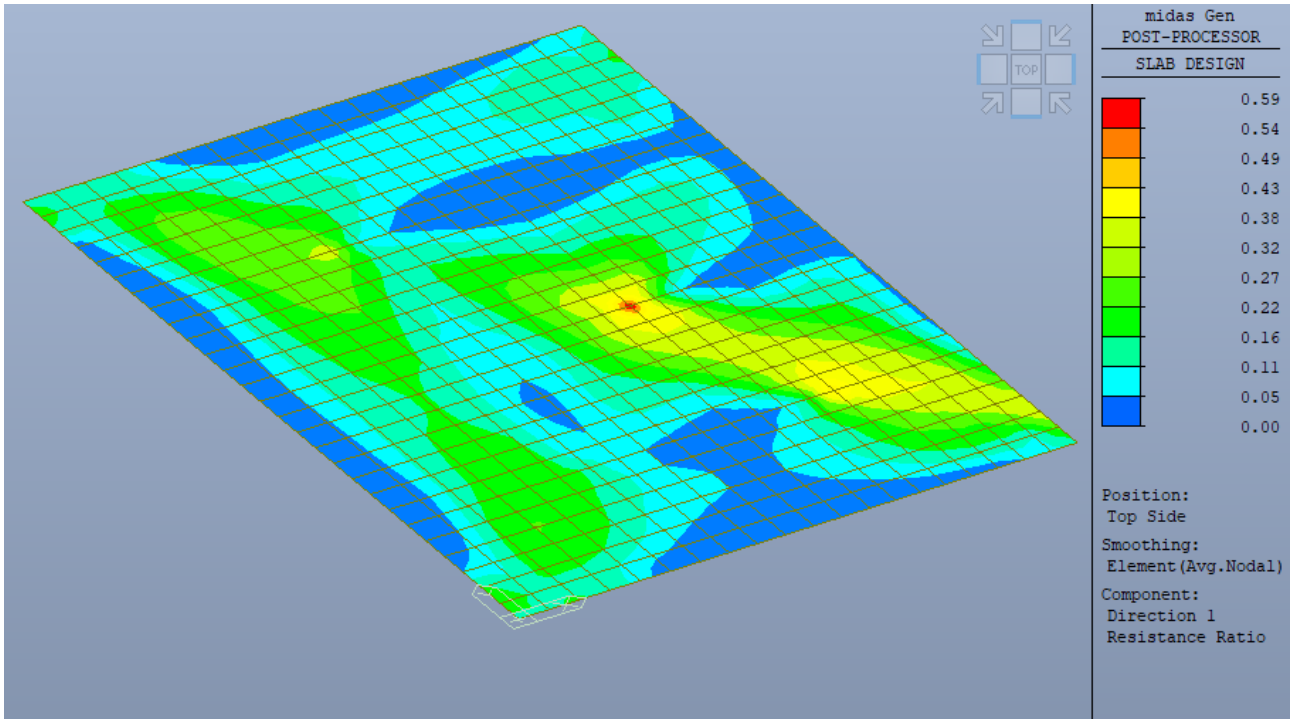
Pareti esterne – armature in direzione verticale – ambo i lati



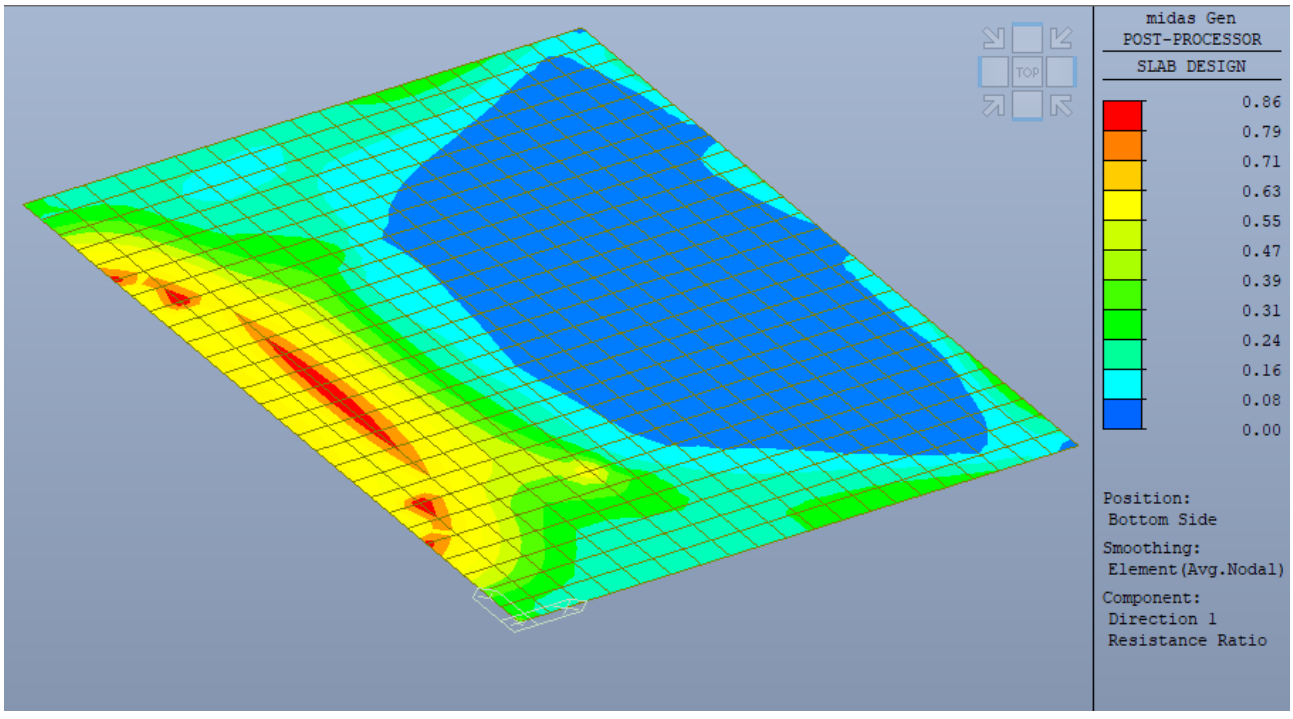
Pareti interne – armature in direzione orizzontale e verticale – ambo i lati

1.7 Verifiche di resistenza SLU grafiche

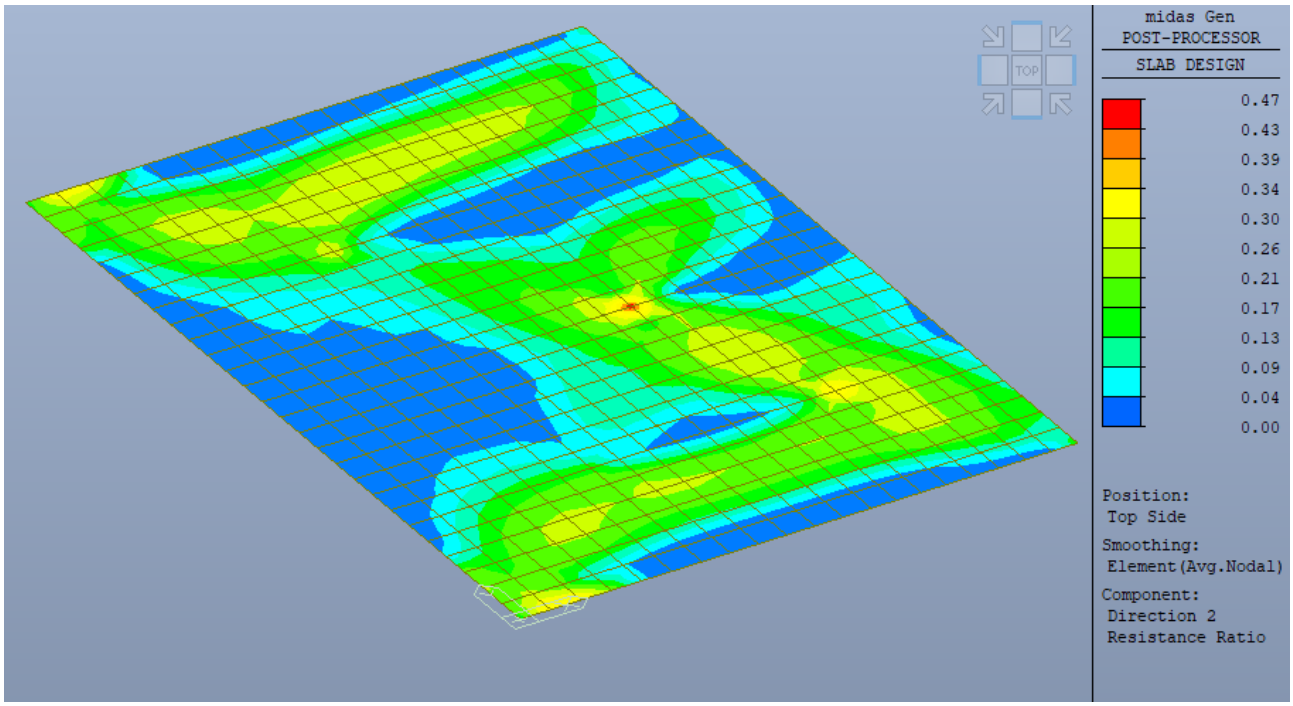
Nelle immagini seguenti vengono riportate le verifiche strutturali per via grafica, come tassi di sfruttamento dell'armatura nelle sezioni di cemento armato, sia per le sollecitazioni flessionali che taglianti:



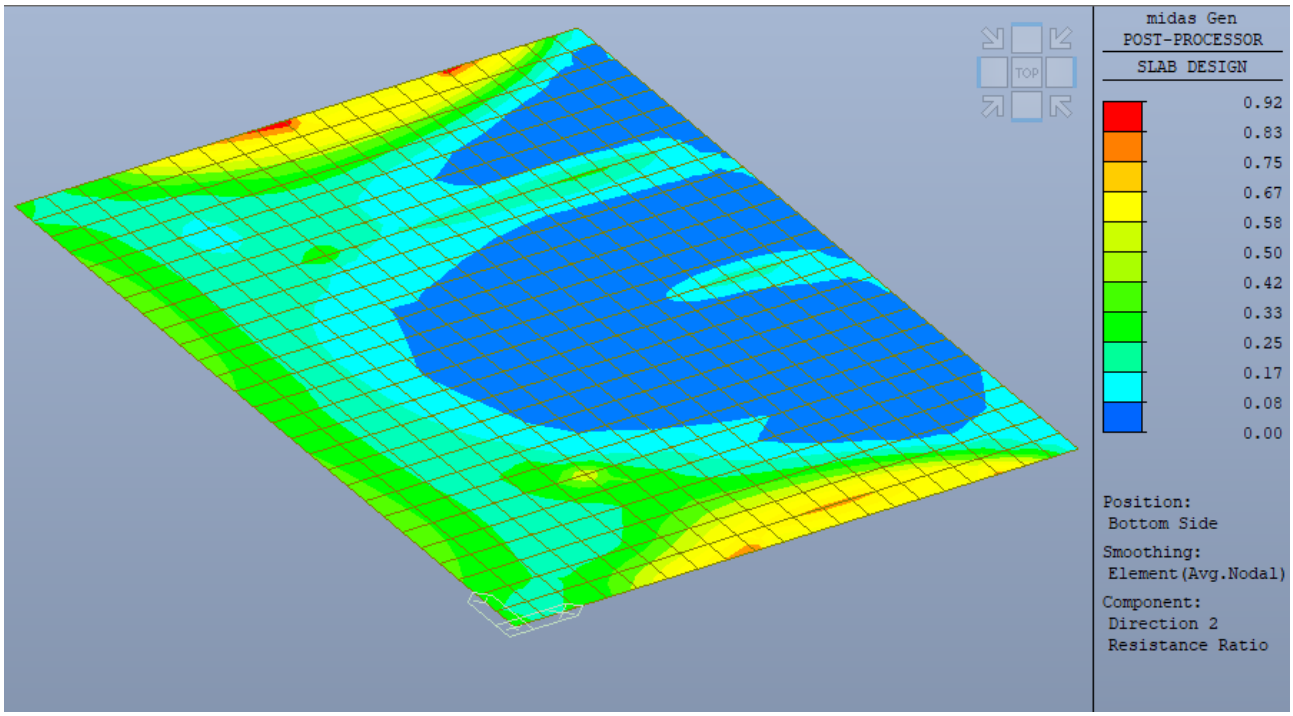
Platea - Indici di resistenza a flessione direzione X superiore (inviluppo SLU e SLV)



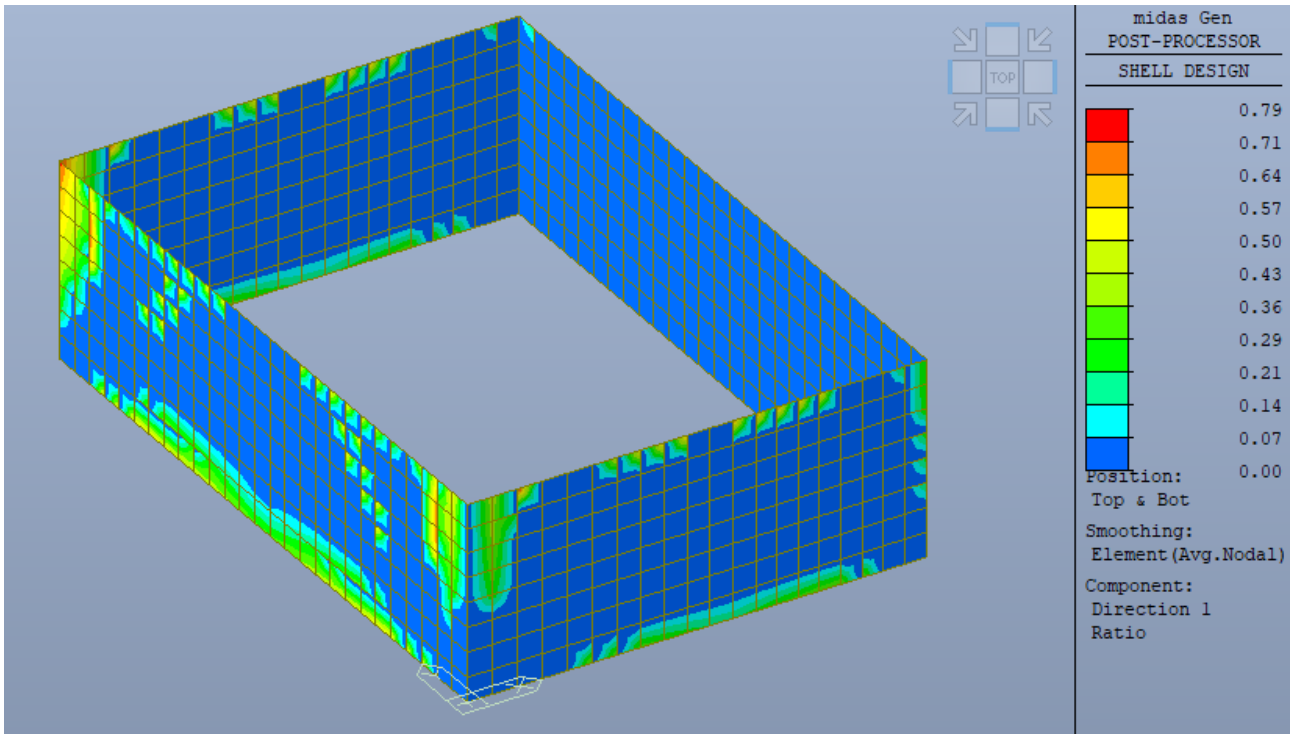
Platea - Indici di resistenza a flessione direzione X inferiore (inviluppo SLU e SLV)



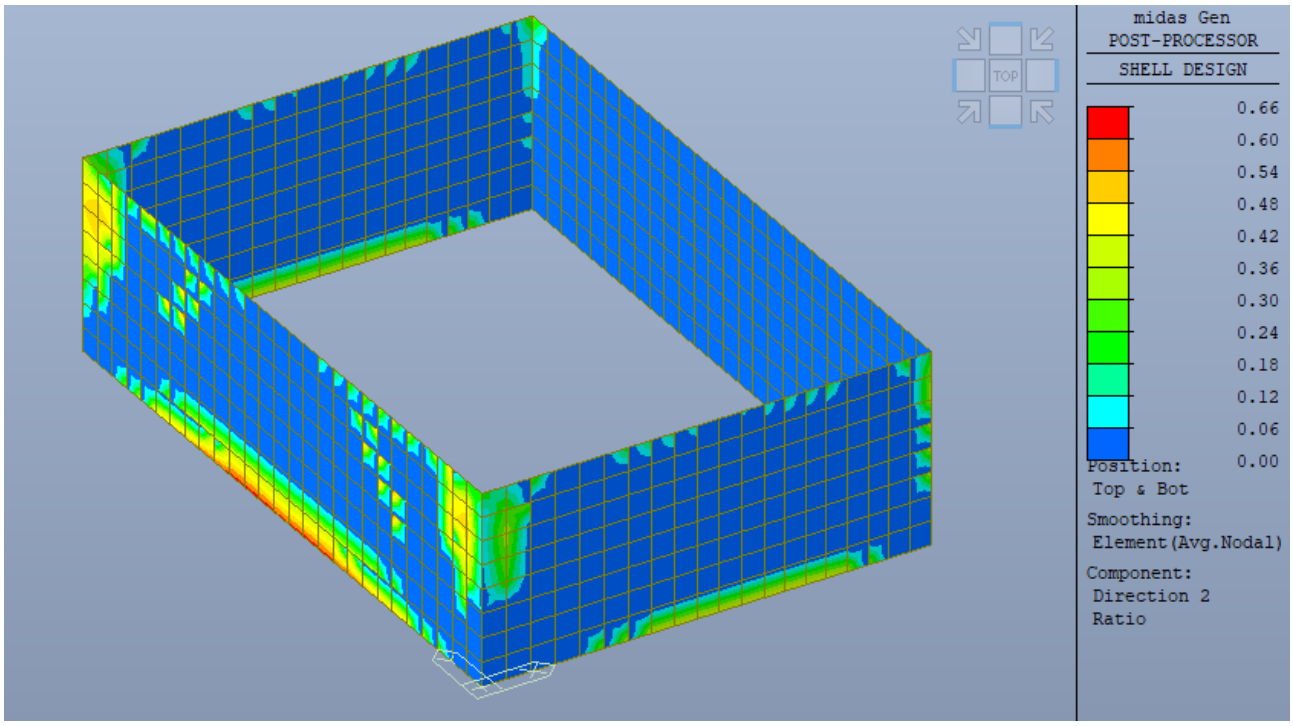
Platea - Indici di resistenza a flessione direzione Y superiore (inviluppo SLU e SLV)



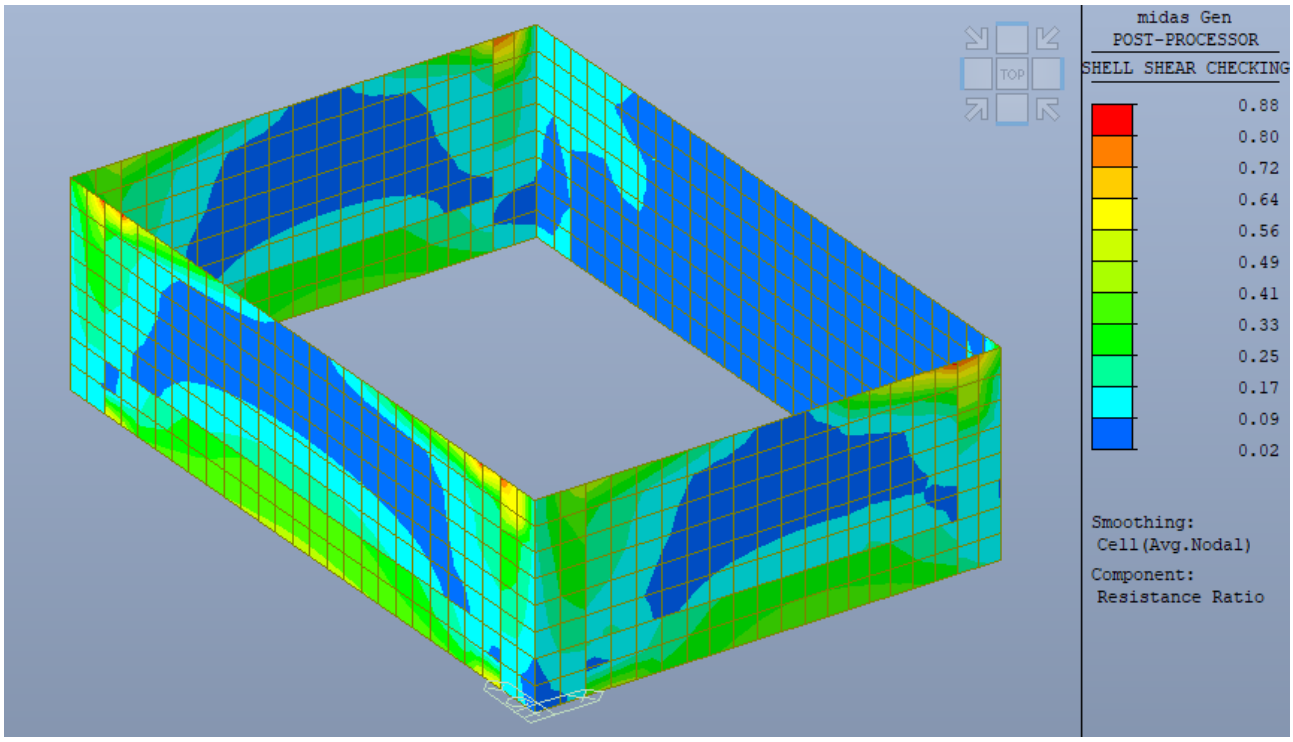
Platea - Indici di resistenza a flessione direzione Y inferiore (inviluppo SLU e SLV)



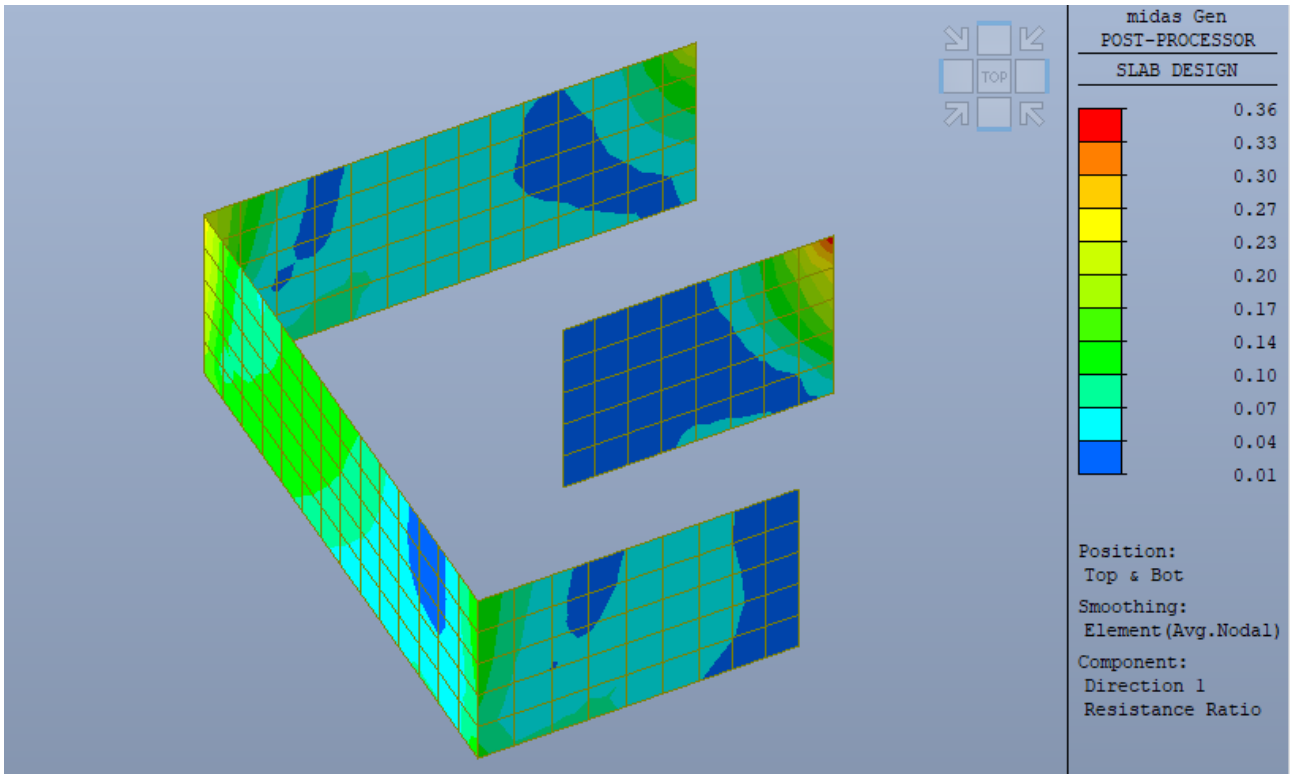
Pareti esterne - Indici di resistenza a perssoflessione direzione orizzontale (inviluppo SLU e SLV)



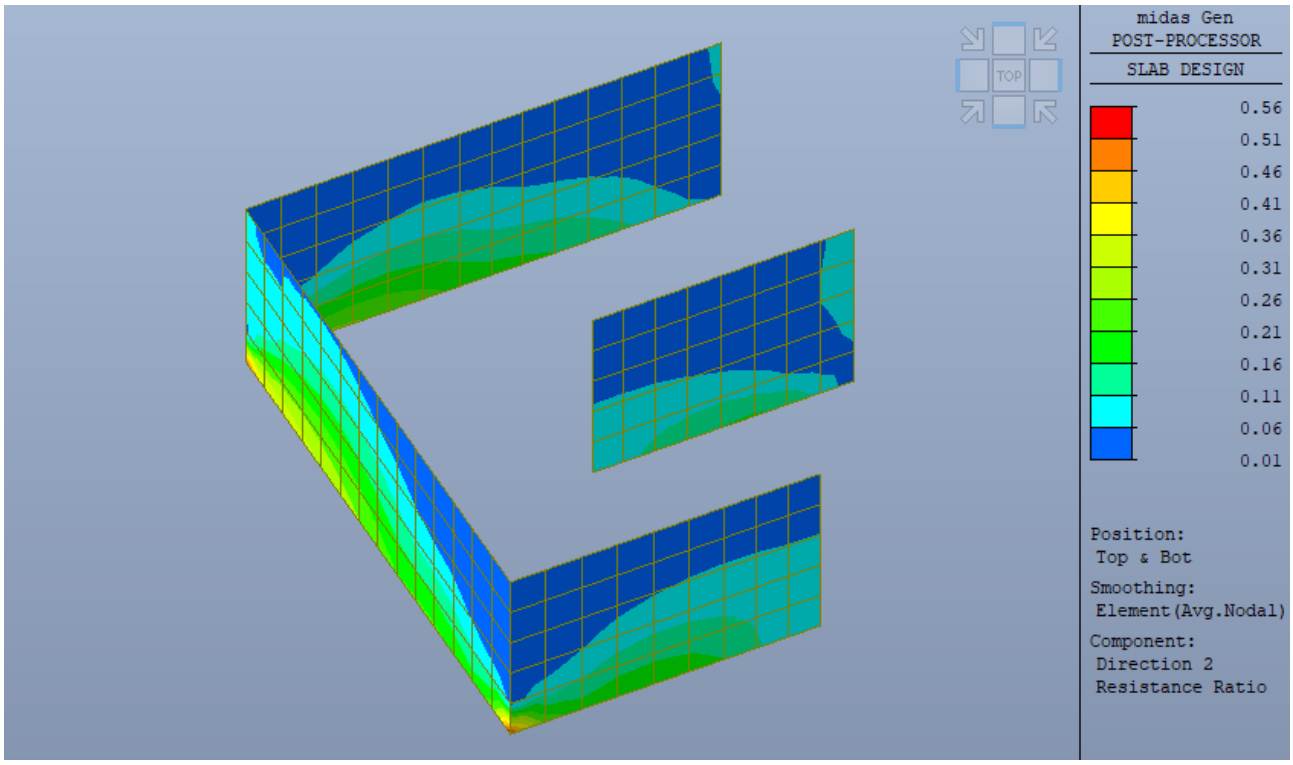
Pareti esterne - Indici di resistenza a pressoflessione direzione verticale (inviluppo SLU e SLV)



Pareti esterne - Indici di resistenza a taglio (inviluppo SLU e SLV)



Pareti interne - Indici di resistenza a flessione direzione orizzontale (inviluppo SLU e SLV)



Pareti interne - Indici di resistenza a flessione direzione verticale (inviluppo SLU e SLV)

1.8 Verifiche di resistenza SLU analitiche

1.8.1 Verifiche flessione Platea

```
================================================================================

  [[[*]]]  SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Platea, Dir 1.

================================================================================

 ------------------------------------------------------------------

   Thk   Elem POS  AsReq  AsUse |   M_Ed( LCB)   M_Rd   Rat CHK

 ------------------------------------------------------------------

 0.4000   846 BOT 0.0015 0.0020 | 184.362(  7) 259.263 0.711  OK

        910 TOP 0.0006 0.0010 | 79.1432(  19) 133.212 0.594  OK

 ------------------------------------------------------------------


<< BOTTOM >>

-. Information of Parameters.

  Elem No.  : 846

  Thickness :   0.4000 m.

  Materials :  fck =  32000.0000 KPa.

           fcd =  21333.3333 KPa.

           fyk = 450000.0000 KPa.

  Covering  :  dB  =   0.0500 m.

           dT  =   0.0500 m.

  LCB No.   :   7


-. Information of Design.

  b      =   0.0010 m.  (by Code Unit Length).

  d      =   0.3500 m.

  lambda   =   0.800

  a      = lambda * x  =   0.037 m.

  eta    =   1.000
```

Cc = eta*fcd*b*a = 0.7817 kN.

M_Rd = Cc*(d-a/2) = 259.2630 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P16 @200 / P16 @200

As_req = 0.0015 m^2/m. (0.0015 m^2/m.)

M_Ed = 184.3616 kN-m./m.

M_Rd = 259.2630 kN-m./m.

RatM = M_Ed / M_Rd = 0.711 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.098

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.098/ 0.450 = 0.218 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 910

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 19

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.018 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3908 kN.

M_Rd = Cc*(d-a/2) = 133.2116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P16 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 79.1432 kN-m./m.

M_Rd = 133.2116 kN-m./m.

RatM = M_Ed / M_Rd = 0.594 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.042

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.042/ 0.450 = 0.093 ---> O.K

==========

[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Platea, Dir 2.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.4000	147	BOT	0.0012	0.0020	142.493(2)	243.434	0.585	OK
	910	TOP	0.0005	0.0010	59.1005(19)	125.291	0.472	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 147

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 2

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.037 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.7810 kN.

M_Rd = Cc*(d-a/2) = 243.4340 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P16 @200 / P16 @200

As_req = 0.0012 m^2/m. (0.0012 m^2/m.)

M_Ed = 142.4929 kN-m./m.

M_Rd = 243.4340 kN-m./m.

RatM = M_Ed / M_Rd = 0.585 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.085

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.085/ 0.450 = 0.189 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 910

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 19

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.018 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3905 kN.

M_Rd = Cc*(d-a/2) = 125.2910 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P16 @200

As_req = 0.0005 m^2/m. (0.0005 m^2/m.)

M_Ed = 59.1005 kN-m./m.

M_Rd = 125.2910 kN-m./m.

RatM = M_Ed / M_Rd = 0.472 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.035

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.035/ 0.450 = 0.079 ---> O.K

1.8.2 Verifiche pressoflessione Pareti Esterne

==========

[[[*]]] MESHED SHELL CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Pareti EXT Angoli.

==========

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 293

-. Node No. : 393

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 5538.5361 KPa.

-. Sig2 = Sig,min = 153.5460 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5921

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.8350$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 405.8459 kN/m.

-. NEdy = 17.3899 kN/m.

-. NEdxy = 15.8060 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5157.2058 KPa.

-. f'tdy = 472.5414 KPa.

-. Sigcd = 395.1509 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0026

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0011 m^2/m. (0.0011 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P18 @100

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0063

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 12423.9130 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4151

-. Rat,bary = f'tdy/ftdy = 0.0961

-. Rat,conc = Sigcd/Sigcn = 0.0370

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.4151 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 253

-. Node No. : 15

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3423.5746 KPa.

-. Sig2 = Sig,min = 1005.9785 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9875

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1359$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 185.2201 kN/m.

-. NEdy = 35.9611 kN/m.

-. NEdxy = -90.9962 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3424.6566 KPa.

-. f'tdy = 1827.4532 KPa.

-. Sigcd = 2274.9057 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P18 @100

-. Rebar,y : P16 @200

---

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0063

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 12423.9130 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2757

-. Rat,bary = f'tdy/ftdy = 0.3718

-. Rat,conc = Sigcd/Sigcn = 0.2133

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3718 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 629

-. Node No. : 901

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 4508.9364 KPa.

-. Sig2 = Sig,min = 605.3464 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.4844

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.4934$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -456.8397 kN/m.

-. NEdy = -48.2878 kN/m.

-. NEdxy = -96.6209 kN/m.

---

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( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = -583.6463 KPa.

-. Sigcd = 5965.9358 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P18 @100

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0063

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 12423.9130 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.1187

-. Rat,conc = Sigcd/Sigcn = 0.5593

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5593 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTTOM, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 1557

-. Node No. : 59

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 8866.9710 KPa.

-. Sig2 = Sig,min = 839.5825 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5427

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 1.9647$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 732.6235 kN/m.

-. NEdy = 102.7136 kN/m.

-. NEdxy = -17.3849 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 9292.8155 KPa.

-. f'tdy = 1674.4506 KPa.

-. Sigcd = 434.6220 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0047

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0019 m^2/m. (0.0019 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P18 @100

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0063

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 12423.9130 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7480

-. Rat,bary = f'tdy/ftdy = 0.3406

-. Rat,conc = Sigcd/Sigcn = 0.0407

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7480 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 1358

-. Node No. : 1914

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 4658.0453 KPa.

-. Sig2 = Sig,min = 806.8574 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.4035

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.5447$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 315.9635 kN/m.

-. NEdy = 85.6578 kN/m.

-. NEdxy = -101.7373 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5152.5689 KPa.

-. f'tdy = 2697.8714 KPa.

-. Sigcd = 2543.4334 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0026

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0014

-. Asx,req = 0.0011 m^2/m. (0.0011 m^2/m.)

-. Asy,req = 0.0006 m^2/m. (0.0006 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P18 @100

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0063

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 12423.9130 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4147

-. Rat,bary = f'tdy/ftdy = 0.5488

-. Rat,conc = Sigcd/Sigcn = 0.2384

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5488 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 293

-. Node No. : 393

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 5538.5361 KPa.

-. Sig2 = Sig,min = 153.5460 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5921

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.8350$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -678.1109 kN/m.

-. NEdy = -7.8943 kN/m.

-. NEdxy = -28.0426 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = -141.7746 KPa.

-. Sigcd = 8490.8816 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P18 @100

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0063

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 12423.9130 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.0288

-. Rat,conc = Sigcd/Sigcn = 0.7960

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7960 ---> O.K.

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[[[*]]] MESHED SHELL CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Pareti EXT Base.

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[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 187

-. Node No. : 72

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3174.0072 KPa.

-. Sig2 = Sig,min = 599.3730 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.3641

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = 0.0495

fcm^2 fcm fcm

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 36.6598 kN/m.

-. NEdy = 188.2191 kN/m.

-. NEdxy = 112.7779 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 1866.4017 KPa.

-. f'tdy = 4196.5929 KPa.

-. Sigcd = 2819.4480 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0021

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0009 m^2/m. (0.0009 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P18 @100

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0063

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 12423.9130 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.3797

-. Rat,bary = f'tdy/ftdy = 0.3378

-. Rat,conc = Sigcd/Sigcn = 0.2643

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3797 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 247

-. Node No. : 166

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 4836.7980 KPa.

-. Sig2 = Sig,min = 1406.7599 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.0010

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = 0.6093

fcm^2 fcm fcm

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 69.1356 kN/m.

-. NEdy = 355.4825 kN/m.

-. NEdxy = -42.9691 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 1393.6689 KPa.

-. f'tdy = 5555.3347 KPa.

-. Sigcd = 1074.2265 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0028

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0011 m^2/m. (0.0011 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P18 @100

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0063

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 12423.9130 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2835

-. Rat,bary = f'tdy/ftdy = 0.4471

-. Rat,conc = Sigcd/Sigcn = 0.1007

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.4471 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 1321

-. Node No. : 1870

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 2458.5215 KPa.

-. Sig2 = Sig,min = -1758.8231 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.2794

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = -0.2042

fcm^2 fcm fcm

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = -26.0836 kN/m.

-. NEdy = -68.6194 kN/m.

-. NEdxy = 133.4473 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -1758.8231 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.082

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTTOM, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 622

-. Node No. : 86

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 4522.3835 KPa.

-. Sig2 = Sig,min = 1030.0003 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.2478

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.5013$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 50.9455 kN/m.

-. NEdy = 260.3970 kN/m.

-. NEdxy = 142.3144 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2505.3642 KPa.

-. f'tdy = 5614.7266 KPa.

-. Sigcd = 3557.8594 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0029

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0011 m^2/m. (0.0011 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P18 @100

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0063

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 12423.9130 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5097

-. Rat,bary = f'tdy/ftdy = 0.4519

-. Rat,conc = Sigcd/Sigcn = 0.3335

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5097 ---> O.K.

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[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 955

-. Node No. : 1165

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 6648.8638 KPa.

-. Sig2 = Sig,min = 1043.2498 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.4403

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 1.2140$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 107.8502 kN/m.

-. NEdy = 541.0613 kN/m.

-. NEdxy = -25.5362 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 1662.3234 KPa.

-. f'tdy = 7899.6772 KPa.

-. Sigcd = 638.4052 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0040

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0016 m^2/m. (0.0016 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P18 @100

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0063

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 12423.9130 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.3382

-. Rat,bary = f'tdy/ftdy = 0.6358

-. Rat,conc = Sigcd/Sigcn = 0.0599

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6358 ---> O.K.

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[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 277

-. Node No. : 4

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3343.2146 KPa.

-. Sig2 = Sig,min = 1086.1697 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.8367

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.1100$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -63.6266 kN/m.

-. NEdy = -319.4207 kN/m.

-. NEdxy = 64.4531 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = -688.9444 KPa.

-. f'tdy = 0.0000 KPa.

-. Sigcd = 4155.3268 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P18 @100

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0025 m^2/m. (0.0025 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0063

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 12423.9130 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.1402

-. Rat,bary = f'tdy/ftdy = 0.0000

-. Rat,conc = Sigcd/Sigcn = 0.3896

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3896 ---> O.K.

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[[[*]]] MESHED SHELL CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 1.

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[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 1530

-. Node No. : 65

-. LCB No. : 13

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3215.2037 KPa.

-. Sig2 = Sig,min = 103.4369 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5906

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.0591$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 206.3355 kN/m.

-. NEdy = 7.4583 kN/m.

-. NEdxy = 37.9575 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3033.7312 KPa.

-. f'tdy = 640.3807 KPa.

-. Sigcd = 948.9384 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6171

-. Rat,bary = f'tdy/ftdy = 0.1303

-. Rat,conc = Sigcd/Sigcn = 0.0890

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6171 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 1536

-. Node No. : 2171

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3115.3202 KPa.

-. Sig2 = Sig,min = -20.3365 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5962

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.0250$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 153.6054 kN/m.

-. NEdy = 5.1143 kN/m.

-. NEdxy = 66.6736 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2729.7479 KPa.

-. f'tdy = 984.4989 KPa.

-. Sigcd = 1666.8411 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5553

-. Rat,bary = f'tdy/ftdy = 0.2003

-. Rat,conc = Sigcd/Sigcn = 0.1563

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5553 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 1563

-. Node No. : 2218

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3939.6117 KPa.

-. Sig2 = Sig,min = 127.2108 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5905

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.3001$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -487.0193 kN/m.

-. NEdy = -28.4601 kN/m.

-. NEdxy = -75.8585 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = -370.2890 KPa.

-. Sigcd = 6235.4380 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.0753

-. Rat,conc = Sigcd/Sigcn = 0.5846

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5846 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTTOM, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 1563

-. Node No. : 2218

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3939.6117 KPa.

-. Sig2 = Sig,min = 127.2108 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5905

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\sqrt{J2}}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.3001$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 239.3173 kN/m.

-. NEdy = 26.8762 kN/m.

-. NEdxy = 68.9625 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3750.2893 KPa.

-. f'tdy = 1360.2191 KPa.

-. Sigcd = 1724.0636 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7629

-. Rat,bary = f'tdy/ftdy = 0.2767

-. Rat,conc = Sigcd/Sigcn = 0.1616

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7629 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 1563

-. Node No. : 2218

-. LCB No. : 13

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3569.9099 KPa.

-. Sig2 = Sig,min = 85.8833 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5932

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1768$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 227.2250 kN/m.

-. NEdy = 26.5320 kN/m.

-. NEdxy = 71.6274 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3663.1563 KPa.

-. f'tdy = 1387.1517 KPa.

-. Sigcd = 1790.6840 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7452

-. Rat,bary = f'tdy/ftdy = 0.2822

-. Rat,conc = Sigcd/Sigcn = 0.1679

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7452 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 1544

-. Node No. : 2067

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 1545.4487 KPa.

-. Sig2 = Sig,min = 486.5565 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.8875

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = -0.4889$$

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = -168.3811 kN/m.

-. NEdy = -90.4260 kN/m.

-. NEdxy = 73.2897 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.000

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[[[*]]] MESHED SHELL CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 2.

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[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 287

-. Node No. : 392

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 4030.3069 KPa.

-. Sig2 = Sig,min = 130.9993 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5905

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = 0.3304

fcm^2 fcm fcm

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 246.7849 kN/m.

-. NEdy = 27.6326 kN/m.

-. NEdxy = 70.4242 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3862.3535 KPa.

-. f'tdy = 1391.3082 KPa.

-. Sigcd = 1760.6041 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7857

-. Rat,bary = f'tdy/ftdy = 0.2830

-. Rat,conc = Sigcd/Sigcn = 0.1651

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7857 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 287

-. Node No. : 392

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3662.5575 KPa.

-. Sig2 = Sig,min = 89.0595 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5931

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = 0.2076

fcm^2 fcm fcm

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 235.0138 kN/m.

-. NEdy = 27.3091 kN/m.

-. NEdxy = 73.2724 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3781.8538 KPa.

-. f'tdy = 1420.9335 KPa.

-. Sigcd = 1831.8098 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7693

-. Rat,bary = f'tdy/ftdy = 0.2891

-. Rat,conc = Sigcd/Sigcn = 0.1717

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7693 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 308

-. Node No. : 420

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3217.8709 KPa.

-. Sig2 = Sig,min = 88.3972 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5922

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.0599$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -302.5717 kN/m.

-. NEdy = -10.6121 kN/m.

-. NEdxy = 48.2602 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = -118.3954 KPa.

-. Sigcd = 3878.3646 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.0241

-. Rat,conc = Sigcd/Sigcn = 0.3636

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3636 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTTOM, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 317

-. Node No. : 443

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3406.4226 KPa.

-. Sig2 = Sig,min = 67.2907 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5942

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1223$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 215.3419 kN/m.

-. NEdy = 6.9589 kN/m.

-. NEdxy = 52.6682 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3347.9992 KPa.

-. f'tdy = 828.7759 KPa.

-. Sigcd = 1316.7055 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6811

-. Rat,bary = f'tdy/ftdy = 0.1686

-. Rat,conc = Sigcd/Sigcn = 0.1234

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6811 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 335

-. Node No. : 19

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3195.1754 KPa.

-. Sig2 = Sig,min = -88.2382 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5924

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.0510$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 153.3310 kN/m.

-. NEdy = 4.3311 kN/m.

-. NEdxy = 78.3711 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2892.0022 KPa.

-. f'tdy = 1112.7293 KPa.

-. Sigcd = 1959.2778 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5883

-. Rat,bary = f'tdy/ftdy = 0.2264

-. Rat,conc = Sigcd/Sigcn = 0.1837

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5883 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 287

-. Node No. : 392

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 4030.3069 KPa.

-. Sig2 = Sig,min = 130.9993 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5905

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.3304$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -493.4077 kN/m.

-. NEdy = -29.0945 kN/m.

-. NEdxy = -78.0179 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = -375.0771 KPa.

-. Sigcd = 6321.7987 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.0763

-. Rat,conc = Sigcd/Sigcn = 0.5927

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5927 ---> O.K.

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[[[*]]] MESHED SHELL CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 3.

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[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 772

-. Node No. : 1003

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 259.6684 KPa.

-. Sig2 = Sig,min = 76.1593 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9899

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = -0.9144$$

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = 1.6339 kN/m.

-. NEdy = 5.4184 kN/m.

-. NEdxy = 10.9629 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.000

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 772

-. Node No. : 1003

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 259.6684 KPa.

-. Sig2 = Sig,min = 76.1593 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9899

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.9144$$

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = 1.6339 kN/m.

-. NEdy = 5.4184 kN/m.

-. NEdxy = 10.9629 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.000

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 772

-. Node No. : 1003

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 259.6684 KPa.

-. Sig2 = Sig,min = 76.1593 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9899

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = -0.9144

fcm^2 fcm fcm

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = 1.6339 kN/m.

-. NEdy = 5.4184 kN/m.

-. NEdxy = 10.9629 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.000

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTTOM, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 772

-. Node No. : 1003

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 259.6684 KPa.

-. Sig2 = Sig,min = 76.1593 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9899

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.9144$$

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = -66.2838 kN/m.

-. NEdy = -21.4537 kN/m.

-. NEdxy = 3.6780 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -564.4863 KPa.

-. alpha = 0.3005(the ratio between the two principal stress)

$$\text{Sig,cdmax} = 0.85\text{fcd} * \frac{1+3.80*\text{alpha}}{(1+\text{alpha})^2} = 22964.2098 \text{ KPa.}$$

-. Rat,con = Sig,min/Sig,cdmax = 0.025

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 772

-. Node No. : 1003

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 259.6684 KPa.

-. Sig2 = Sig,min = 76.1593 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9899

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = -0.9144$$

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = -66.2838 kN/m.

-. NEdy = -21.4537 kN/m.

-. NEdxy = 3.6780 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -564.4863 KPa.

-. alpha = 0.3005(the ratio between the two principal stress)

1+3.80*alpha

-. Sig,cdmax = 0.85fcd * ---------- 22964.2098 KPa.

(1+alpha)^2

-. Rat,con = Sig,min/Sig,cdmax = 0.025

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 772

-. Node No. : 1003

-. LCB No. : 21

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 259.6684 KPa.

-. Sig2 = Sig,min = 76.1593 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9899

-. beta = 4.6286

alpha*J2 lambda*SQRT[J2] beta*I1

-. PHI = -------- + ---------- + -------- - 1.0 = -0.9144

fcm^2 fcm fcm

---> UNCRACKED. CHECK CONCRETE STRESS !!!

( ). Membrane forces.

-. NEdx = -66.2838 kN/m.

-. NEdy = -21.4537 kN/m.

-. NEdxy = 3.6780 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -564.4863 KPa.

-. alpha = 0.3005(the ratio between the two principal stress)

-. Sig,cdmax = 0.85fcd * $\frac{1+3.80*alpha}{(1+alpha)^2}$ 22964.2098 KPa.

-. Rat,con = Sig,min/Sig,cdmax = 0.025

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[[[*]]] MESHED SHELL CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 4.

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[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 1001

-. Node No. : 1412

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3062.3987 KPa.

-. Sig2 = Sig,min = -516.8827 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.4656

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.0039$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 90.3479 kN/m.

-. NEdy = 61.1395 kN/m.

-. NEdxy = 139.7403 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2813.7197 KPa.

-. f'tdy = 2775.0802 KPa.

-. Sigcd = 3493.5086 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0014

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0006 m^2/m. (0.0006 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5724

-. Rat,bary = f'tdy/ftdy = 0.5645

-. Rat,conc = Sigcd/Sigcn = 0.3275

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5724 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 624

-. Node No. : 859

-. LCB No. : 6

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3094.6638 KPa.

-. Sig2 = Sig,min = -1319.1322 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.9643

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.0097$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 31.6133 kN/m.

-. NEdy = 68.8904 kN/m.

-. NEdxy = -175.9996 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2673.2182 KPa.

-. f'tdy = 3256.6433 KPa.

-. Sigcd = 4399.9905 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0017

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0007 m^2/m. (0.0007 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5438

-. Rat,bary = f'tdy/ftdy = 0.6625

-. Rat,conc = Sigcd/Sigcn = 0.4125

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6625 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : TOP, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 634

-. Node No. : 894

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 5383.5135 KPa.

-. Sig2 = Sig,min = -10.4106 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5964

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.7820$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -574.5425 kN/m.

-. NEdy = -45.7404 kN/m.

-. NEdxy = -131.7830 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = -479.0872 KPa.

-. Sigcd = 7559.6200 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.0975

-. Rat,conc = Sigcd/Sigcn = 0.7087

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7087 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTTOM, REINFORCEMENT DIR-1

( ). Information of Parameters.

-. Elem No. : 1350

-. Node No. : 1898

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 5224.5129 KPa.

-. Sig2 = Sig,min = -30.9772 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5962

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.7286$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 340.1714 kN/m.

-. NEdy = 44.2011 kN/m.

-. NEdxy = -137.4673 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5901.1734 KPa.

-. f'tdy = 2548.3697 KPa.

-. Sigcd = 3436.6816 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0030

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0013

-. Asx,req = 0.0012 m^2/m. (0.0012 m^2/m.)

-. Asy,req = 0.0005 m^2/m. (0.0005 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200/P18 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0023 m^2/m. (0.0023 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0057

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 11127.7174 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5303

-. Rat,bary = f'tdy/ftdy = 0.5184

-. Rat,conc = Sigcd/Sigcn = 0.3222

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5303 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, REINFORCEMENT DIR-2

( ). Information of Parameters.

-. Elem No. : 1352

-. Node No. : 1912

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0700 m., dT = 0.0700 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3637.6940 KPa.

-. Sig2 = Sig,min = -246.7870 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5729

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1970$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = 158.3454 kN/m.

-. NEdy = 49.3239 kN/m.

-. NEdxy = -142.4133 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3678.7780 KPa.

-. f'tdy = 2656.4520 KPa.

-. Sigcd = 3560.3335 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0014

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0005 m^2/m. (0.0005 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7484

-. Rat,bary = f'tdy/ftdy = 0.5404

-. Rat,conc = Sigcd/Sigcn = 0.3338

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7484 ---> O.K.

---

[*] SHELL FLEXURAL MAXIMUM RESULT : BOTTOM, CONCRETE STRESS

( ). Information of Parameters.

-. Elem No. : 687

-. Node No. : 972

-. LCB No. : 2

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Check elements cracked or not.

[EN1992-2:2005, Annex LL, (LL.101)]

-. Sig1 = Sig,max = 3793.9841 KPa.

-. Sig2 = Sig,min = -90.1080 KPa.

-. Sig3 = 0.0000 KPa. (2D Element)

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5934

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.2501$$

---> CRACKED. A SANDWICH MODEL SHOULD BE USED !!!

( ). Membrane forces.

-. NEdx = -356.2922 kN/m.

-. NEdy = -10.9692 kN/m.

-. NEdxy = 98.0729 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = 69.7531 KPa.

-. Sigcd = 4791.0972 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0020

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0010

-. Asx,req = 0.0008 m^2/m. (0.0008 m^2/m.)

-. Asy,req = 0.0004 m^2/m. (0.0004 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P16 @200

-. Rebar,y : P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. Asy,use = 0.0010 m^2/m. (0.0010 m^2/m.)

-. rhox,use = 0.0025

-. rhoy,use = 0.0025

-. ftdx = rhox,use*fyd*(t/ck) = 4915.7609 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 4915.7609 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0000

-. Rat,bary = f'tdy/ftdy = 0.0142

-. Rat,conc = Sigcd/Sigcn = 0.4492

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.4492 ---> O.K.

1.8.3 Verifiche a taglio Pareti Esterne

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[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Pareti EXT Angoli.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 631

-. Node No. : 894

-. LCB No. : 13

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Calculate the principal shear of the inner layer.

-. V_Edx = 196.5527 kN/m.

-. V_Edy = 13.9917 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 197.0501 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 0.0712

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0063

( ). Calculate the design shear resistance without shear reinforcement.

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.7670

-. C_Rdc = 0.18/Gamma_c = 0.1200

-. Sig_cp = MIN[N_Ed/Ac, 0.2*fcd] = 711.8240 KPa.

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 232.8294 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 194.4147 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 232.8294 kN/m.

-. RatV = V_Edo / V_Rdc = 0.8463 ---> O.K.

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[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Pareti EXT Base.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 612

-. Node No. : 89

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Calculate the principal shear of the inner layer.

-. V_Edx = -90.2157 kN/m.

-. V_Edy = 26.8894 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 94.1378 kN/m.

-. tan(Phio) = V_Edy/V_Edx = -0.2981

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0028

( ). Calculate the design shear resistance without shear reinforcement.

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.7670

-. C_Rdc = 0.18/Gamma_c = 0.1200

-. Sig_cp = MIN[N_Ed/Ac, 0.2*fcd] = 5.8040 KPa.

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 150.4862 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 158.4077 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 158.4077 kN/m.

-. RatV = V_Edo / V_Rdc = 0.5943 ---> O.K.

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[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 1.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 1521

-. Node No. : 2150

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Calculate the principal shear of the inner layer.

-. V_Edx = -139.2439 kN/m.

-. V_Edy = -2.9872 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 139.2759 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 0.0215

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0025

( ). Calculate the design shear resistance without shear reinforcement.

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.7670

-. C_Rdc = 0.18/Gamma_c = 0.1200

-. Sig_cp = MIN[N_Ed/Ac, 0.2*fcd] = 828.5929 KPa.

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 186.6825 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 200.3699 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 200.3699 kN/m.

-. RatV = V_Edo / V_Rdc = 0.6951 ---> O.K.

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[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 2.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 329

-. Node No. : 461

-. LCB No. : 9

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Calculate the principal shear of the inner layer.

-. V_Edx = 136.5428 kN/m.

-. V_Edy = 4.8881 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 136.6303 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 0.0358

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0025

( ). Calculate the design shear resistance without shear reinforcement.

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.7670

-. C_Rdc = 0.18/Gamma_c = 0.1200

-. Sig_cp = MIN[N_Ed/Ac, 0.2*fcd] = 0.0000 KPa.

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 144.4243 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 158.1116 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 158.1116 kN/m.

-. RatV = V_Edo / V_Rdc = 0.8641 ---> O.K.

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[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 3.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 1400

-. Node No. : 1975

-. LCB No. : 6

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Calculate the principal shear of the inner layer.

-. V_Edx = 51.6021 kN/m.

-. V_Edy = -4.8312 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 51.8278 kN/m.

-. tan(Phio) = V_Edy/V_Edx = -0.0936

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0025

( ). Calculate the design shear resistance without shear reinforcement.

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.7670

-. C_Rdc = 0.18/Gamma_c = 0.1200

-. Sig_cp = MIN[N_Ed/Ac, 0.2*fcd] = 4266.6667 KPa.

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 362.0243 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 375.7116 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 375.7116 kN/m.

-. RatV = V_Edo / V_Rdc = 0.1379 ---> O.K.

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[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Parete Esterna 4.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 1347

-. Node No. : 1897

-. LCB No. : 7

-. Materials : fck = 32000.0000 KPa., fyk = 450000.0000 KPa.

-. Thickness : t = 0.4000 m.

-. Covering : dB = 0.0500 m., dT = 0.0500 m.

( ). Calculate the principal shear of the inner layer.

-. V_Edx = -197.5083 kN/m.

-. V_Edy = 0.1842 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 197.5083 kN/m.

-. tan(Phio) = V_Edy/V_Edx = -0.0009

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0025

( ). Calculate the design shear resistance without shear reinforcement.

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.7670

-. C_Rdc = 0.18/Gamma_c = 0.1200

-. Sig_cp = MIN[N_Ed/Ac, 0.2*fcd] = 1319.4136 KPa.

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 211.7143 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 225.4017 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 225.4017 kN/m.

-. RatV = V_Edo / V_Rdc = 0.8763 ---> O.K.

1.8.4 Verifiche flessione Pareti Interne

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================================================================================
  [[[*]]]  SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 1, Dir 1.
================================================================================
 --------------------------------------------------------------------
   Thk   Elem POS  AsReq  AsUse |   M_Ed( LCB)   M_Rd   Rat CHK
 --------------------------------------------------------------------
 0.4000    363 BOT 0.0006 0.0008 | 14.0118(   4) 103.031 0.136  OK
         362 TOP 0.0006 0.0008 | 7.96918(   4) 103.031 0.077  OK
 --------------------------------------------------------------------

<< BOTTOM >>

-. Information of Parameters.
  Elem No.  : 363
  Thickness :   0.4000 m.
```

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 14.0118 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.136 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 362

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 7.9692 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.077 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 2, Dir 1.

==========

Thk Elem POS AsReq AsUse | M_Ed(LCB) M_Rd Rat CHK

0.4000 592 BOT 0.0006 0.0008 | 4.67708(2) 103.031 0.045 OK

573 TOP 0.0006 0.0008 | 37.5101(19) 103.031 0.364 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 592

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 2

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 4.6771 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.045 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 573

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 19

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 37.5101 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.364 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 3, Dir 1.

==========

Thk Elem POS AsReq AsUse | M_Ed(LCB) M_Rd Rat CHK

0.4000 1103 BOT 0.0006 0.0008 | 25.4987(10) 103.031 0.247 OK

1084 TOP 0.0006 0.0008 | 24.6195(4) 103.031 0.239 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1103

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 10

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 25.4987 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.247 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 1084

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 24.6195 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.239 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 4, Dir 1.

==========

Thk Elem POS AsReq AsUse | M_Ed(LCB) M_Rd Rat CHK

0.4000 1162 BOT 0.0006 0.0008 | 14.7512(4) 103.031 0.143 OK

1158 TOP 0.0006 0.0008 | 26.6975(4) 103.031 0.259 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1162

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 14.7512 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.143 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 1158

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.3004 kN.

M_Rd = Cc*(d-a/2) = 103.0306 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 26.6975 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.259 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.050

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.050/ 0.450 = 0.112 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 1, Dir 2.

==========

Thk Elem POS AsReq AsUse | M_Ed(LCB) M_Rd Rat CHK

0.4000 367 BOT 0.0006 0.0008 | 50.4379(2) 96.8116 0.521 OK

352 TOP 0.0006 0.0008 | 19.8415(4) 96.8116 0.205 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 367

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 2

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 50.4379 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.521 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 352

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 19.8415 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.205 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 2, Dir 2.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.4000	592	BOT	0.0006	0.0008	15.9599(14)	96.8116	0.165	OK
	574	TOP	0.0006	0.0008	9.37618(19)	96.8116	0.097	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 592

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 14

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 15.9599 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.165 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 574

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 19

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 9.3762 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.097 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 3, Dir 2.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.4000	1082	BOT	0.0006	0.0008	26.0028(4)	96.8116	0.269	OK
	1087	TOP	0.0006	0.0008	33.7075(11)	96.8116	0.348	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1082

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 26.0028 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.269 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 1087

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 11

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 33.7075 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.348 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

==========

[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete Interna 4, Dir 2.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.4000	1162	BOT	0.0006	0.0008	48.9123(4)	96.8116	0.505	OK
	527	TOP	0.0006	0.0008	54.4467(2)	96.8116	0.562	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1162

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 4

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 48.9123 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.505 < 1.0 ---> O.K !

-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 527

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 2

-. Information of Design.

b = 0.0010 m. (by Code Unit Length).

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2997 kN.

M_Rd = Cc*(d-a/2) = 96.8116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0006 m^2/m. (0.0006 m^2/m.)

M_Ed = 54.4467 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.562 < 1.0 ---> O.K !

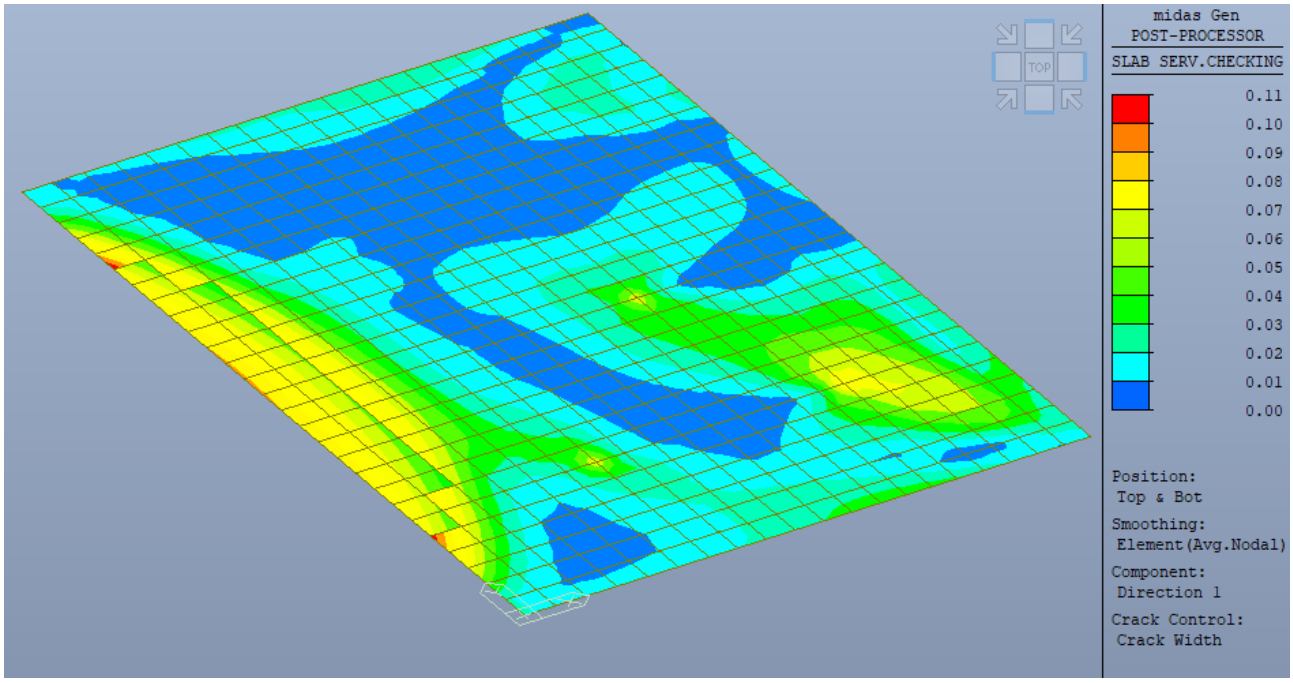
-. Check ratio of neutral axis depth to effective depth.

x/d = 0.053

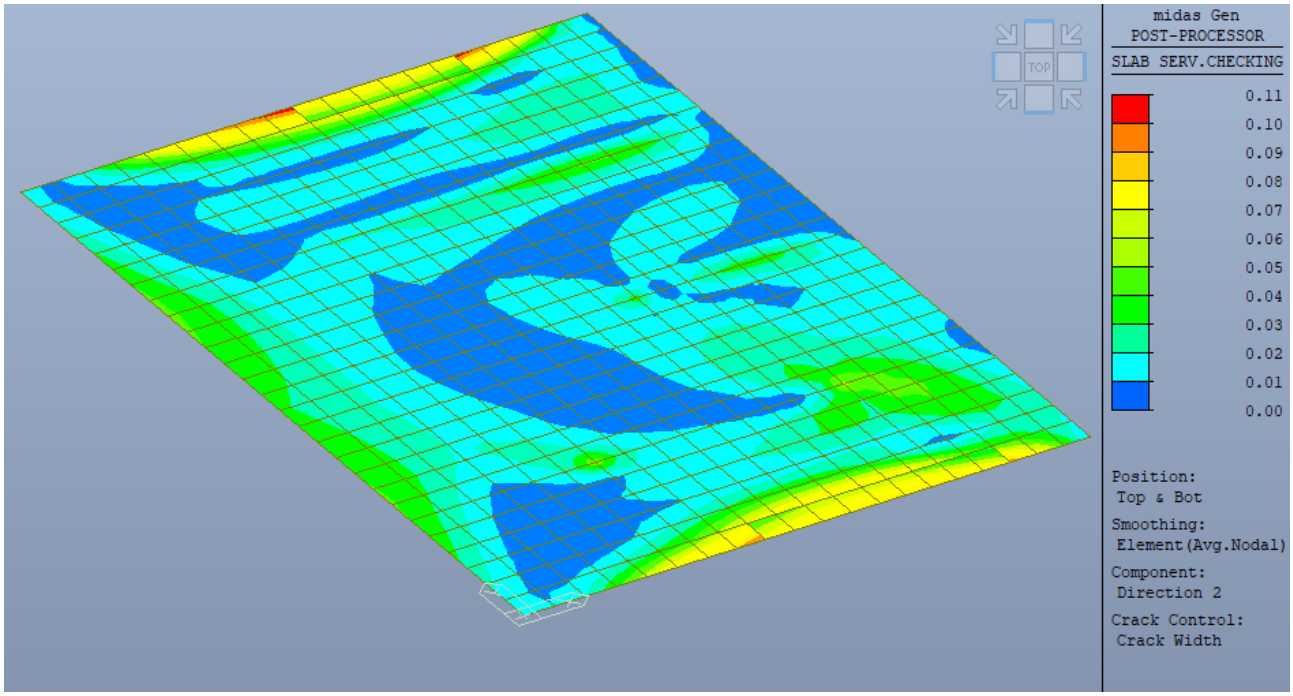
Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

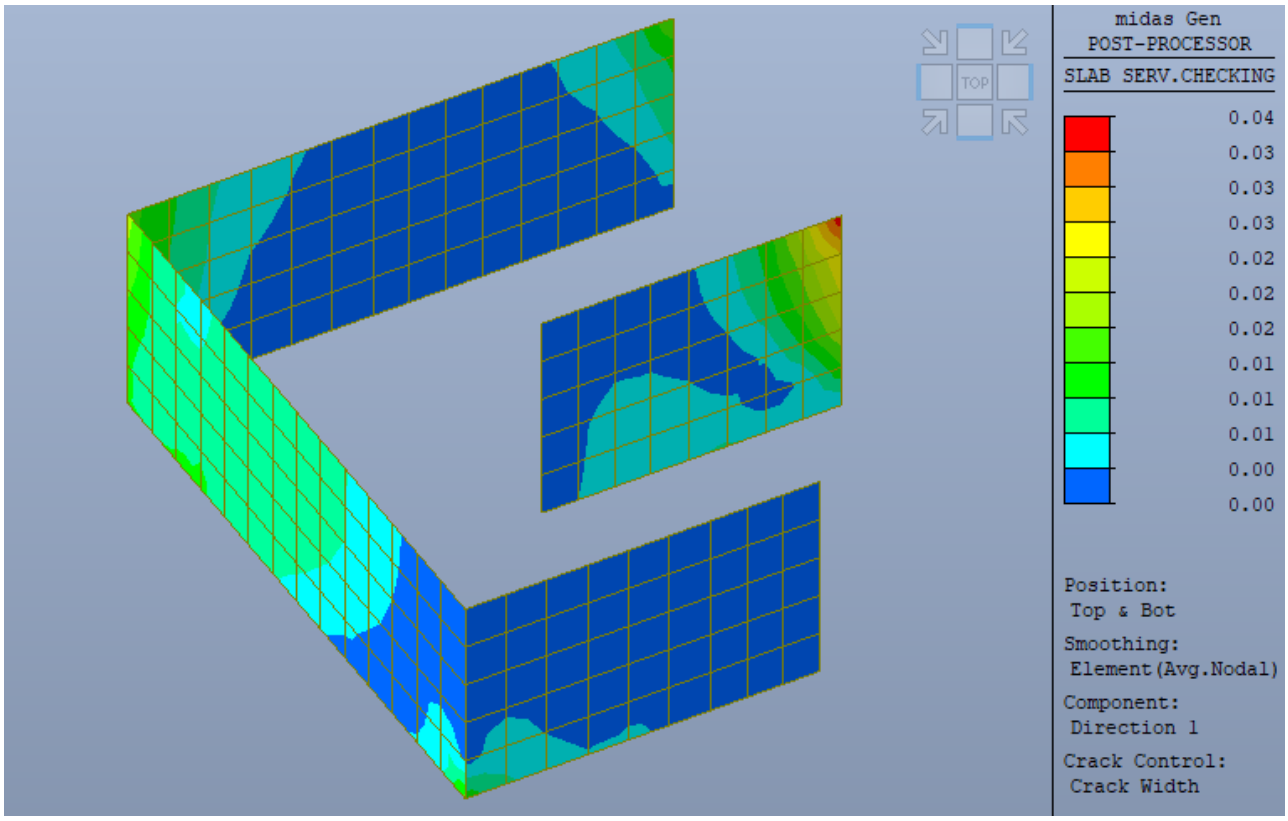
1.9 Verifiche in condizioni di esercizio SLE



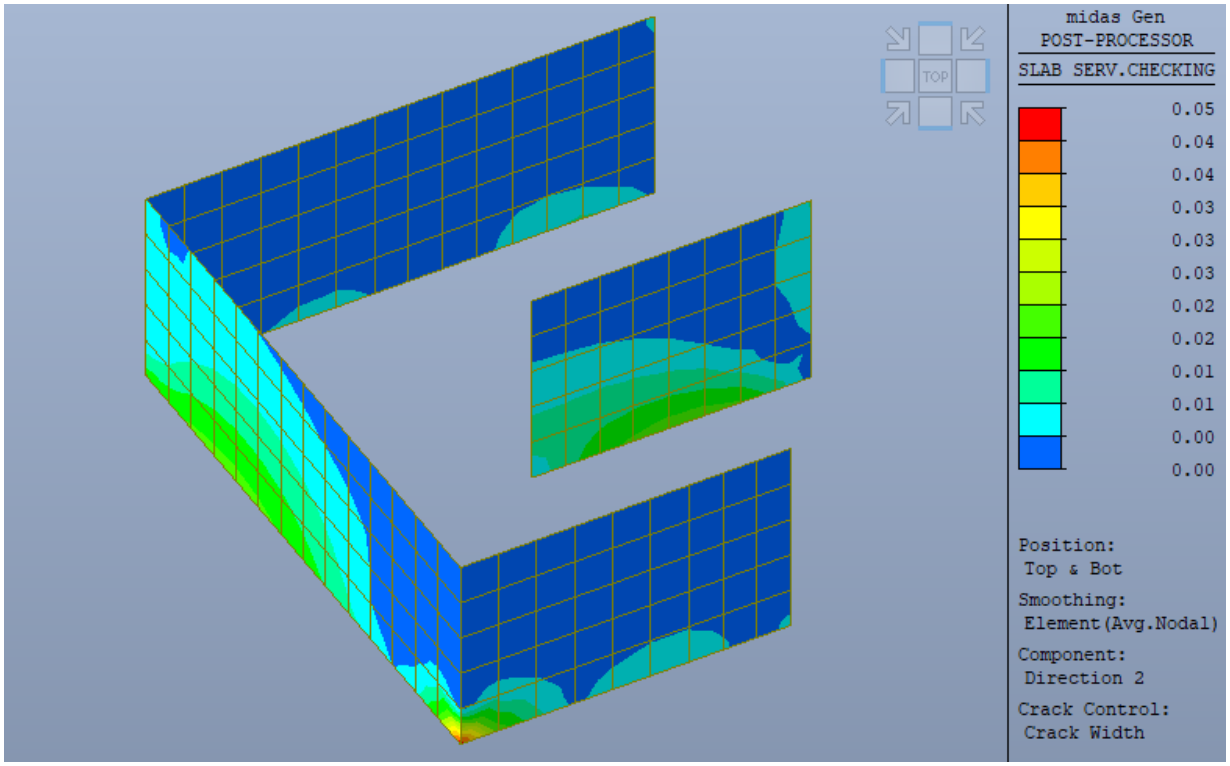
Platea – Verifica a fessurazione SLE - ratio direzione X



Platea – Verifica a fessurazione SLE - ratio direzione Y



Pareti interne – Verifica a fessurazione SLE - ratio direzione X



Pareti interne – Verifica a fessurazione SLE - ratio direzione Y