MANDATARIA:

STUDIO D' INGEGNERIA ASSOCIATO
ISOLA-BOASSO & ASSOCIATI S.r.l.

MANDANTI:

ETATEC STUDIO PAOLETTI

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FSC Fondo per lo Sviluppo e la Coesione

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 G

Rev.	AGGIORNAMENTI	DATA

OGGETTO

FASCICOLO DEI CALCOLI – MANUFATTO PARTITORE AI SEDIMENTATORI

Il Responsabile Dott. Ing. Riccardo ISOLA	Visto

* Riservato all'Amministrazione

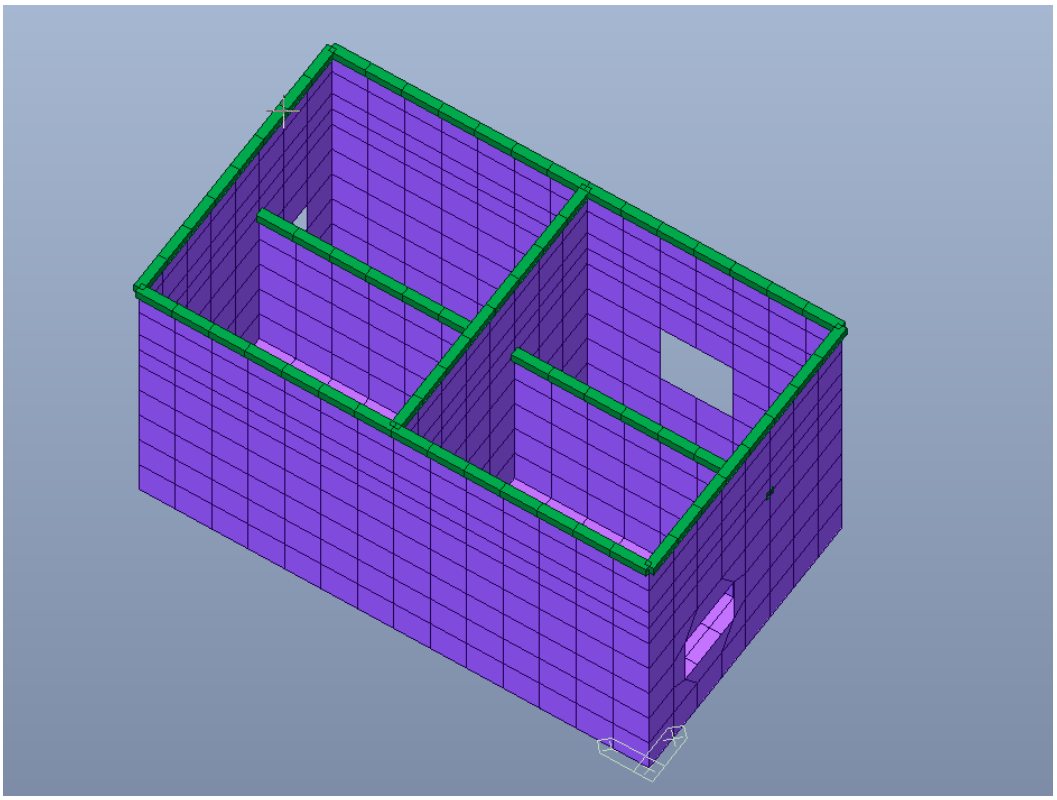
Sommario

1 Fascicolo dei calcoli Manufatto partitore ai Sedimentatori

1.1 Dati della modellazione

Nell'immagine seguente 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 e beam per le travi.
In particolare, gli spessori adottati per gli elementi plate sono i seguenti:

- Platea di fondazione sp.30 cm;
- Pareti esterne verso sp.30 cm;
- Parete interna alta sp.30 cm;
- Pareti interne per stramazzi sp.20 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 16000 kN/m^3, ricavata dalle caratteristiche geotecniche del terreno con la formula di Vesic.
Essendo l'opera praticamente tutta interrata, l'analisi sismica è stata effettuata mediante analisi statica equivalente, nella quale le azioni sismiche sono state inserite come sovra spinte sismiche sia del terreno che del liquame, calcolate rispettivamente con le formule di Wood e di Housner.
Per la determinazione delle suddette spinte si faccia riferimento alla relazione di calcolo 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.

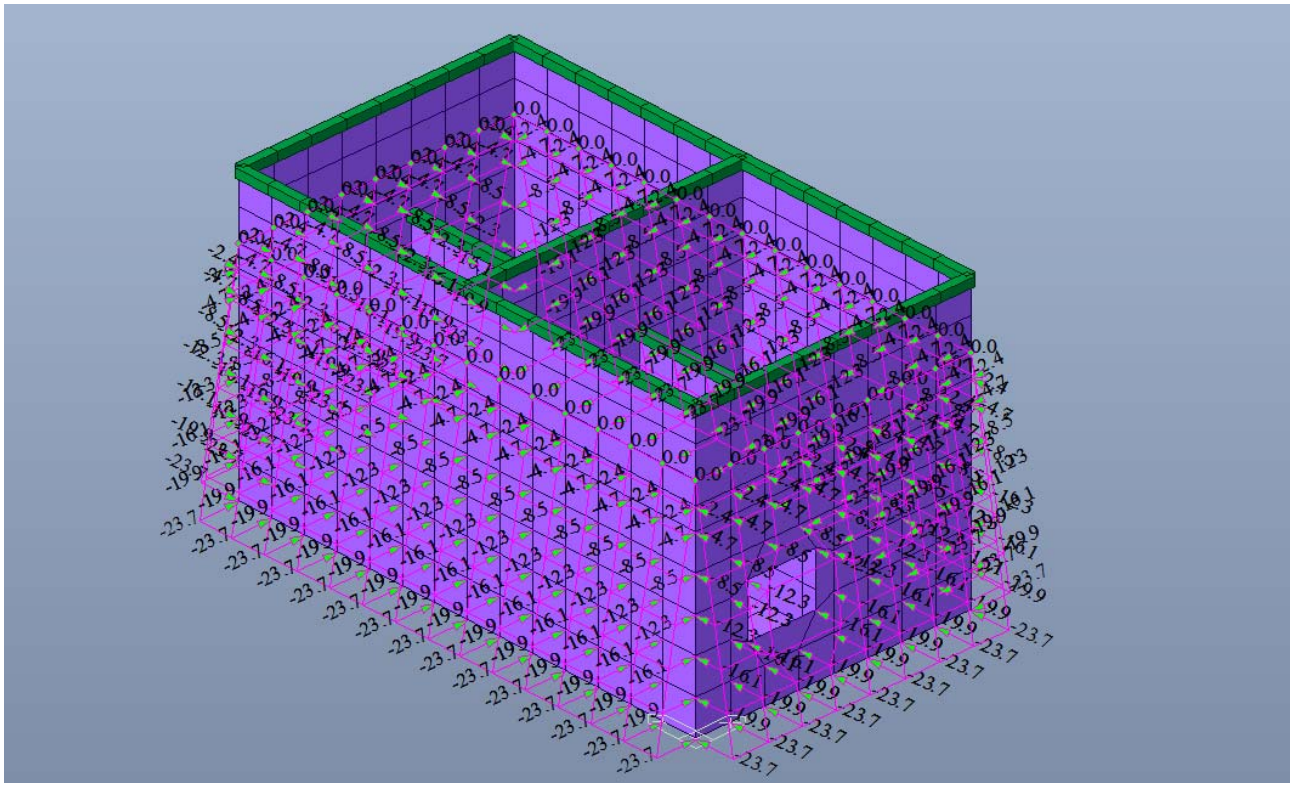
Le condizioni di carico adottate nella modellazione della struttura sono le seguenti:

No	Name	Type	Description
1	DL	Dead Load (D)	Peso Proprio
2	PP	Dead Load (D)	Permanente Paratoie
3	PG	Dead Load (D)	Permanente Grigliati
4	PM	Dead Load (D)	Permanente Magrone
5	VM	Live Load (L)	Variabile Manutenzione
6	SST	Dead Load (D)	Spinta Statica Terreno
7	SSTF	Dead Load (D)	Spinta Statica Terreno con Falda
8	SSL1	Dead Load (D)	Spinta Statica Liquame 1
9	SSL2	Dead Load (D)	Spinta Statica Liquame 2
10	SGAL	Dead Load (D)	Spinta Galeggiamento
11	SSS	Live Load (L)	Spinta Sovraccarico
12	ET X	Earthquake (E)	Spinta Sismica Terreno X
13	ET Y	Earthquake (E)	Spinta Sismica Terreno Y
14	EL X	Earthquake (E)	Spinta Sismica Liquame X
15	EL Y	Earthquake (E)	Spinta Sismica Liquame Y

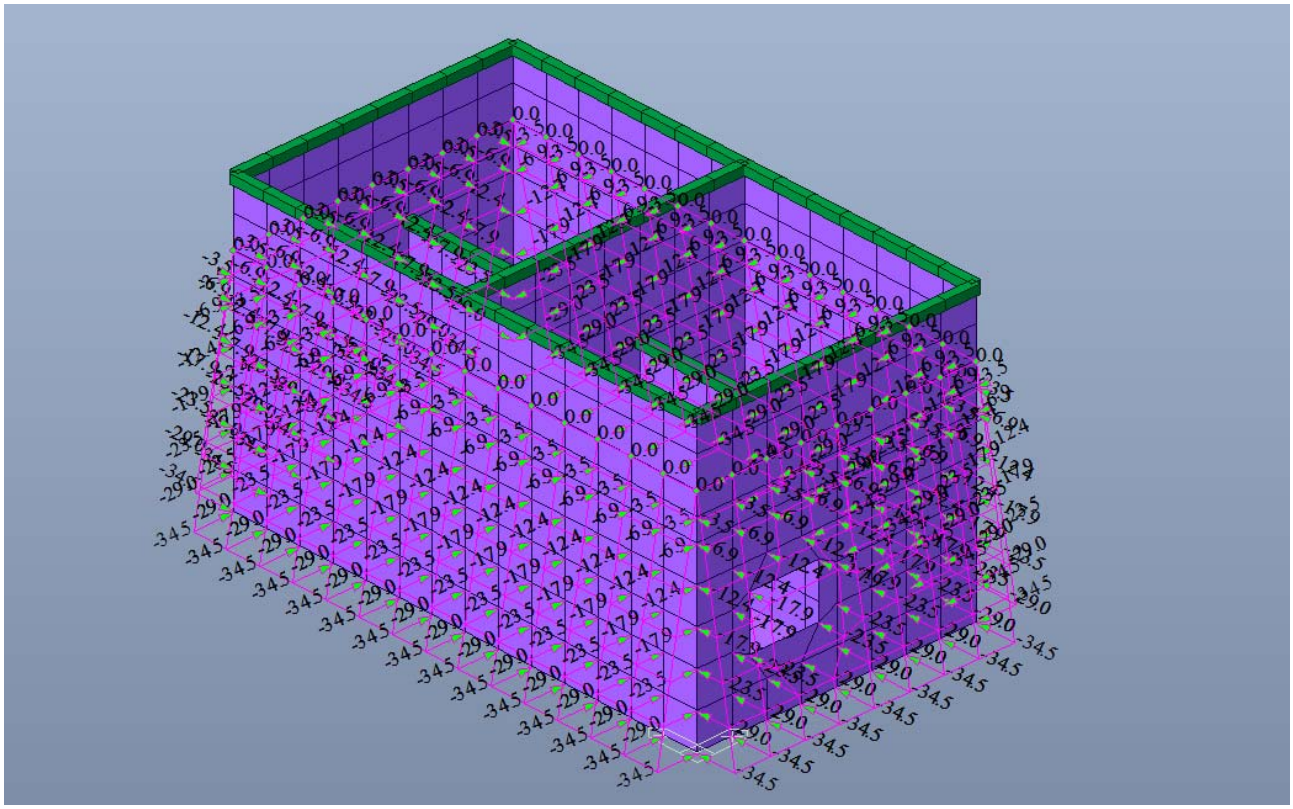
Le combinazioni delle condizioni di carico elementari, realizzate sulla base delle indicazioni del paragrafo 2.5.3 delle NTC 2018, sono le seguenti:

No	Name	DL(ST)	PP(ST)	PG(ST)	PM(ST)	VM(ST)	SST(ST)	SSTF(ST)	SSL1(ST)	SSL2(ST)	SGAL(ST)	SSS(ST)	ET X(ST)	ET Y(ST)	EL X(ST)	EL Y(ST)
1	SLU 1	1.3000	1.3000	1.3000	1.3000	1.5000	1.3000									
2	SLU 2	1.3000	1.3000	1.3000	1.3000	1.5000		1.3000			1.3000					
3	SLU 3	1.3000	1.3000	1.3000	1.3000	1.5000	1.3000		1.3000							
4	SLU 4	1.3000	1.3000	1.3000	1.3000		1.3000					1.5000				
5	SLU 5	1.3000	1.3000	1.3000	1.3000	1.5000	1.3000		1.3000			1.0500				
6	SLU 6	1.3000	1.3000	1.3000	1.3000	1.5000		1.3000	1.3000							
7	SLU 7	1.3000	1.3000	1.3000	1.3000	1.5000		1.3000	1.3000			1.0500				
8	SLU 8	1.3000	1.3000	1.3000	1.3000	1.0500		1.3000	1.3000			1.5000				
9	SLV 1	1.0000	1.0000	1.0000	1.0000		1.0000						1.0000	0.3000		
10	SLV 2	1.0000	1.0000	1.0000	1.0000		1.0000						1.0000	-0.3000		
11	SLV 3	1.0000	1.0000	1.0000	1.0000		1.0000						-1.0000	0.3000		
12	SLV 4	1.0000	1.0000	1.0000	1.0000		1.0000						-1.0000	-0.3000		
13	SLV 5	1.0000	1.0000	1.0000	1.0000		1.0000						0.3000	1.0000		
14	SLV 6	1.0000	1.0000	1.0000	1.0000		1.0000						0.3000	-1.0000		
15	SLV 7	1.0000	1.0000	1.0000	1.0000		1.0000						-0.3000	1.0000		
16	SLV 8	1.0000	1.0000	1.0000	1.0000		1.0000						-0.3000	-1.0000		
17	SLV 9	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			1.0000	0.3000	1.0000	0.3000
18	SLV 10	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			1.0000	-0.3000	1.0000	-0.3000
19	SLV 11	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			-1.0000	0.3000	-1.0000	0.3000
20	SLV 12	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			-1.0000	-0.3000	-1.0000	-0.3000
21	SLV 13	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			0.3000	1.0000	0.3000	1.0000
22	SLV 14	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			0.3000	-1.0000	0.3000	-1.0000
23	SLV 15	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			-0.3000	1.0000	-0.3000	1.0000
24	SLV 16	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000			-0.3000	-1.0000	-0.3000	-1.0000
25	SLE R1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000									
26	SLE R2	1.0000	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000					
27	SLE R3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000		1.0000							
28	SLE R4	1.0000	1.0000	1.0000	1.0000		1.0000					1.0000				
29	SLE R5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000		1.0000			0.7000				
30	SLE R6	1.0000	1.0000	1.0000	1.0000	1.0000		1.0000	1.0000							
31	SLE R7	1.0000	1.0000	1.0000	1.0000	1.0000		1.0000	1.0000			0.7000				
32	SLE R8	1.0000	1.0000	1.0000	1.0000	0.5000		1.0000	1.0000			1.0000				
33	SLE F1	1.0000	1.0000	1.0000	1.0000	0.5000	1.0000									
34	SLE F2	1.0000	1.0000	1.0000	1.0000	0.5000	1.0000					0.3000				
35	SLE F3	1.0000	1.0000	1.0000	1.0000	0.5000	1.0000			1.0000						
36	SLE F4	1.0000	1.0000	1.0000	1.0000	0.5000	1.0000			1.0000		0.3000				
37	SLE Qp	1.0000	1.0000	1.0000	1.0000		1.0000			1.0000						

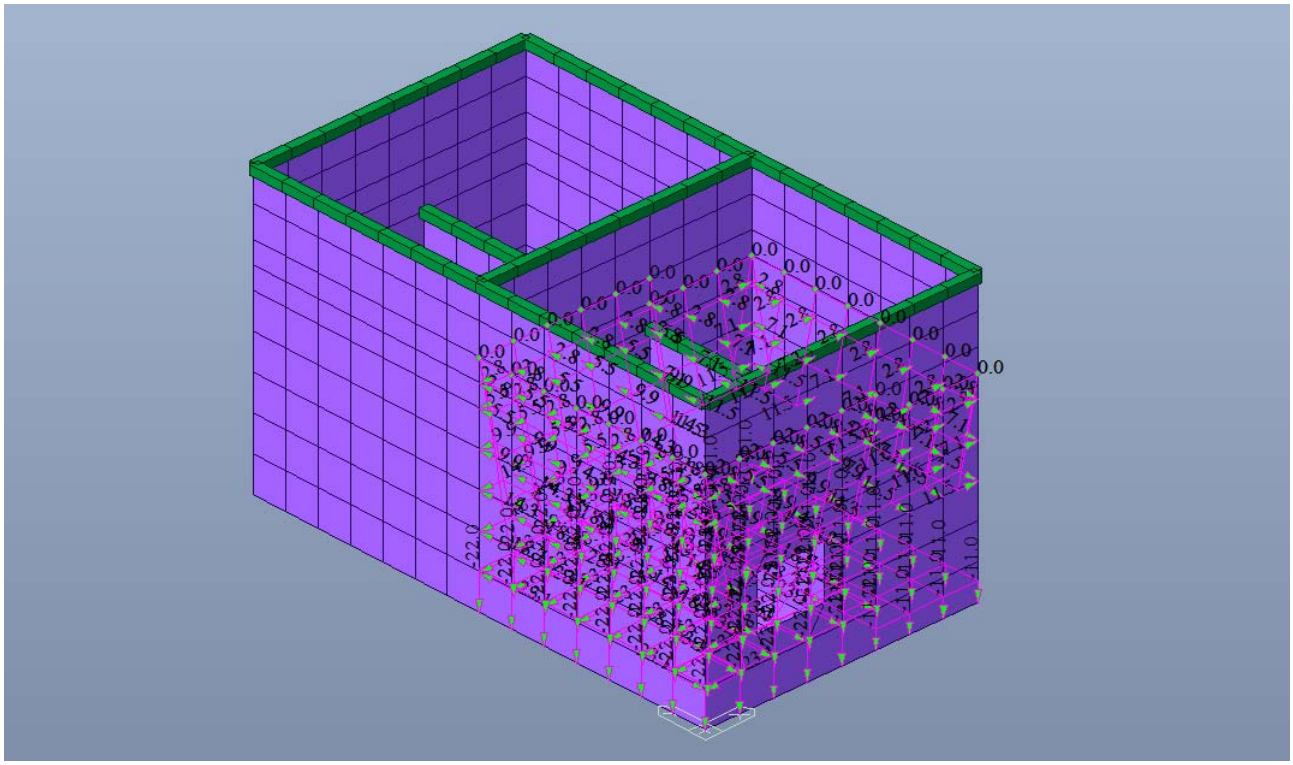
Nelle immagini seguenti si riportano le assegnazioni dei carichi:



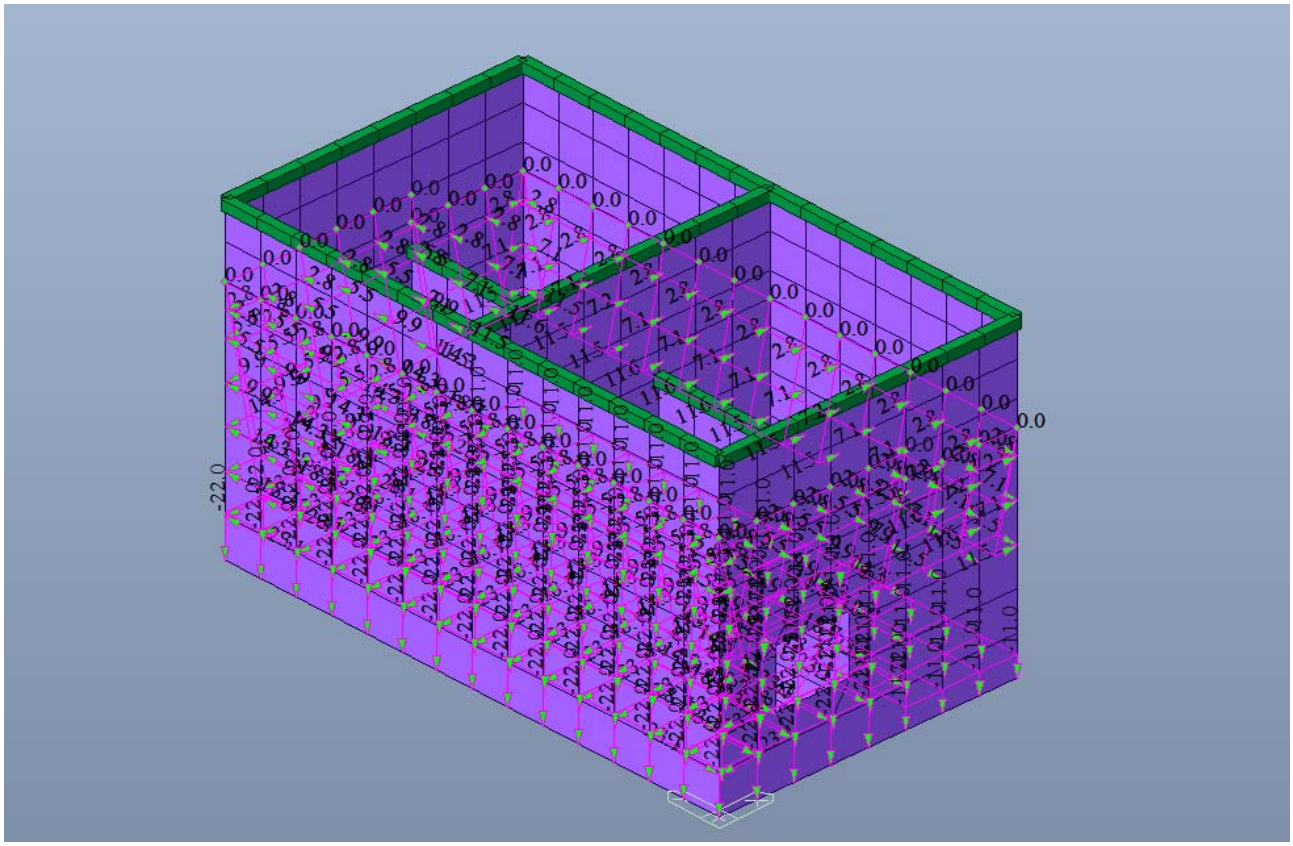
Assegnazione spinta statica del terreno (SST) - [kN/mq]



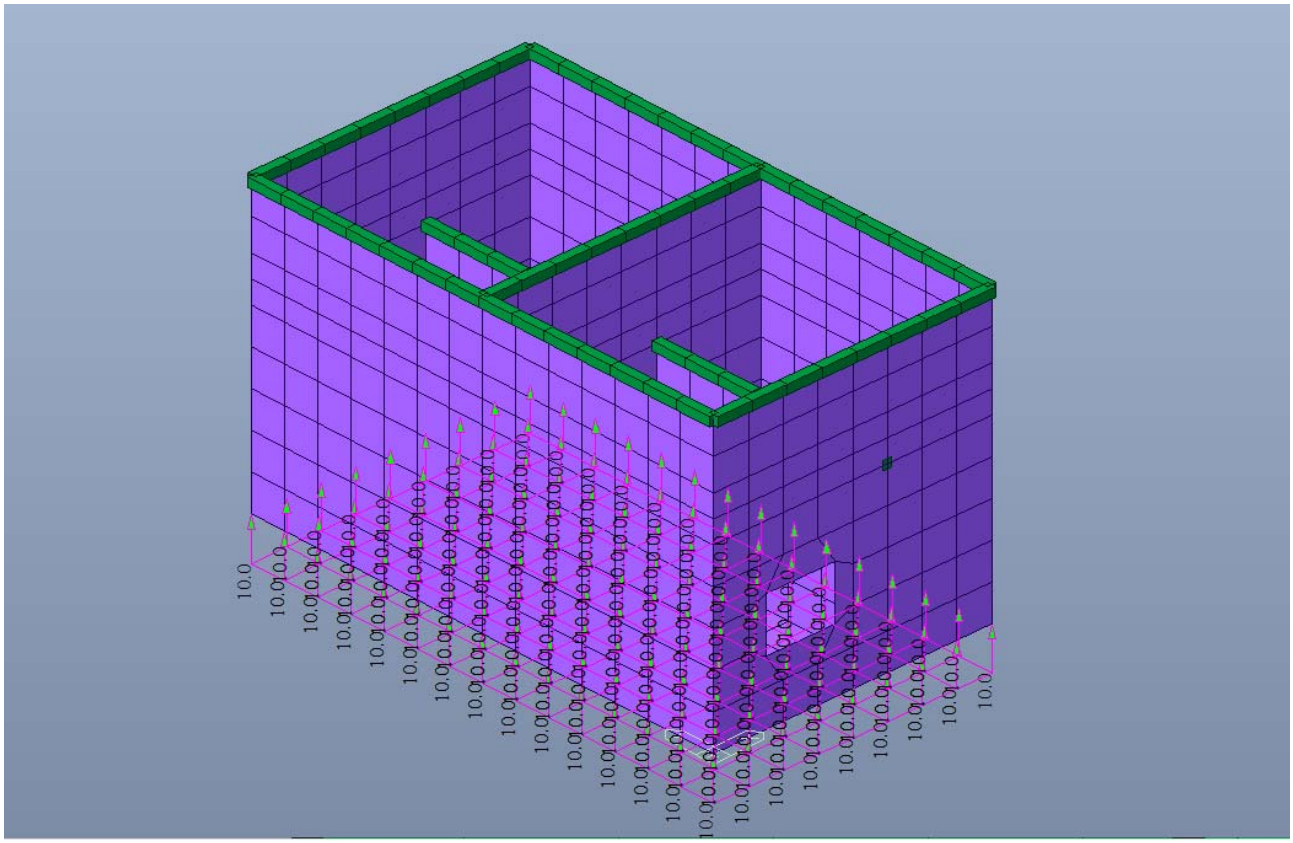
Assegnazione spinta statica del terreno con falda (SSTF) - [kN/mq]



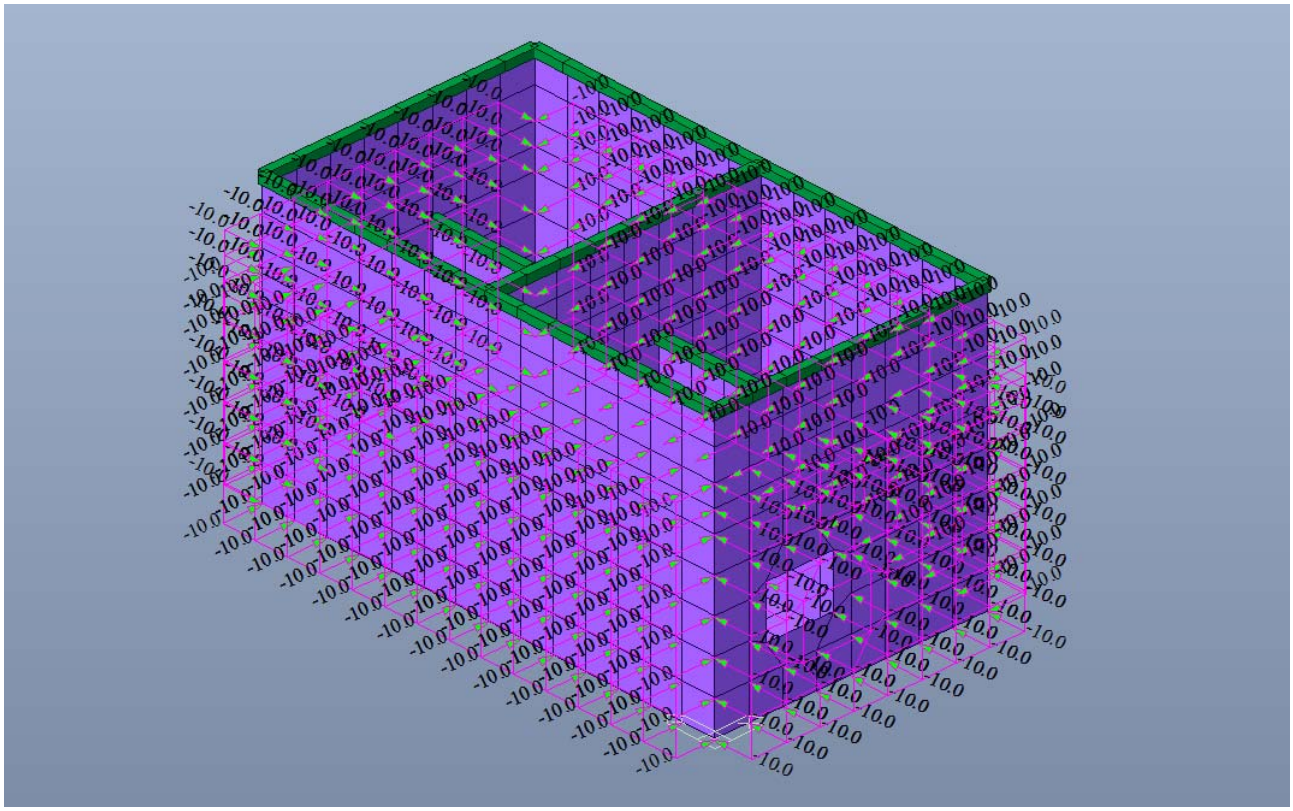
Assegnazione spinta statica liquame una vasca (SSL1) - [kN/mq]



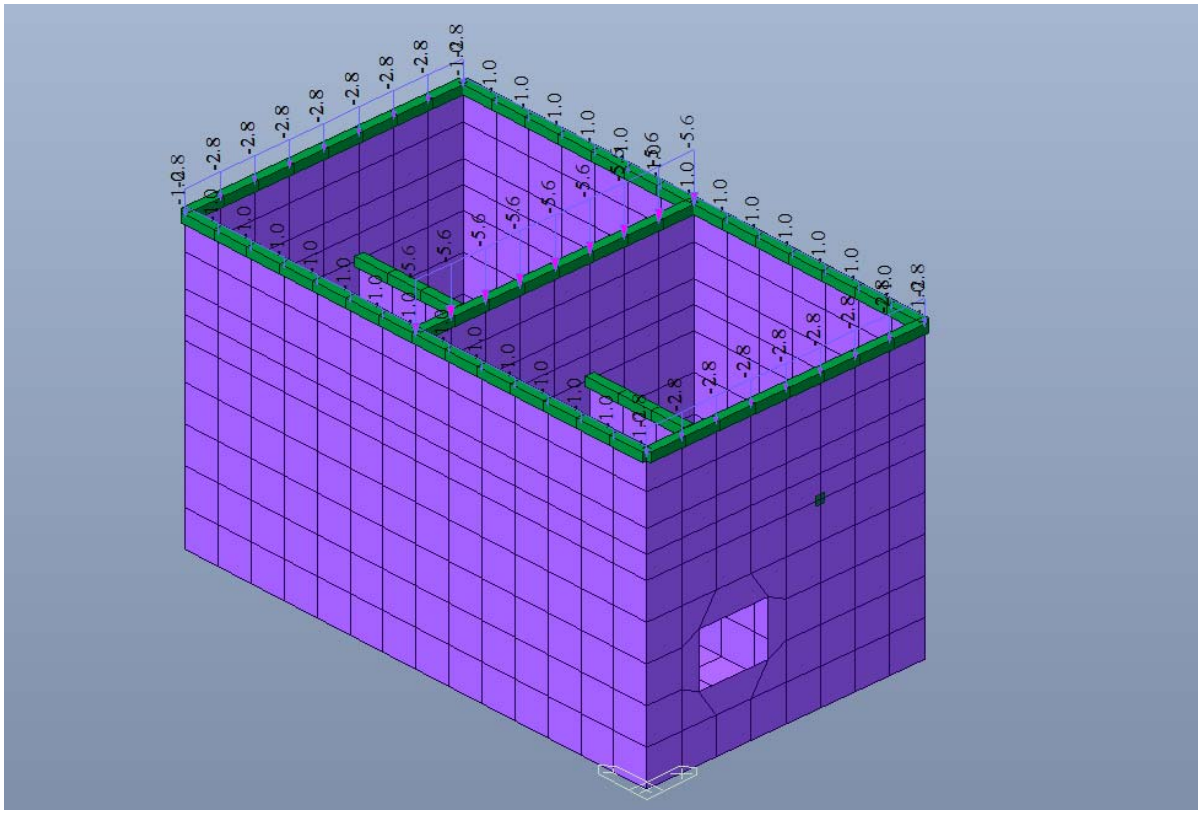
Assegnazione spinta statica liquame entrambe le vasche (SSL2) - [kN/mq]



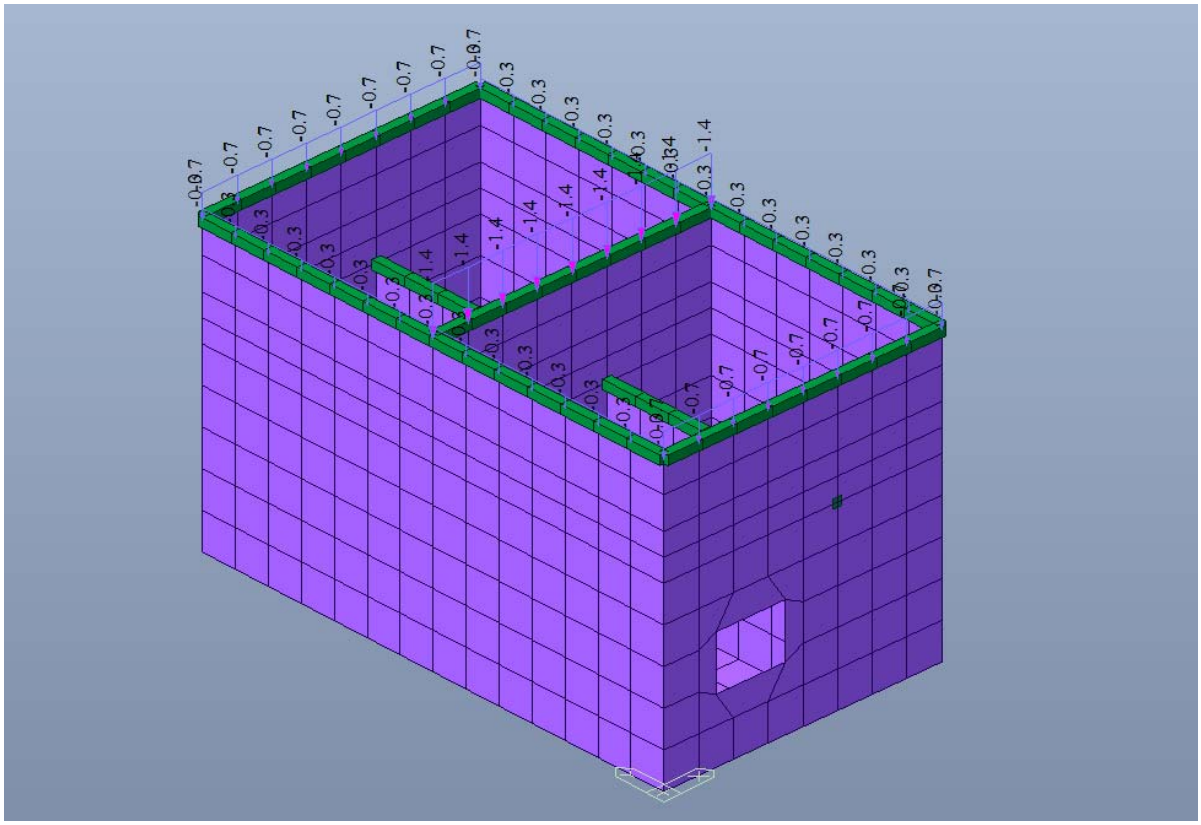
Assegnazione spinta galleggiamento (S GAL) - [kN/mq]



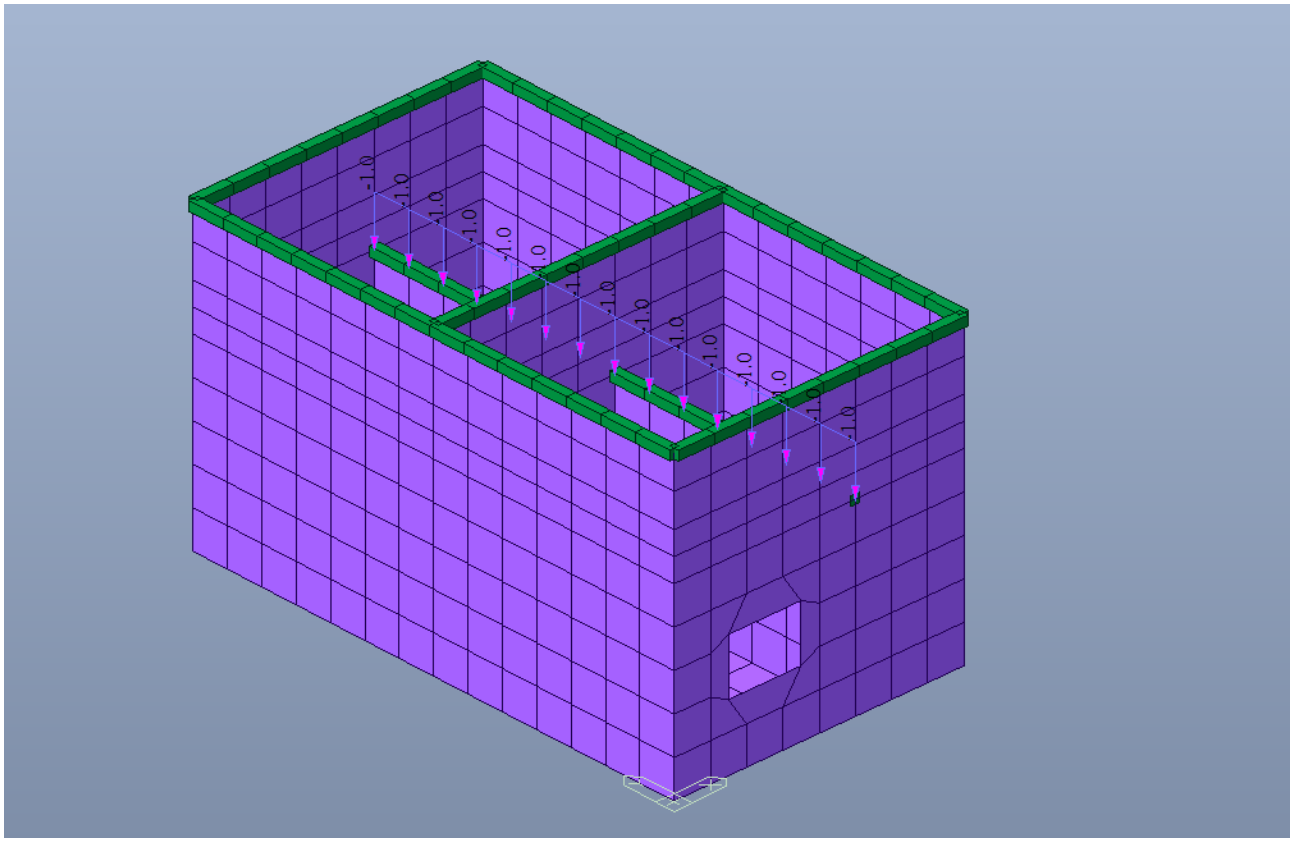
Assegnazione spinta statica sovraccarico (SSS) - [kN/mq]



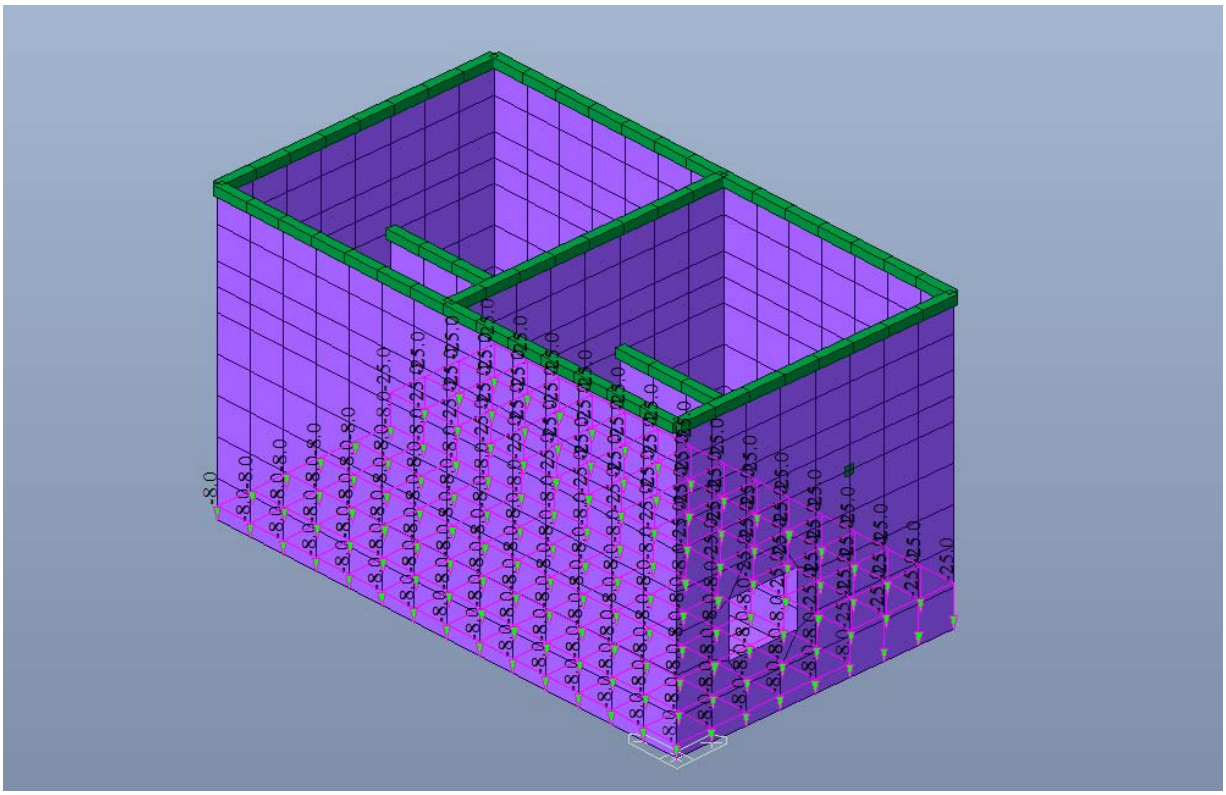
Assegnazione variabile manutenzione (VM) - [kN/m]



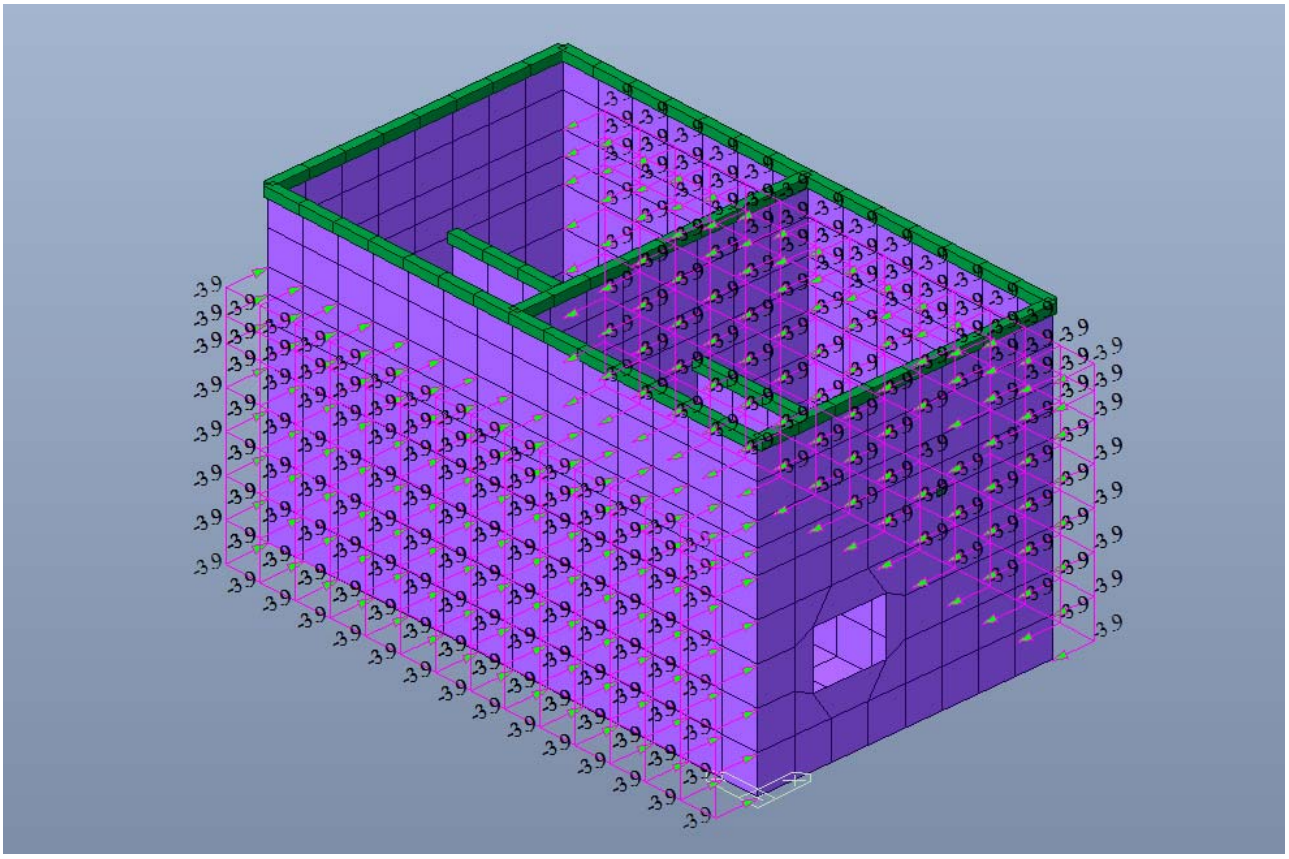
Assegnazione permanente grigliati (PG) - [kN/m]



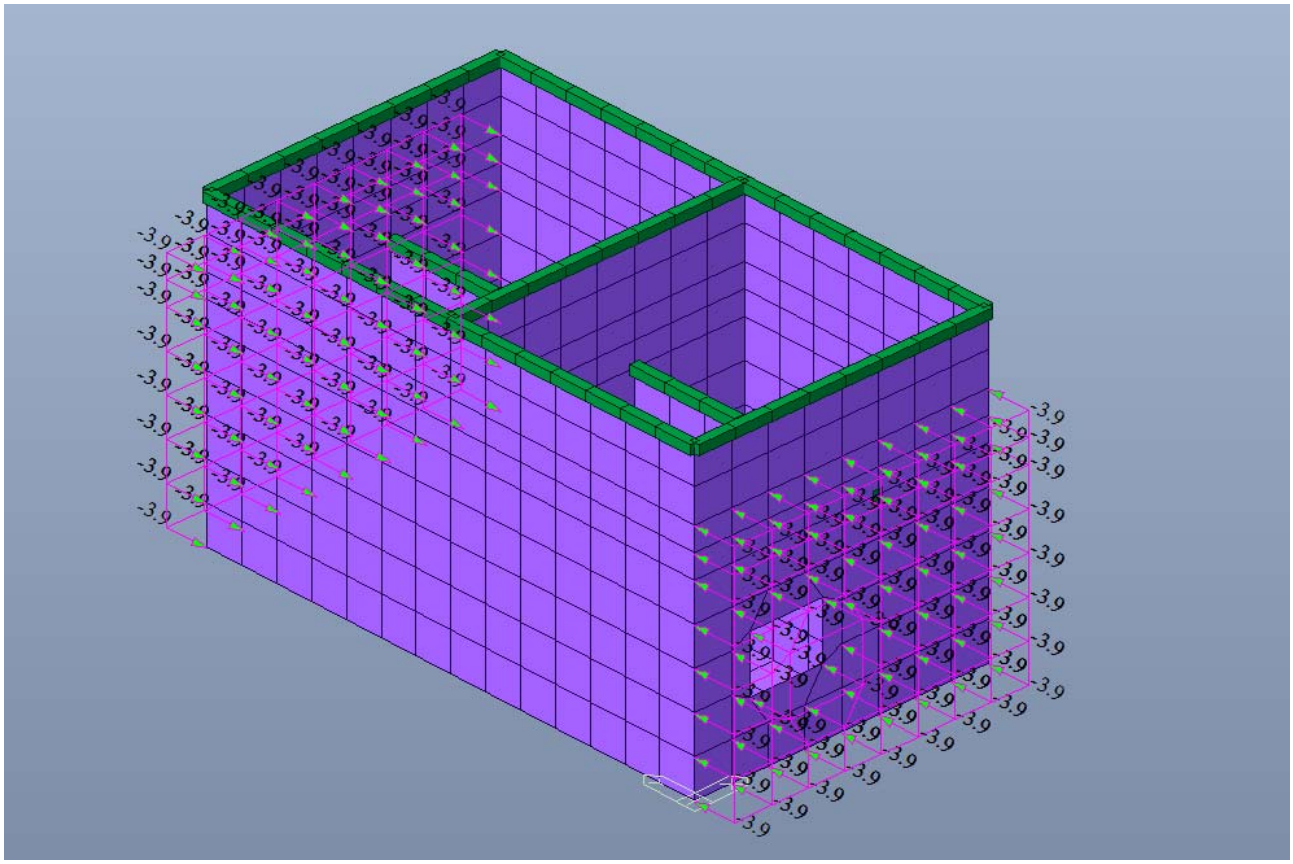
Assegnazione permanente paratoie (PP) - [kN/m]



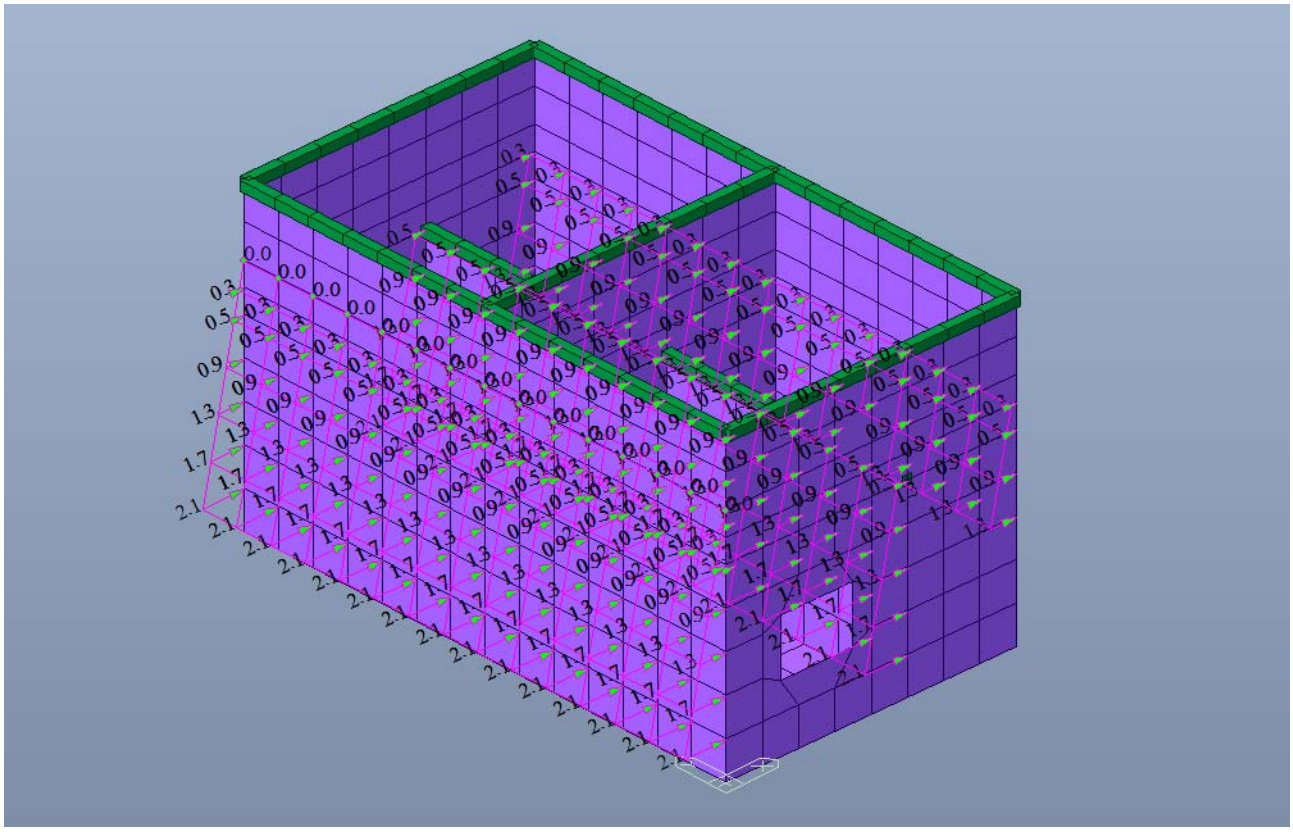
Assegnazione permanente magrone (PM) - [kN/mq]



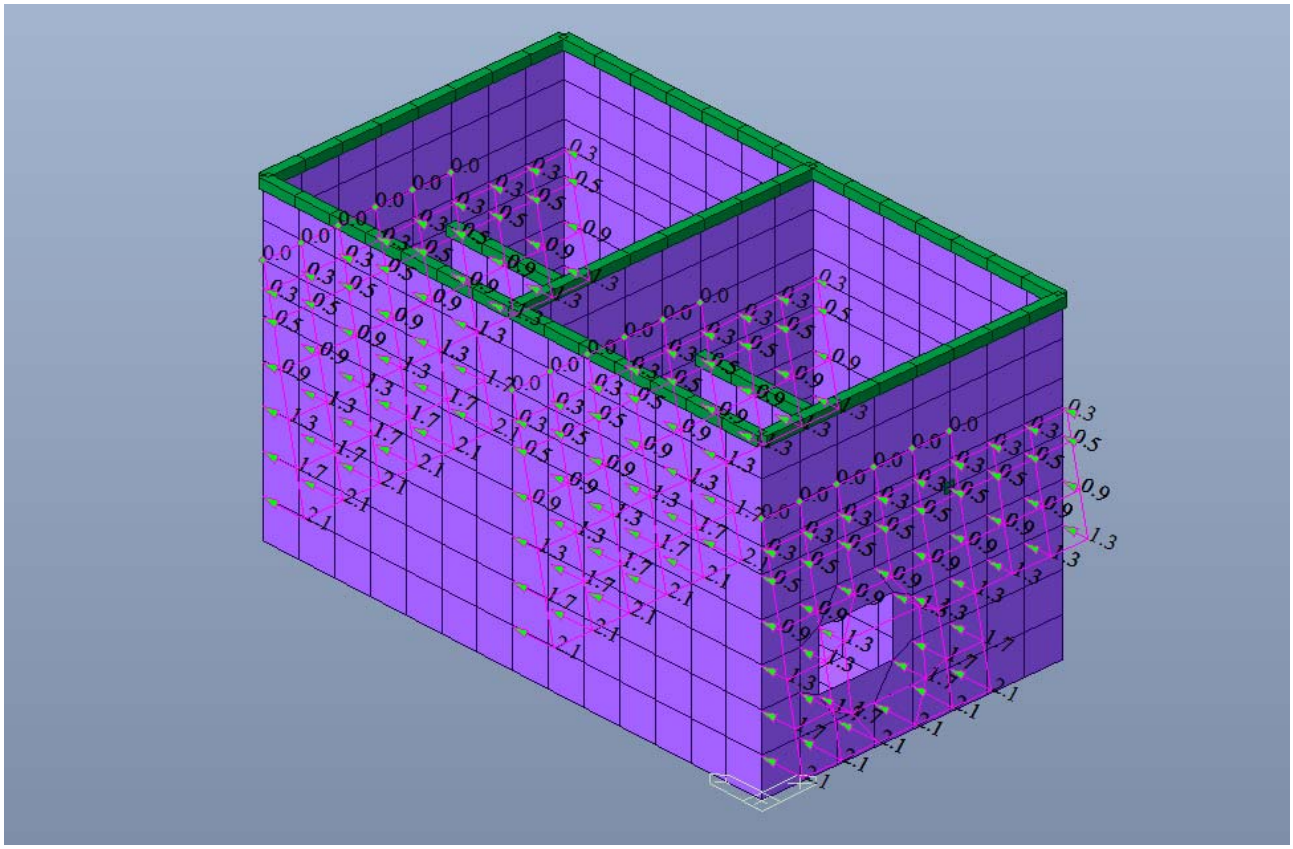
Assegnazione sovra spinta sismica terreno X (ET X) - [kN/mq]



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



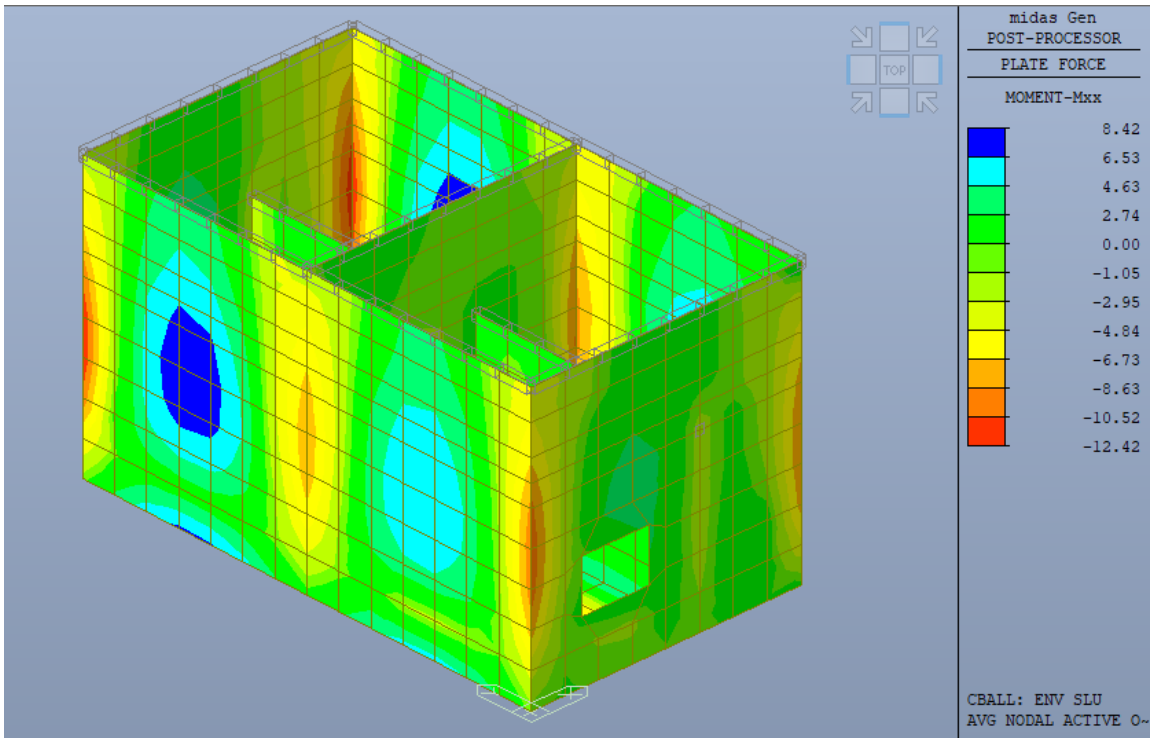
Assegnazione sovra spinta sismica liquame X (EL X) - [kN/mq]



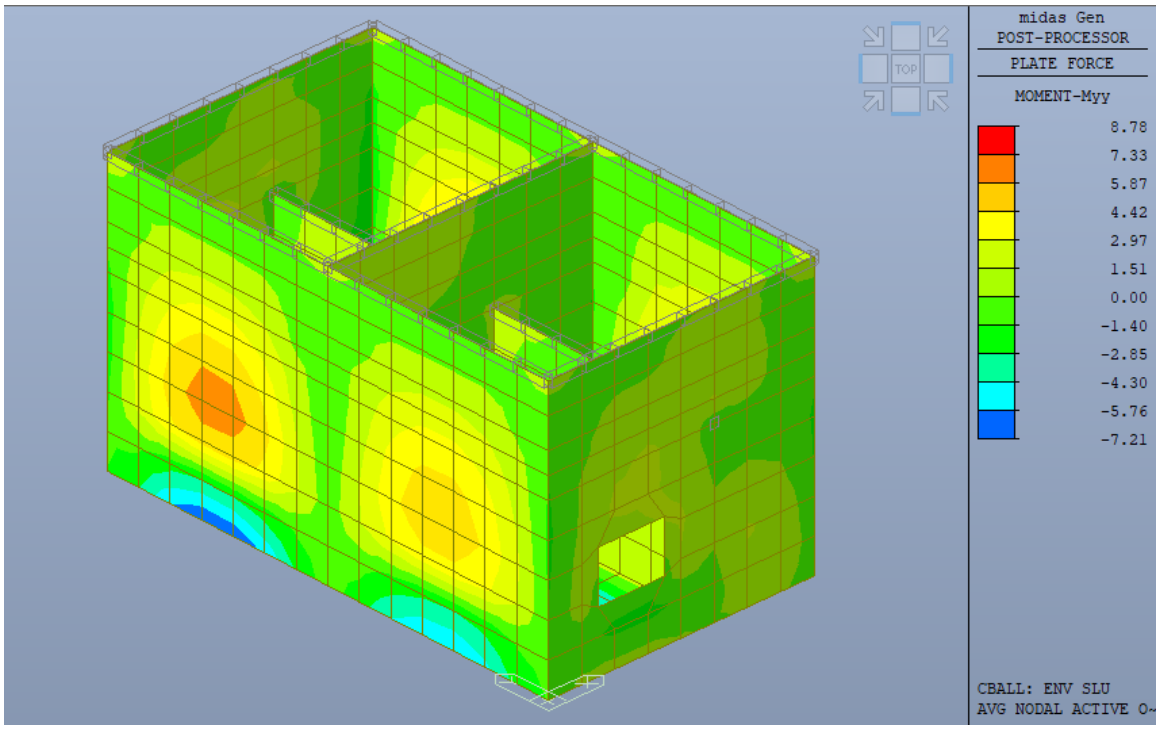
Assegnazione sovra spinta sismica liquame Y (EL Y) - [kN/mq]

1.3 Sollecitazioni

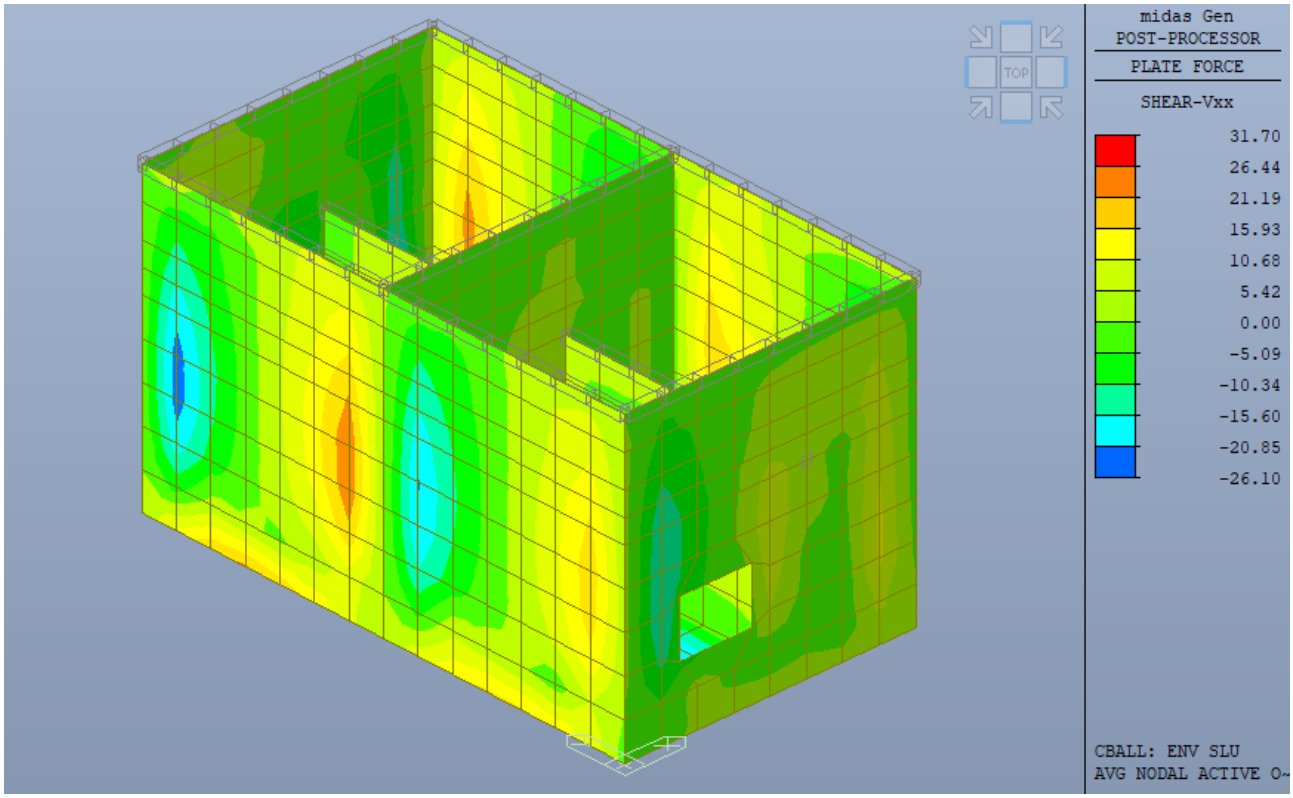
Nel presente paragrafo vengono riportate per via grafica le sollecitazioni sulla struttura indotte dai carichi applicati, per le varie combinazioni di carico statiche e sismiche.



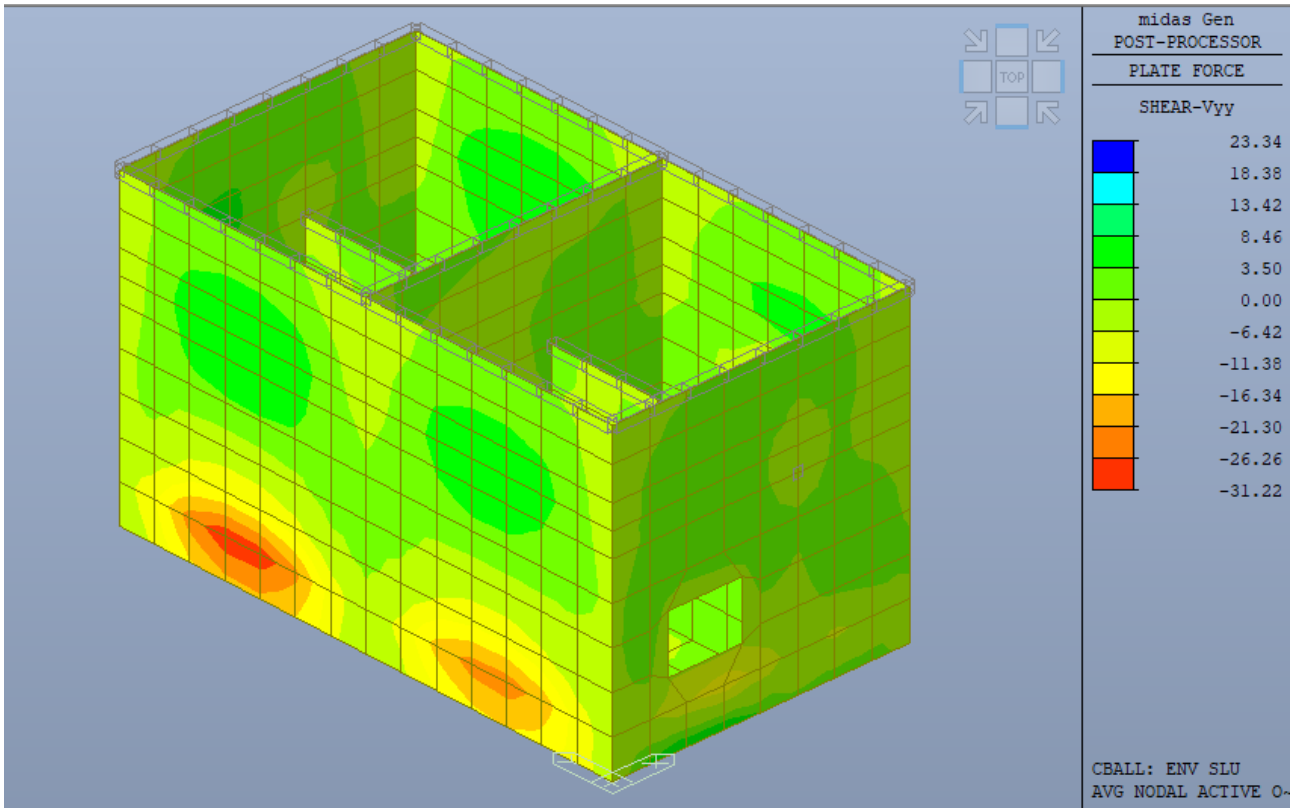
Momento flettente membranale Mxx – inviluppo SLU [kN*m/m]



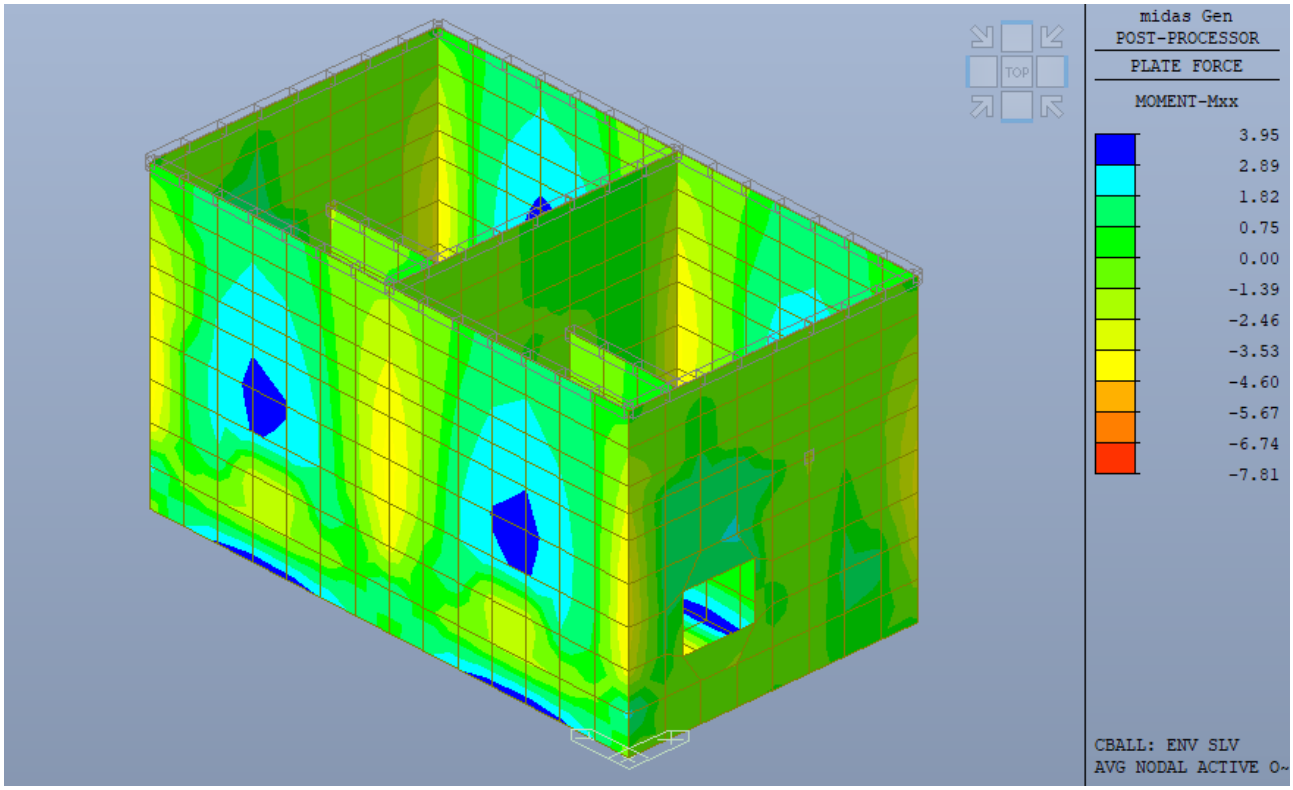
Momento flettente membranale Myy – inviluppo SLU [kN*m/m]



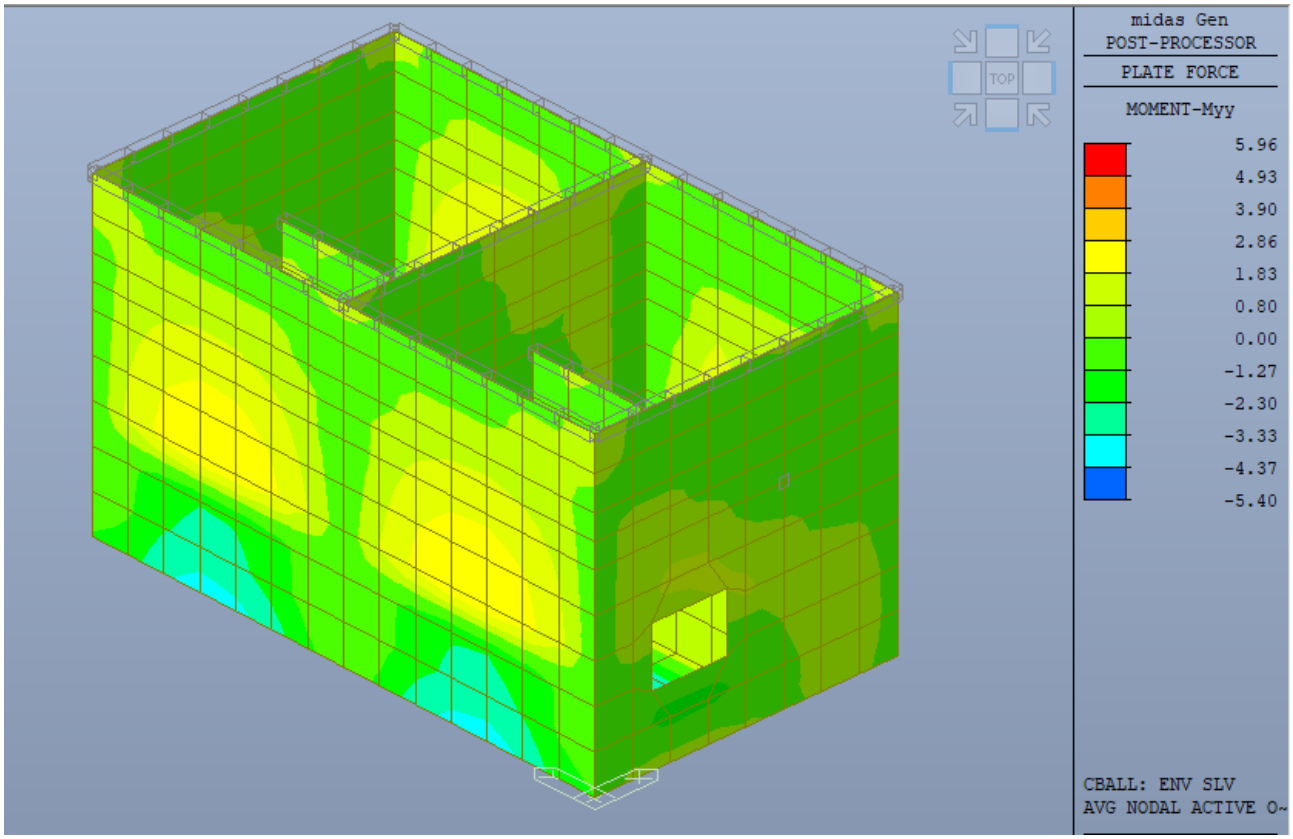
Sollecitazione tagliante Vxx – inviluppo SLU [kN/m]



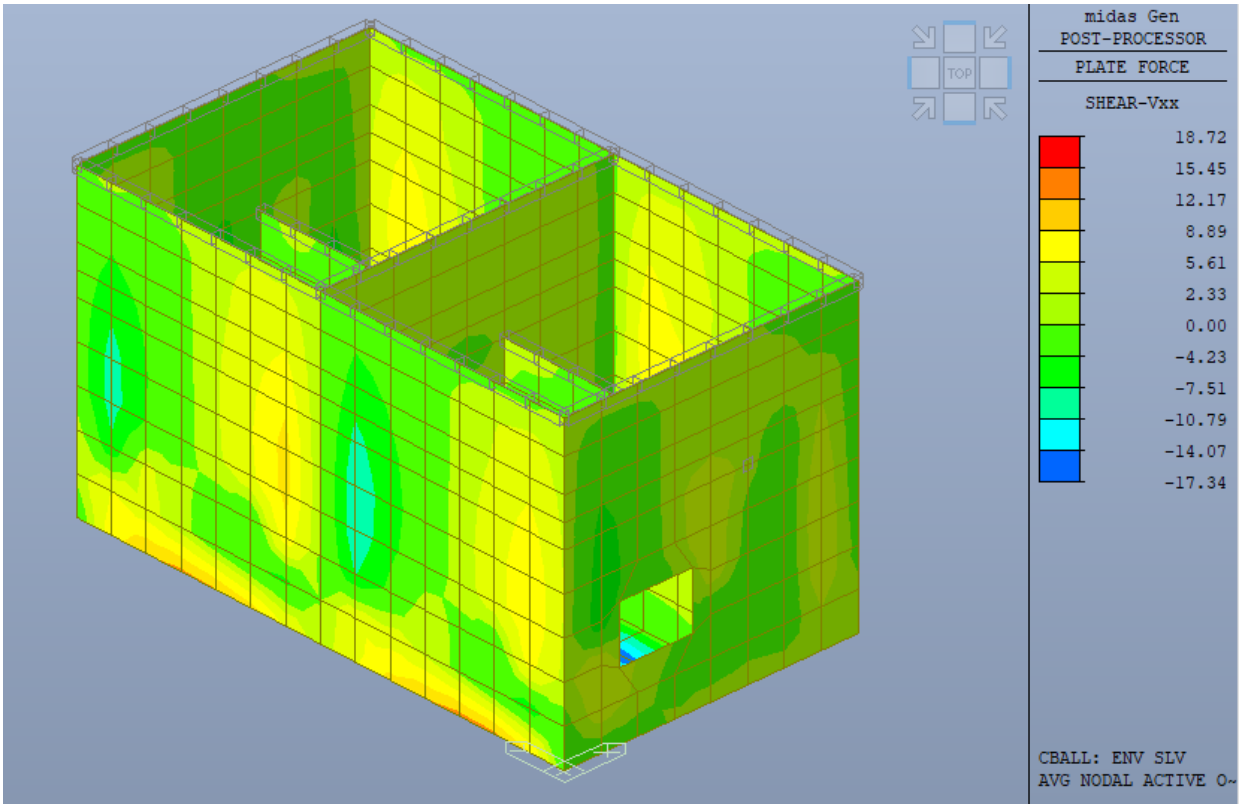
Sollecitazione tagliante Vyy – inviluppo SLU [kN/m]



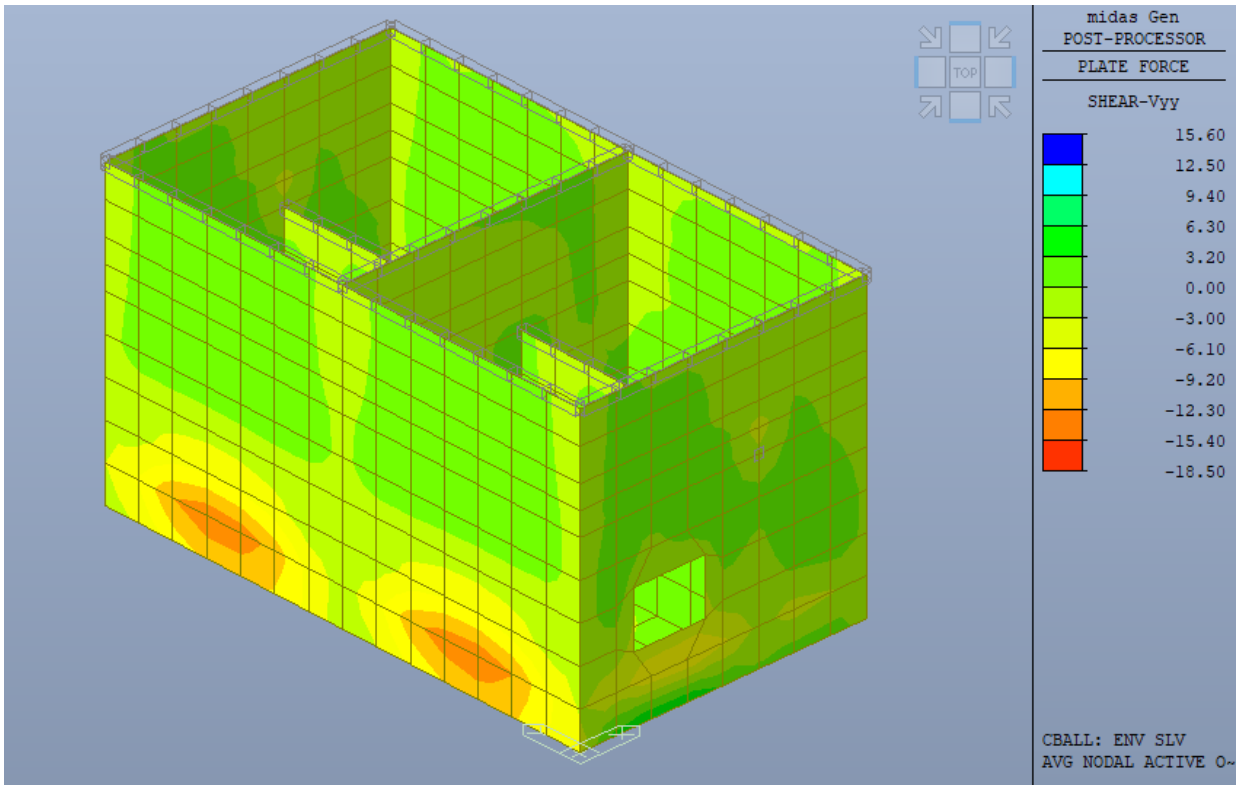
Momento flettente membranale Mxx – inviluppo SLV [kN*m/m]



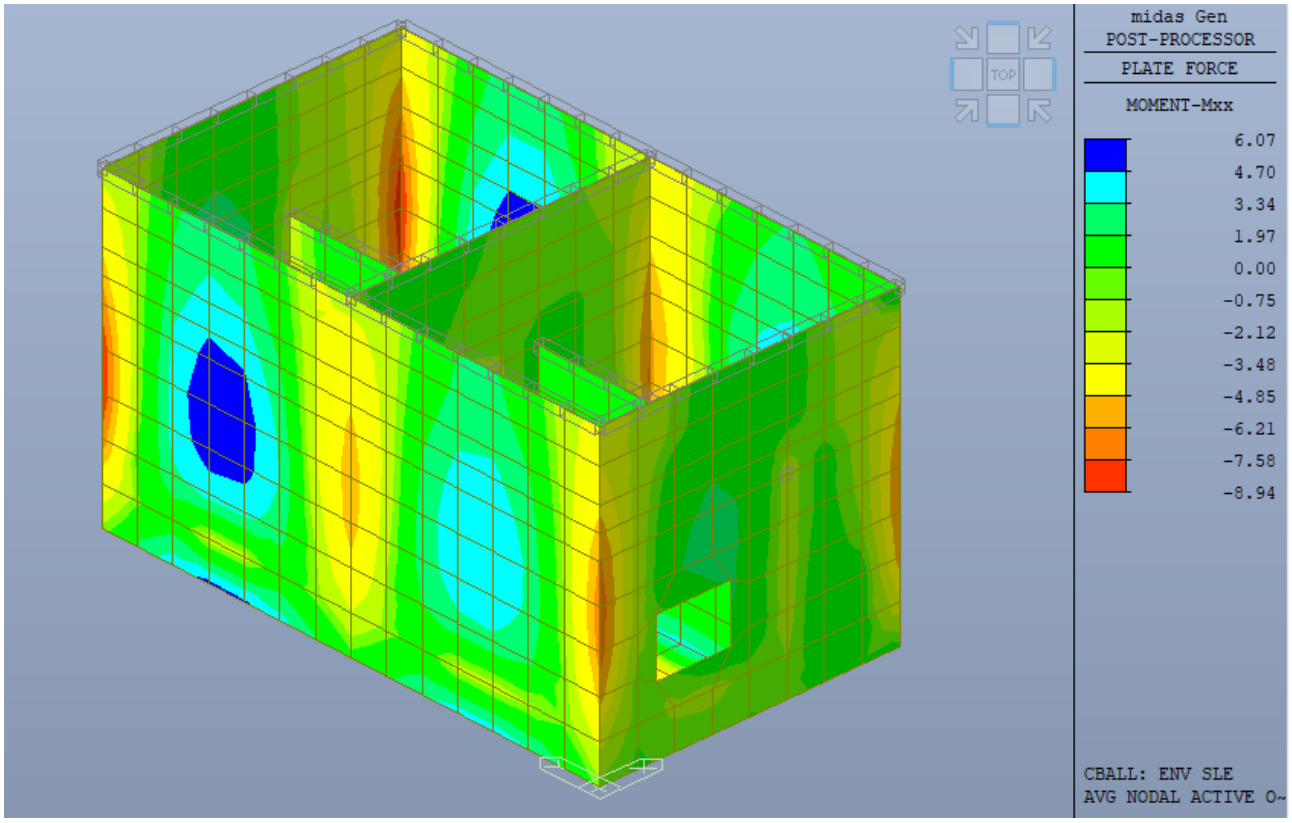
Momento flettente membranale Myy – inviluppo SLV [kN*m/m]



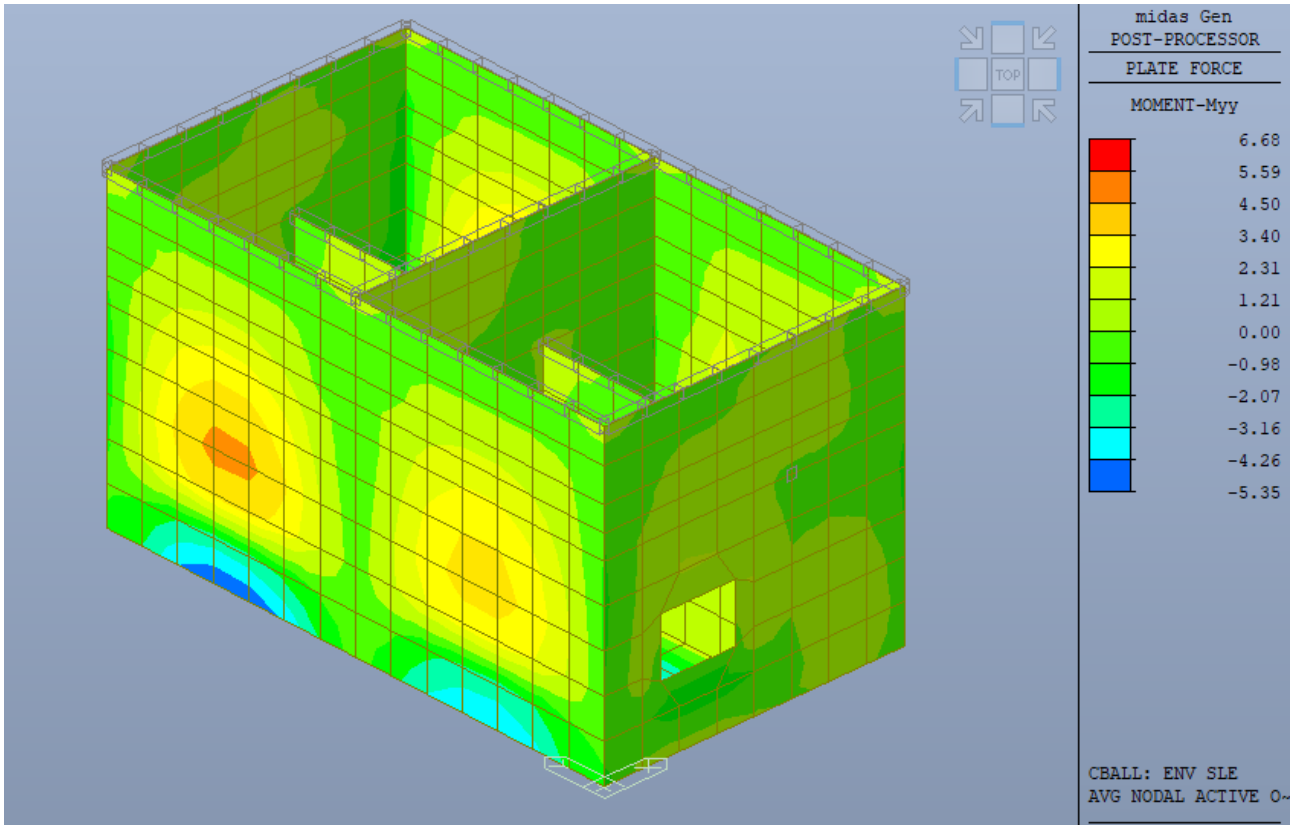
Sollecitazione tagliante Vxx – inviluppo SLV [kN/m]



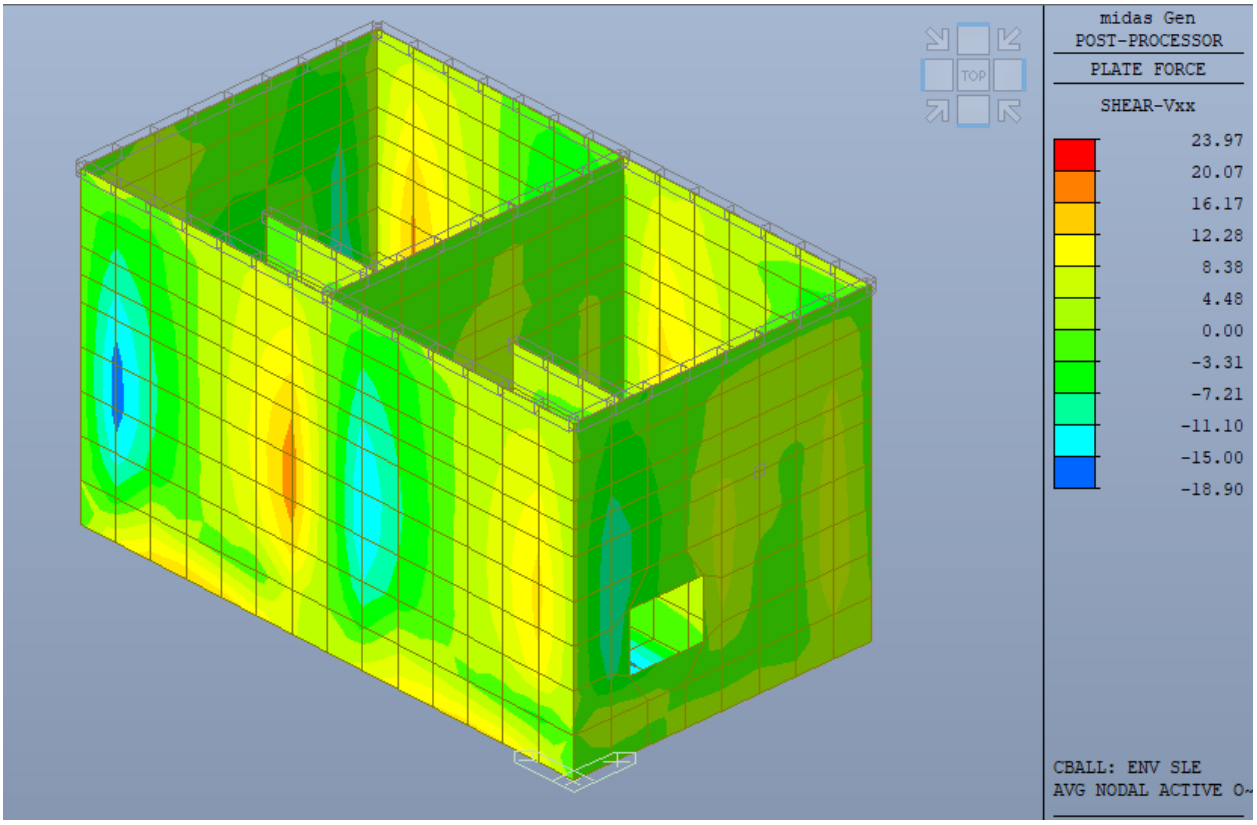
Sollecitazione tagliante Vyy – inviluppo SLV [kN/m]



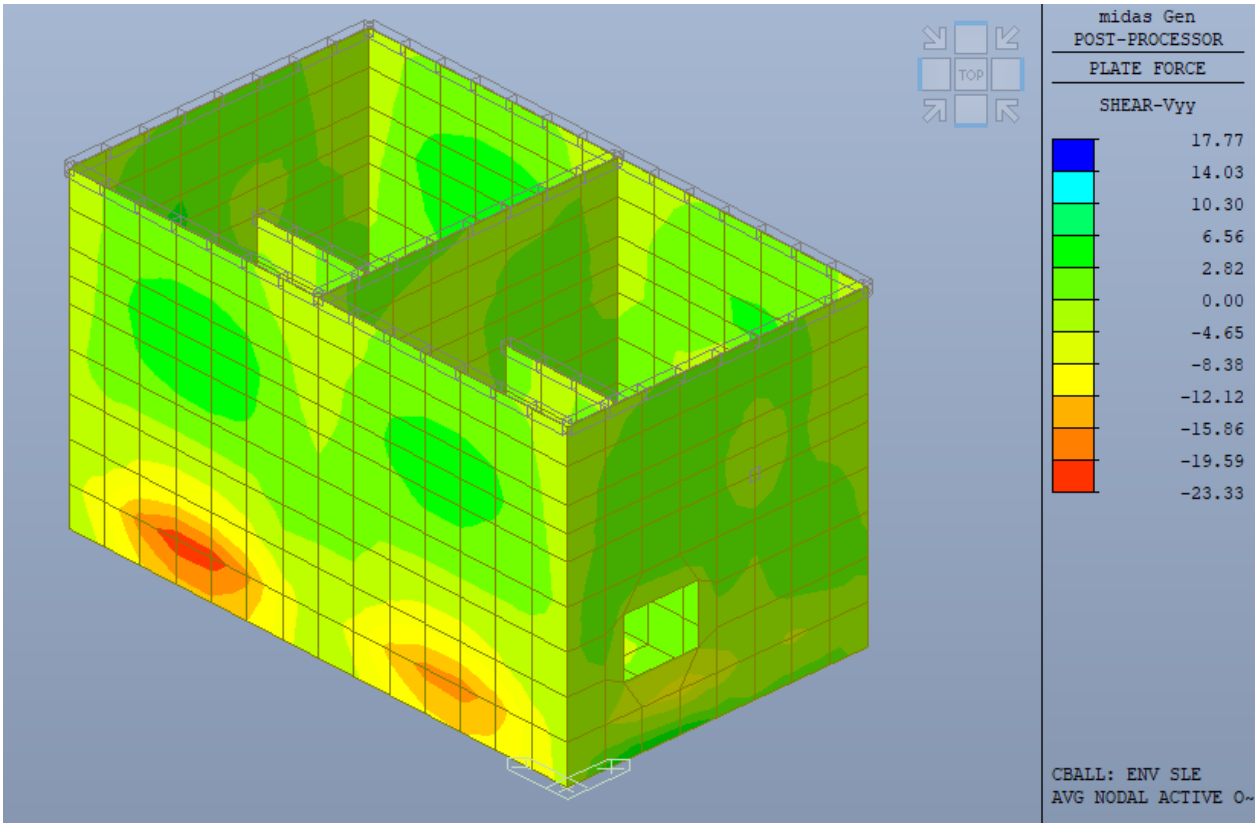
Momento flettente membranale Mxx – inviluppo SLE [kN*m/m]



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



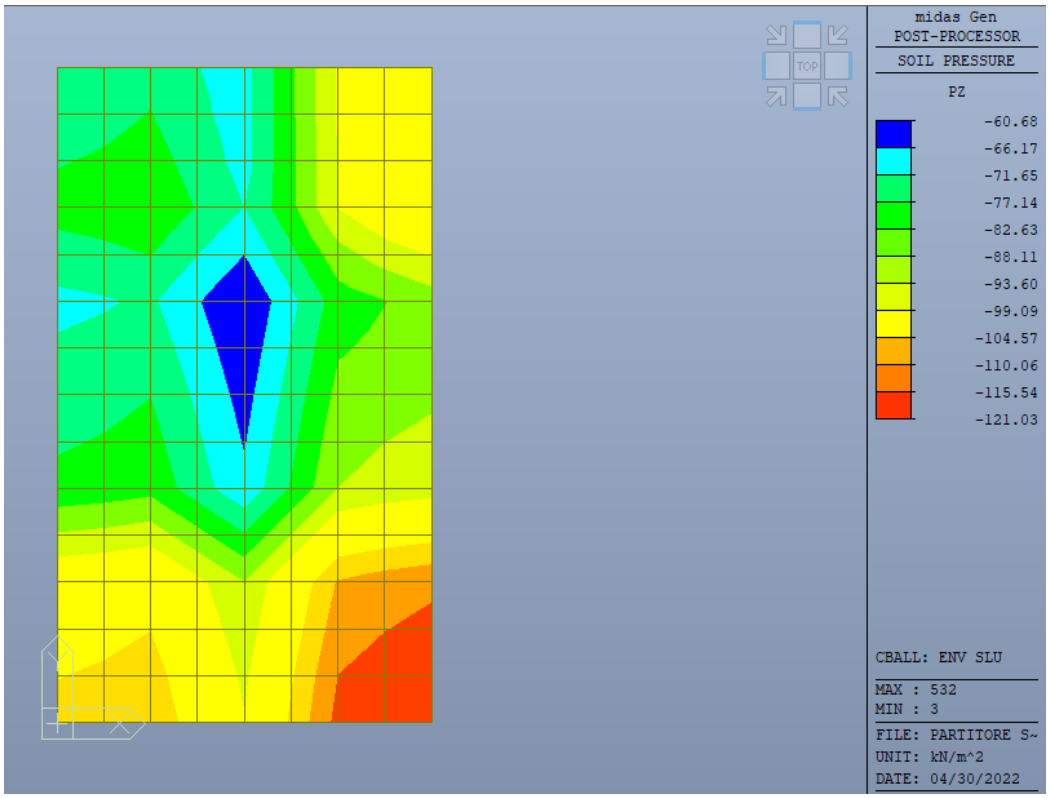
Sollecitazione tagliante Vxx – inviluppo SLE [kN/m]



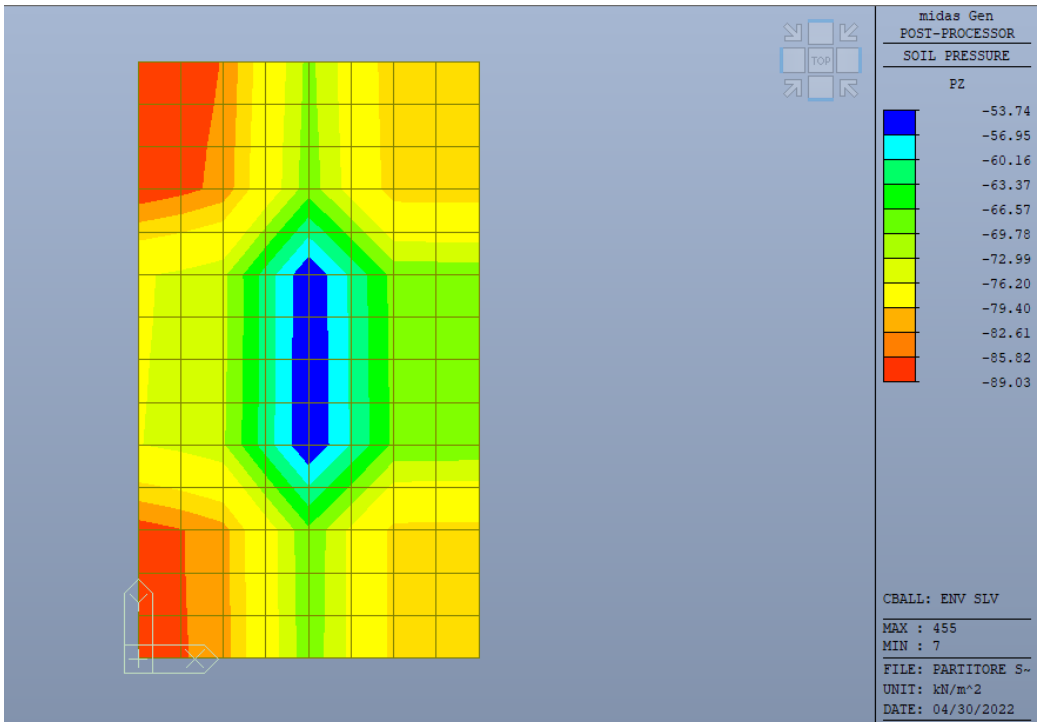
Sollecitazione tagliante Vyy – inviluppo SLE [kN/m]

1.4 Reazioni vincolari e pressioni sul terreno

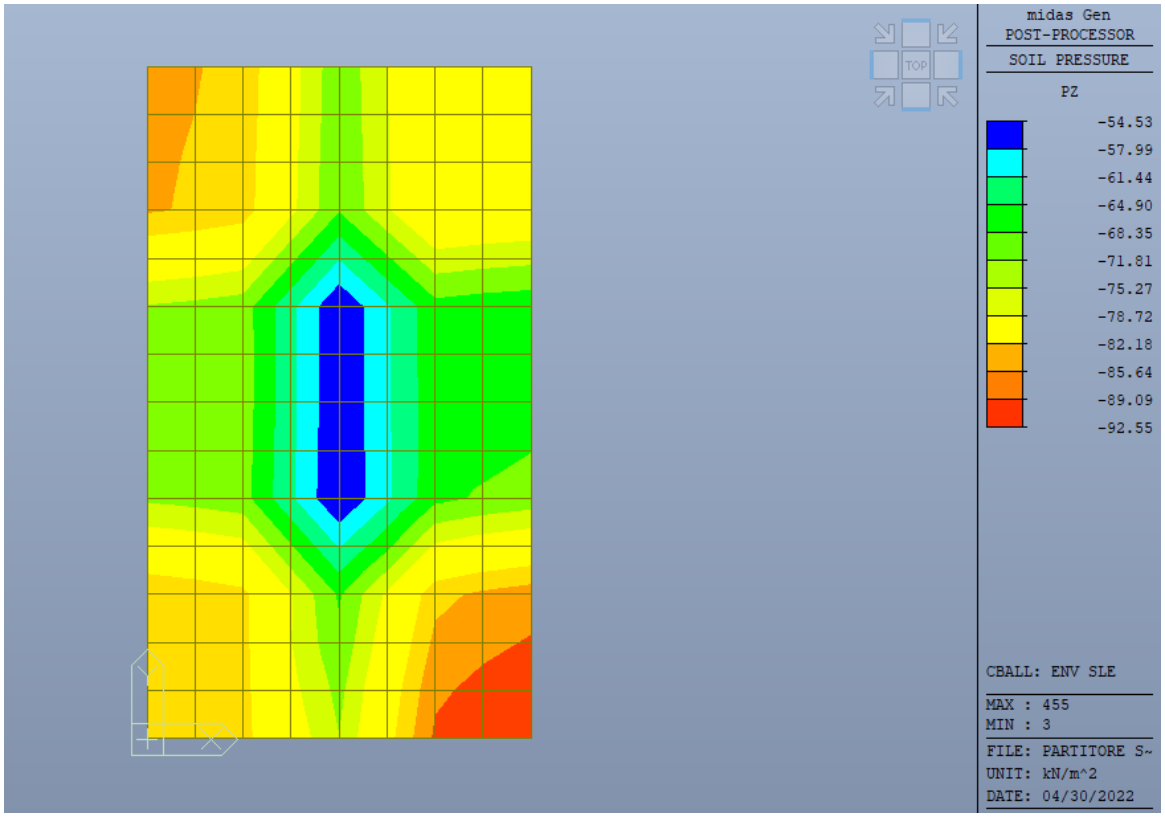
Nel presente paragrafo vengono riportate le reazioni vincolari e le pressioni sul terreno.



Pressioni sul terreno ENV SLU



Pressioni sul terreno ENV SLV



Pressioni sul terreno ENV SLE

SUMMATION OF REACTION FORCES PRINTOUT							
	Load	FX (kN)	FY (kN)	FZ (kN)			
	SLU 1	-10.253568	2.957760	1319.756000			
	SLU 2	-14.926080	4.305600	1086.796000			
	SLU 3	59.852182	-7.338240	1527.964000			
	SLU 4	-19.853568	5.357760	1249.196000			
	SLU 5	53.132182	-5.658240	1527.964000			
	SLU 6	55.179670	-5.990400	1527.964000			
	SLU 7	48.459670	-4.310400	1527.964000			
	SLU 8	45.579670	-3.590400	1506.796000			
	SLV 1	-10.389760	2.462880	960.920000			
	SLV 2	-10.389760	2.087520	960.920000			
	SLV 3	-5.384960	2.462880	960.920000			
	SLV 4	-5.384960	2.087520	960.920000			
	SLV 5	-8.638080	2.900800	960.920000			
	SLV 6	-8.638080	1.649600	960.920000			
	SLV 7	-7.136640	2.900800	960.920000			
	SLV 8	-7.136640	1.649600	960.920000			
	SLV 9	66.272240	-7.376970	1281.240000			
	SLV 10	66.272240	1.367370	1281.240000			
	SLV 11	127.679040	-7.376970	1281.240000			
	SLV 12	127.679040	1.367370	1281.240000			
	SLV 13	87.764620	-17.578700	1281.240000			
	SLV 14	87.764620	11.569100	1281.240000			
	SLV 15	106.186660	-17.578700	1281.240000			
	SLV 16	106.186660	11.569100	1281.240000			
	SLE R1	-7.887360	2.275200	1007.960000			
	SLE R2	-11.481600	3.312000	828.760000			
	SLE R3	46.040140	-5.644800	1168.120000			
	SLE R4	-14.287360	3.875200	960.920000			
	SLE R5	41.560140	-4.524800	1168.120000			
	SLE R6	42.445900	-4.608000	1168.120000			
	SLE R7	37.965900	-3.488000	1168.120000			
	SLE R8	36.045900	-3.008000	1144.600000			
	SLE F1	-7.887360	2.275200	984.440000			
	SLE F2	-9.807360	2.755200	984.440000			
	SLE F3	96.975640	-3.004800	1304.760000			
	SLE F4	95.055640	-2.524800	1304.760000			
	SLE Qp	96.975640	-3.004800	1281.240000			

Reazioni vincolari

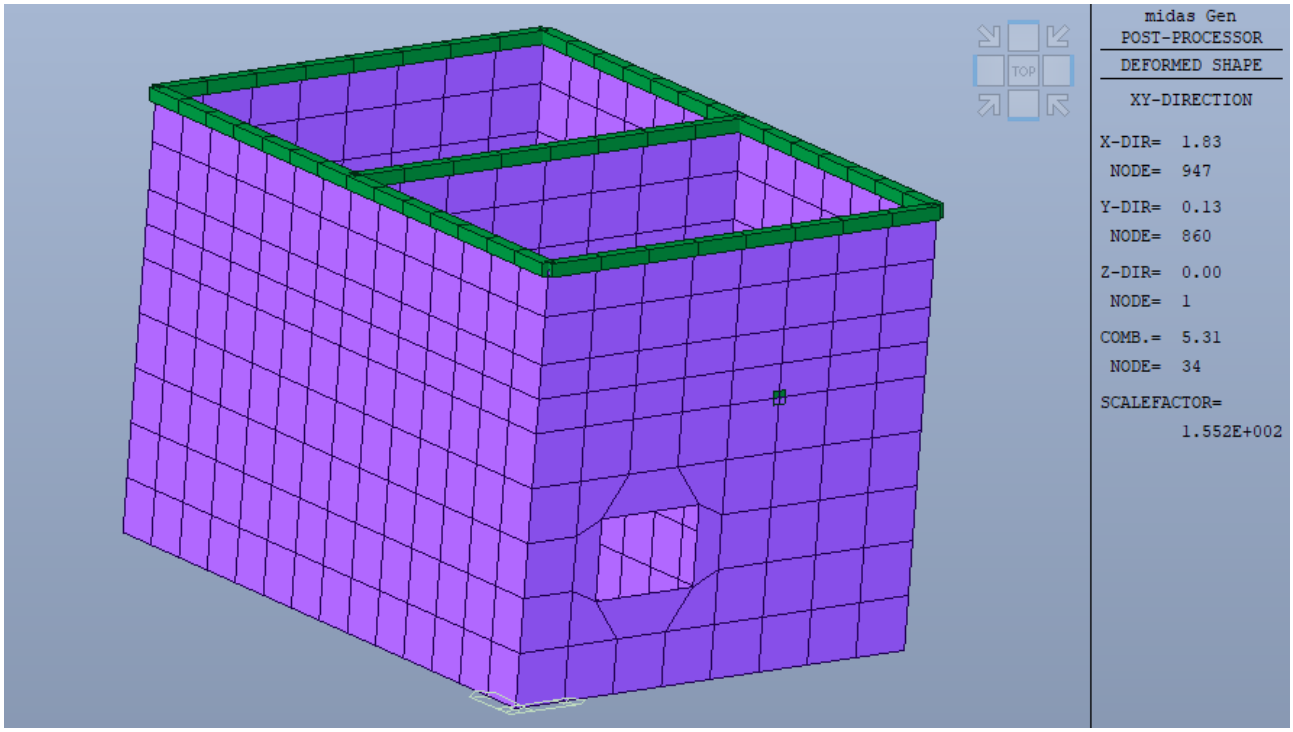
1.5 Deformazioni

Per le costruzioni ricadenti in classe d'uso 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 ≤ drp ≤ 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

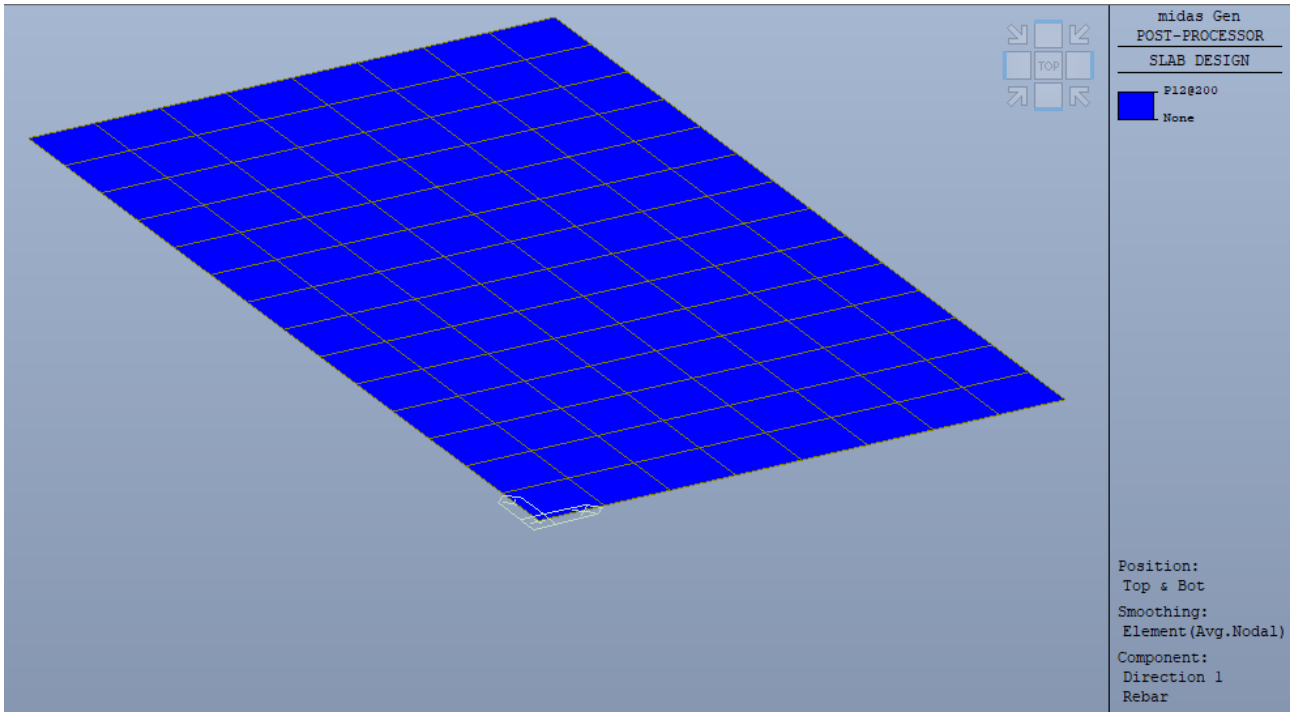
Premesso che l'opera in oggetto è completamente in c.a. e che quindi anche il superamento di questi limiti non produrrebbe alcun effetto, dall'immagine seguente si evince che lo spostamento massimo sotto l'azione sismica a SLO è pari a 1.8 mm che corrisponde a circa 0,0004 h, quindi trascurabile.



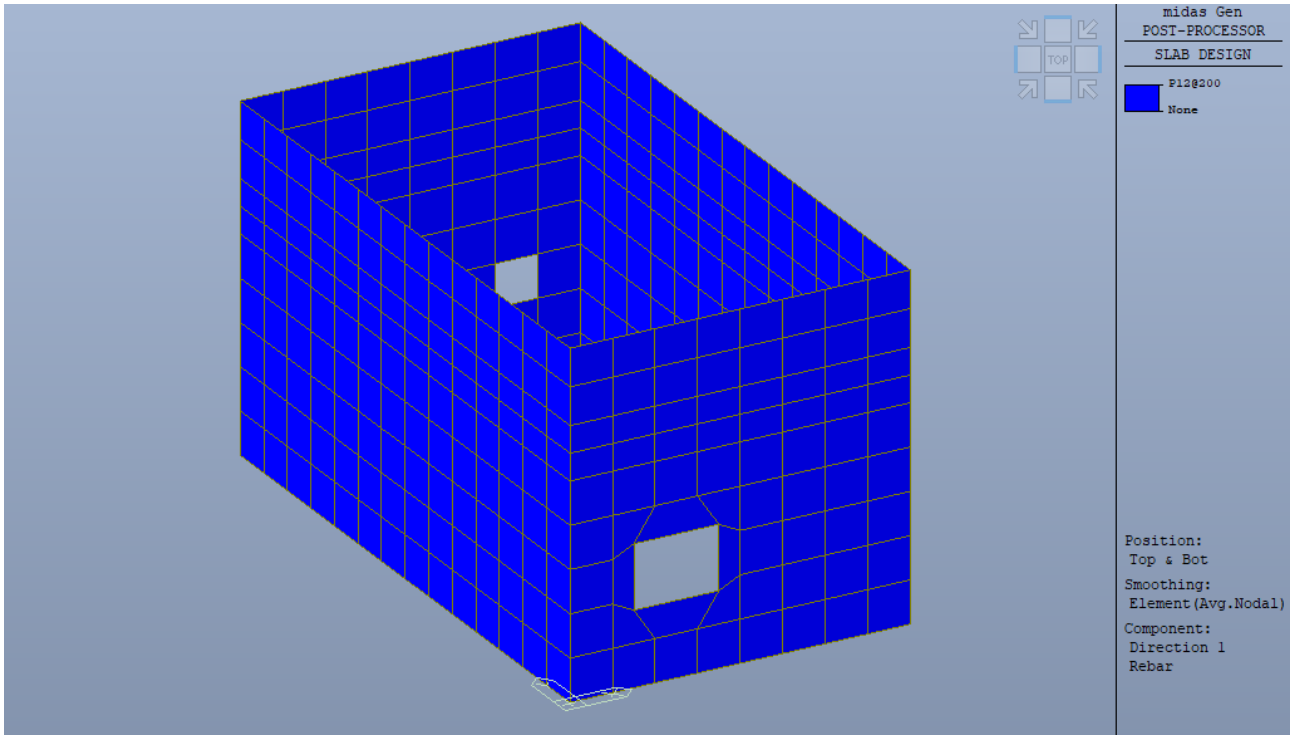
Massime deformazioni SLO combinata XY [cm]

1.6 Armature previste

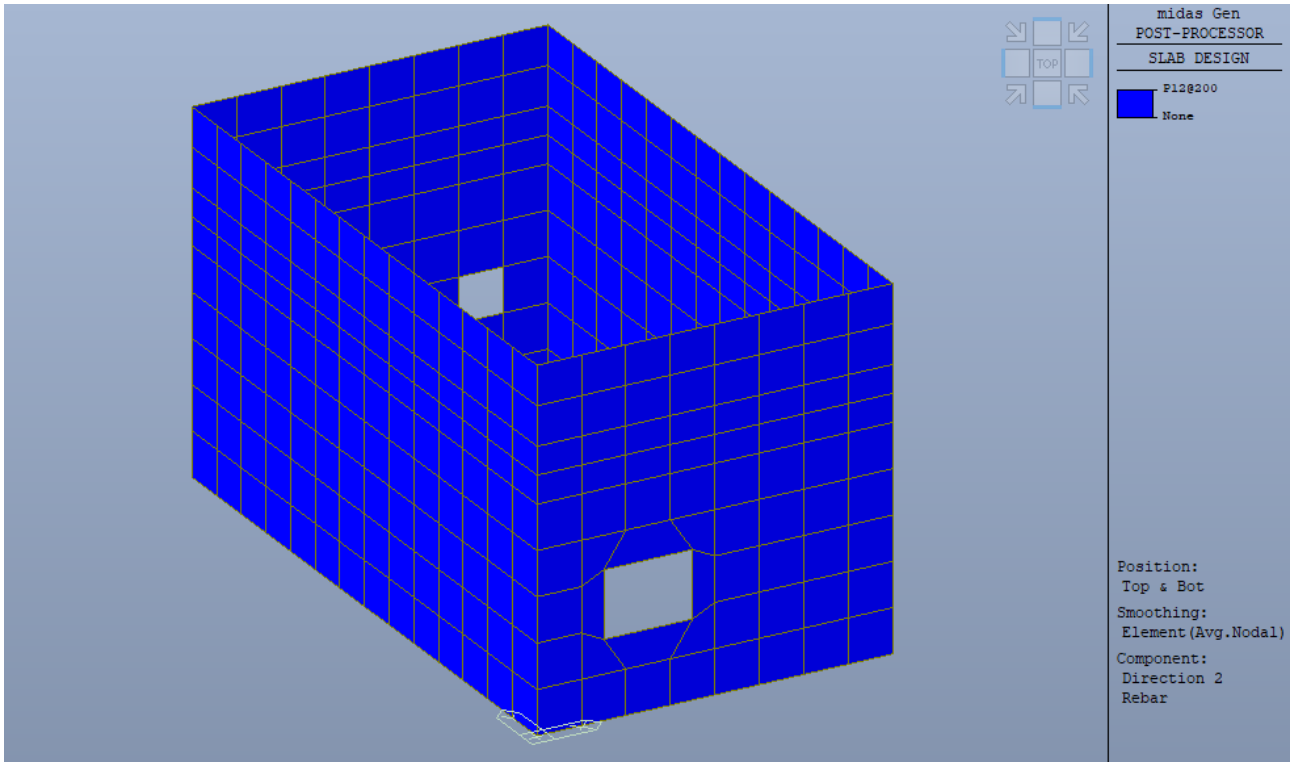
Nelle immagini seguenti vengono riportate le armature previste per i vari elementi strutturali.



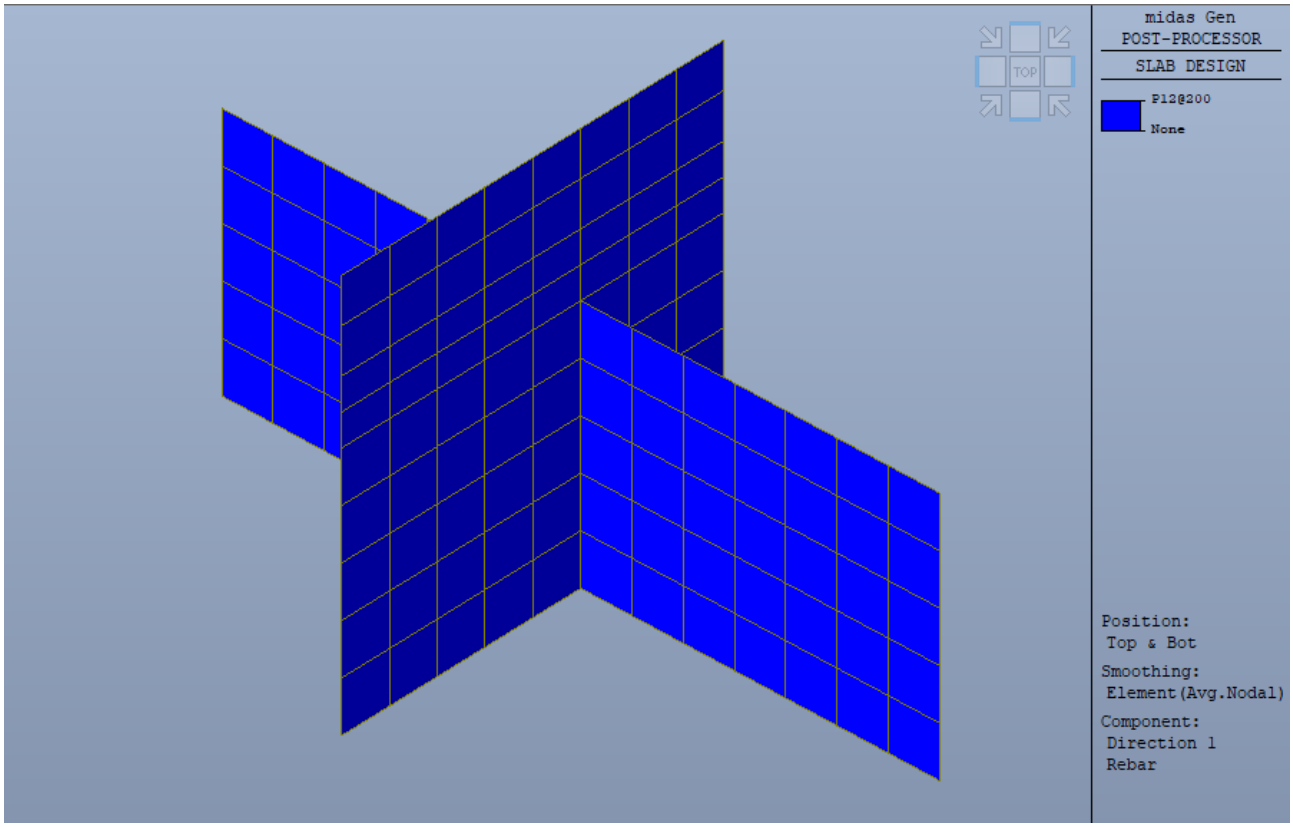
Platea – armature in direzione X e Y – ambo i lati



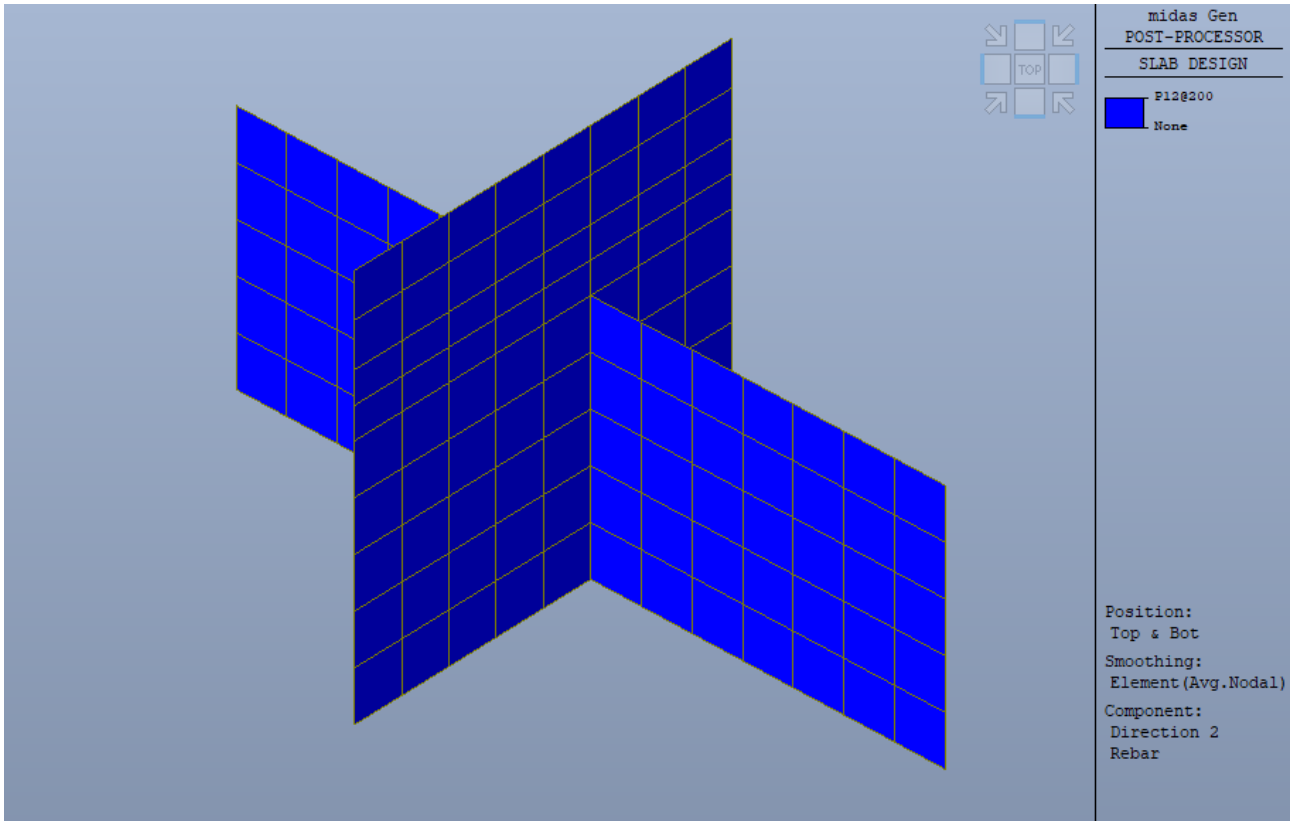
Pareti esterne – armature in direzione orizzontale – ambo i lati



Pareti esterne – armature in direzione verticale – ambo i lati



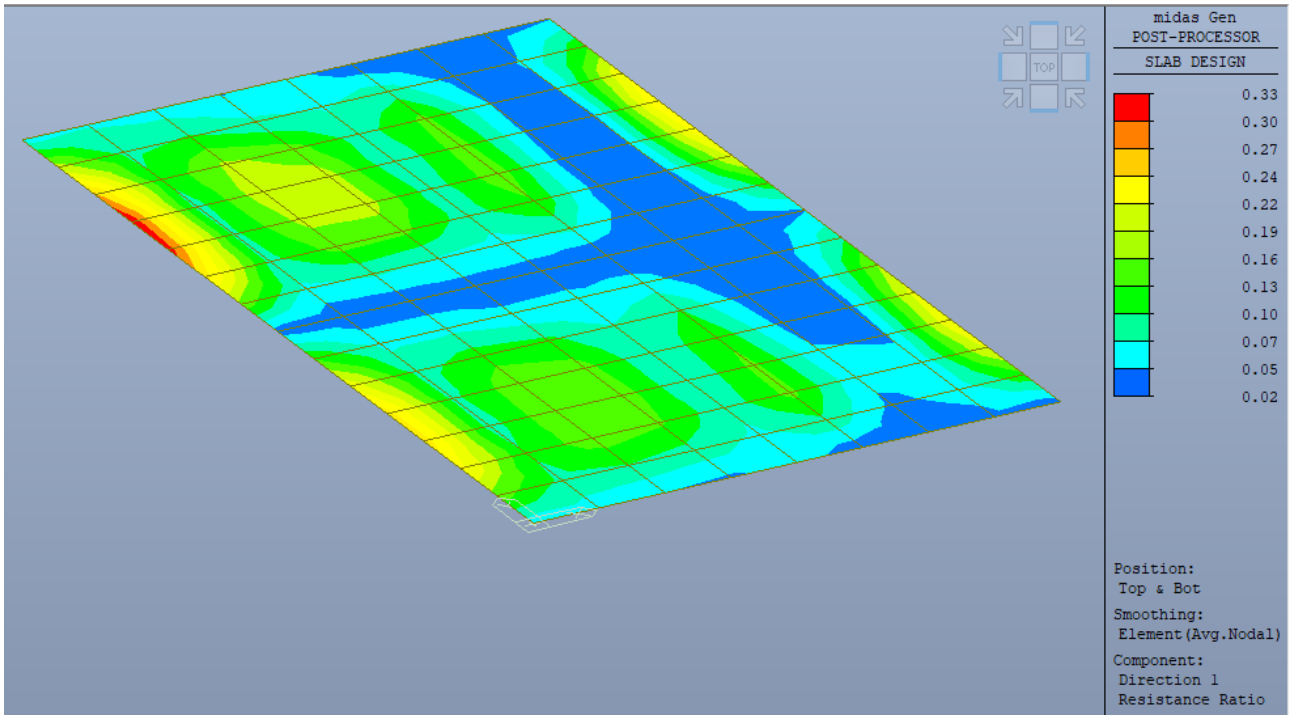
Pareti interne – armature in direzione orizzontale – ambo i lati



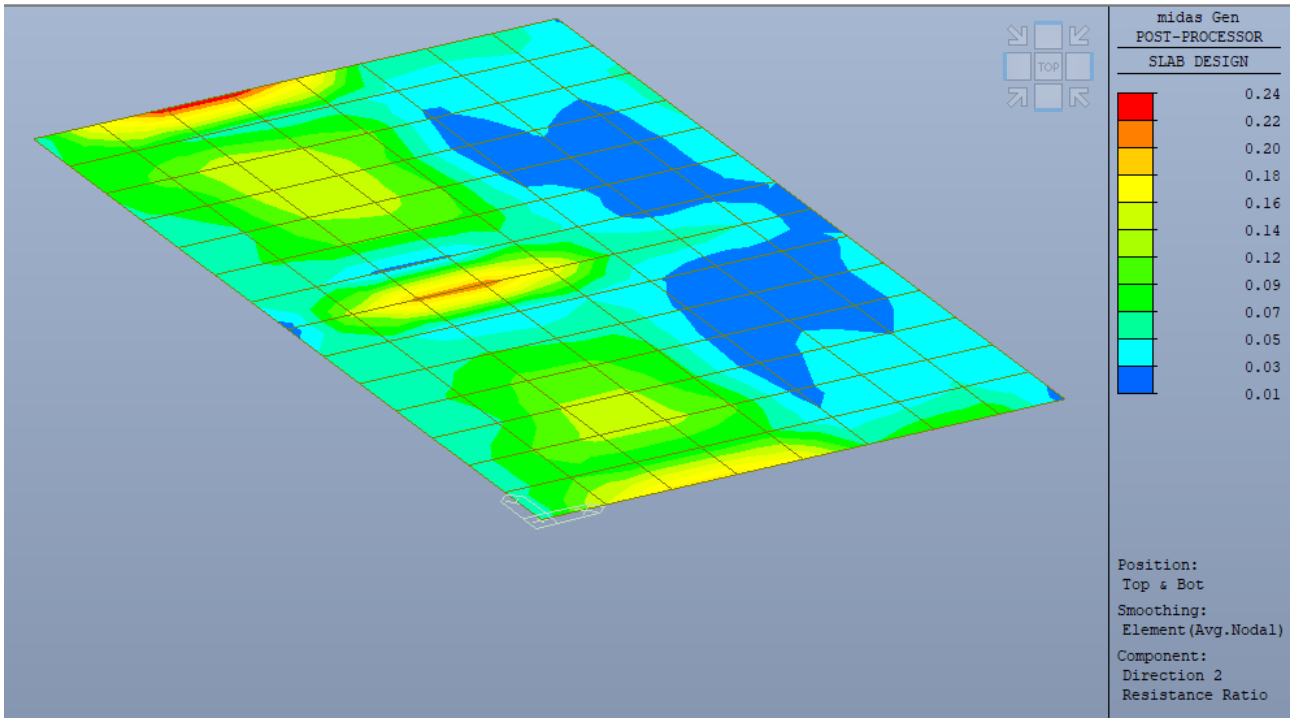
Pareti interne – armature in direzione verticale – ambo i lati

1.7 Verifiche di resistenza SLU grafiche

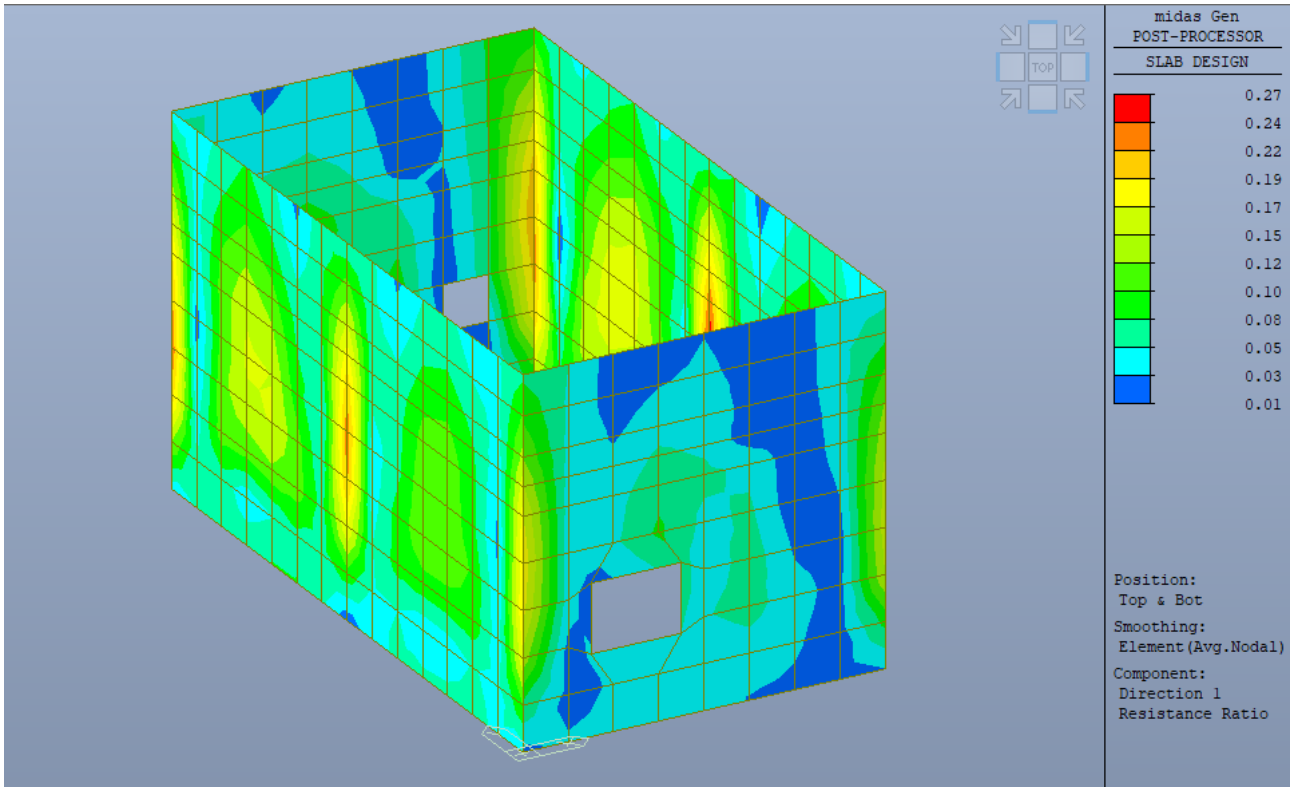
Nelle immagini seguenti vengono riportate le verifiche strutturali per via grafica, come tassi di sfruttamento dell'armatura nelle sezioni di cemento armato, sia per le sollecitazioni flessionali che taglianti:



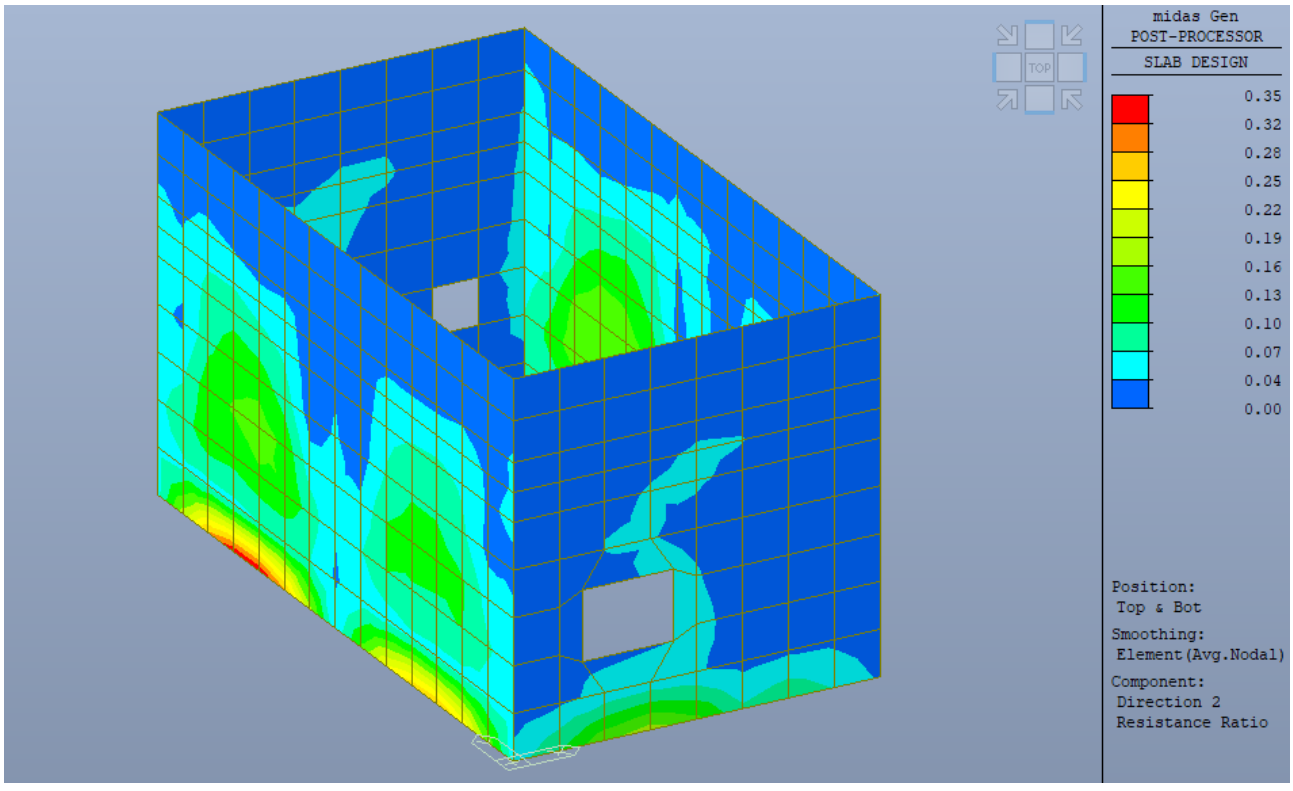
Platea - Indici di resistenza a flessione direzione X (inviluppo SLU e SLV)



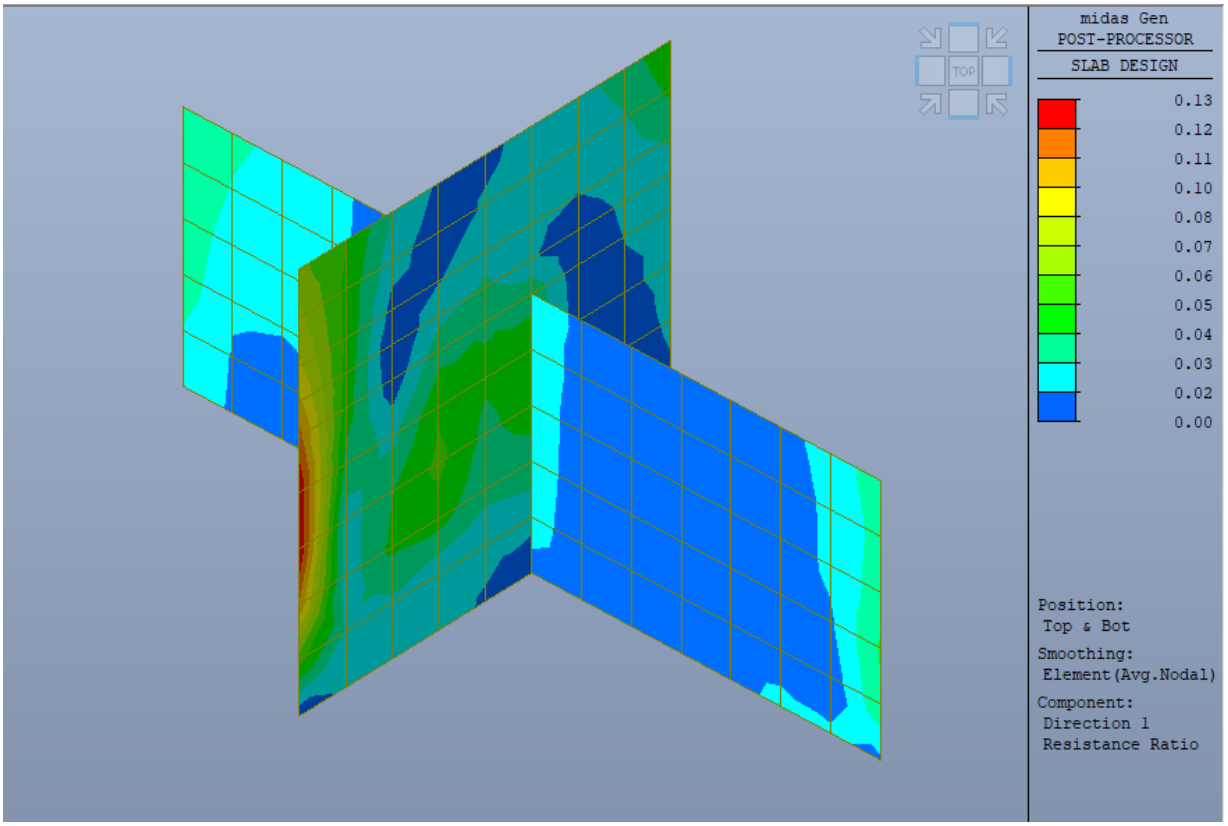
Platea - Indici di resistenza a flessione direzione Y (inviluppo SLU e SLV)



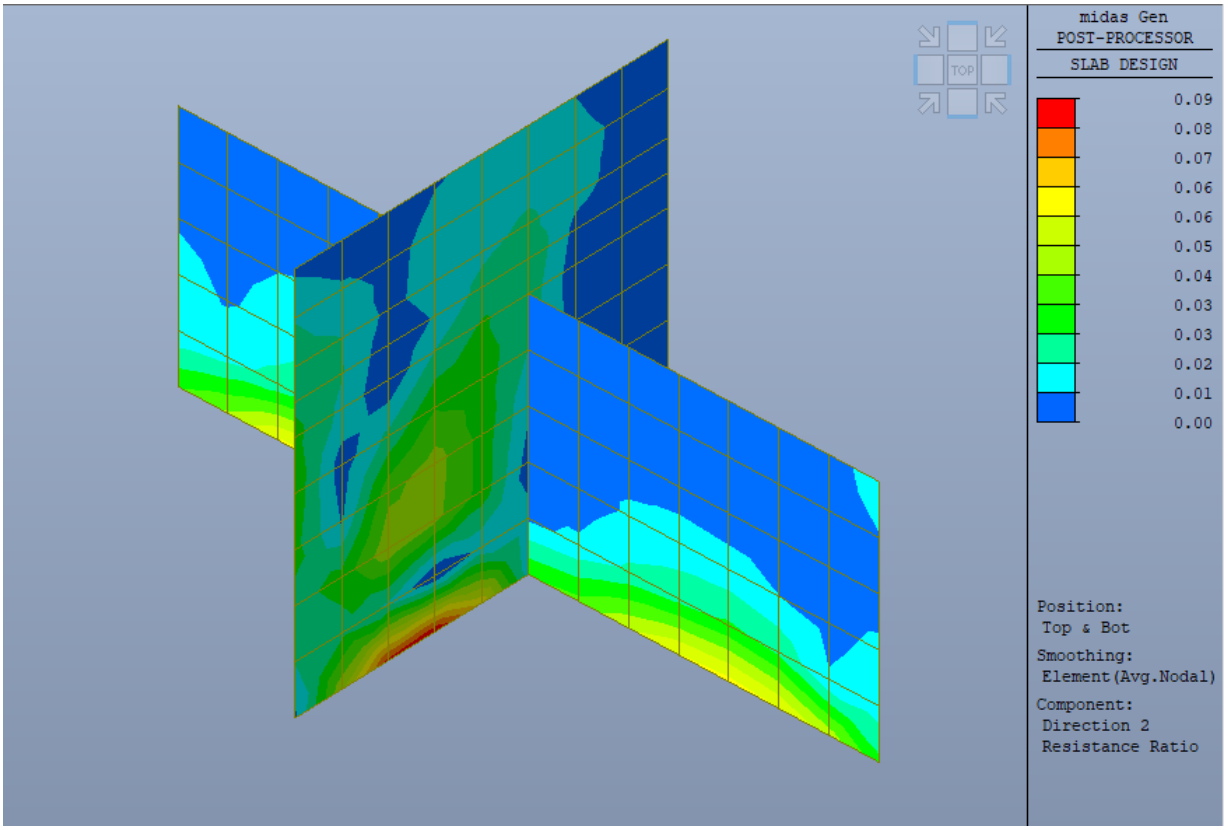
Pareti esterne - Indici di resistenza a flessione direzione orizzontale (inviluppo SLU e SLV)



Pareti esterne - Indici di resistenza a flessione direzione verticale (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 Platea

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

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

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

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

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

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

 0.3000    357 BOT 0.0004 0.0006 | 17.8551(   8) 54.0653 0.330  OK

         371 TOP 0.0004 0.0006 | 9.76843(   3) 54.0653 0.181  OK

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


<< BOTTOM >>


-. Information of Parameters.

  Elem No.  : 357

  Thickness :   0.3000 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.   :   8


-. Information of Design.

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

  d       =   0.2500 m.

  lambda  =   0.800

  a       = lambda * x  =   0.010 m.
```

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 17.8551 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.330 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 371

Thickness : 0.3000 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. : 3

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 9.7684 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.181 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	380	BOT	0.0004	0.0006	12.4916(8)	51.6656	0.242	OK
	371	TOP	0.0004	0.0006	7.05558(3)	51.6656	0.137	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 380

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 12.4916 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.242 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 371

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 3

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 7.0556 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.137 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

1.8.2 Verifiche Pareti Esterne

==========

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

==========

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

0.3000 56 BOT 0.0004 0.0006 | 4.39751(4) 54.0653 0.081 OK

41 TOP 0.0004 0.0006 | 10.2473(4) 54.0653 0.190 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 56

Thickness : 0.3000 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 = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 4.3975 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.081 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 41

Thickness : 0.3000 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 = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 10.2473 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.190 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	166	BOT	0.0004	0.0006	9.53534(8)	54.0653	0.176	OK
	185	TOP	0.0004	0.0006	14.3719(8)	54.0653	0.266	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 166

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 9.5353 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.176 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 185

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 14.3719 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.266 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 3, Dir 1.

==========

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

0.3000 296 BOT 0.0004 0.0006 | 12.5511(8) 54.0653 0.232 OK

285 TOP 0.0004 0.0006 | 5.95332(8) 54.0653 0.110 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 296

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 12.5511 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.232 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 285

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 5.9533 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.110 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 4, Dir 1.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	80	BOT	0.0004	0.0006	13.2508(8)	54.0653	0.245	OK
	96	TOP	0.0004	0.0006	8.25272(8)	54.0653	0.153	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 80

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 13.2508 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.245 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 96

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 8.2527 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.153 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	59	BOT	0.0004	0.0006	2.59005(4)	51.6656	0.050	OK
	52	TOP	0.0004	0.0006	9.04193(4)	51.6656	0.175	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 59

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 4

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 2.5900 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.050 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 52

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 4

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 9.0419 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.175 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	174	BOT	0.0004	0.0006	8.07321(8)	51.6656	0.156	OK
	202	TOP	0.0004	0.0006	14.7274(8)	51.6656	0.285	OK

<< BOTTOM >

-. Information of Parameters.

Elem No. : 174

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 8.0732 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.156 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 202

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 14.7274 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.285 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 3, Dir 2.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	282	BOT	0.0004	0.0006	12.3696(8)	51.6656	0.239	OK
	283	TOP	0.0004	0.0006	4.77083(8)	51.6656	0.092	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 282

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 12.3696 kN-m./m.

M_Rd = 51.6656 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 = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 283

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 4.7708 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.092 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 4, Dir 2.

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.3000	97	BOT	0.0004	0.0006	17.9335(8)	51.6656	0.347	OK
	100	TOP	0.0004	0.0006	7.41982(8)	51.6656	0.144	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 97

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 17.9335 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.347 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 100

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 7.4198 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.144 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

1.8.3 Verifiche Pareti Interne

==========

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

==========

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

0.2000 441 BOT 0.0003 0.0006 | 1.27291(3) 31.8656 0.040 OK

448 TOP 0.0003 0.0006 | 1.21734(8) 31.8656 0.038 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 441

Thickness : 0.2000 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. : 3

-. Information of Design.

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

d = 0.1500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 31.8656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0003 m^2/m. (0.0003 m^2/m.)

M_Ed = 1.2729 kN-m./m.

M_Rd = 31.8656 kN-m./m.

RatM = M_Ed / M_Rd = 0.040 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 448

Thickness : 0.2000 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. : 8

-. Information of Design.

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

d = 0.1500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 31.8656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0003 m^2/m. (0.0003 m^2/m.)

M_Ed = 1.2173 kN-m./m.

M_Rd = 31.8656 kN-m./m.

RatM = M_Ed / M_Rd = 0.038 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

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

0.3000 235 BOT 0.0004 0.0006 | 2.88008(8) 54.0653 0.053 OK

220 TOP 0.0004 0.0006 | 7.07968(3) 54.0653 0.131 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 235

Thickness : 0.3000 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. : 8

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 2.8801 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.053 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 220

Thickness : 0.3000 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. : 3

-. Information of Design.

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

d = 0.2500 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2208 kN.

M_Rd = Cc*(d-a/2) = 54.0653 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 7.0797 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.131 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.2000	443	BOT	0.0002	0.0006	0.45256(3)	29.5792	0.015	OK
	459	TOP	0.0002	0.0006	1.78536(20)	29.5792	0.060	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 443

Thickness : 0.2000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 3

-. Information of Design.

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

d = 0.1400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2193 kN.

M_Rd = Cc*(d-a/2) = 29.5792 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0002 m^2/m. (0.0002 m^2/m.)

M_Ed = 0.4526 kN-m./m.

M_Rd = 29.5792 kN-m./m.

RatM = M_Ed / M_Rd = 0.015 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 459

Thickness : 0.2000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 20

-. Information of Design.

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

d = 0.1400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2193 kN.

M_Rd = Cc*(d-a/2) = 29.5792 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0002 m^2/m. (0.0002 m^2/m.)

M_Ed = 1.7854 kN-m./m.

M_Rd = 29.5792 kN-m./m.

RatM = M_Ed / M_Rd = 0.060 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

==========

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

==========

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

0.3000 229 BOT 0.0004 0.0006 | 2.41111(8) 51.6656 0.047 OK

232 TOP 0.0004 0.0006 | 4.49748(8) 51.6656 0.087 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 229

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 2.4111 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.047 < 1.0 ---> O.K !

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

x/d = 0.040

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

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 232

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0600 m.

dT = 0.0600 m.

LCB No. : 8

-. Information of Design.

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

d = 0.2400 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2200 kN.

M_Rd = Cc*(d-a/2) = 51.6656 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m^2/m. (0.0004 m^2/m.)

M_Ed = 4.4975 kN-m./m.

M_Rd = 51.6656 kN-m./m.

RatM = M_Ed / M_Rd = 0.087 < 1.0 ---> O.K !

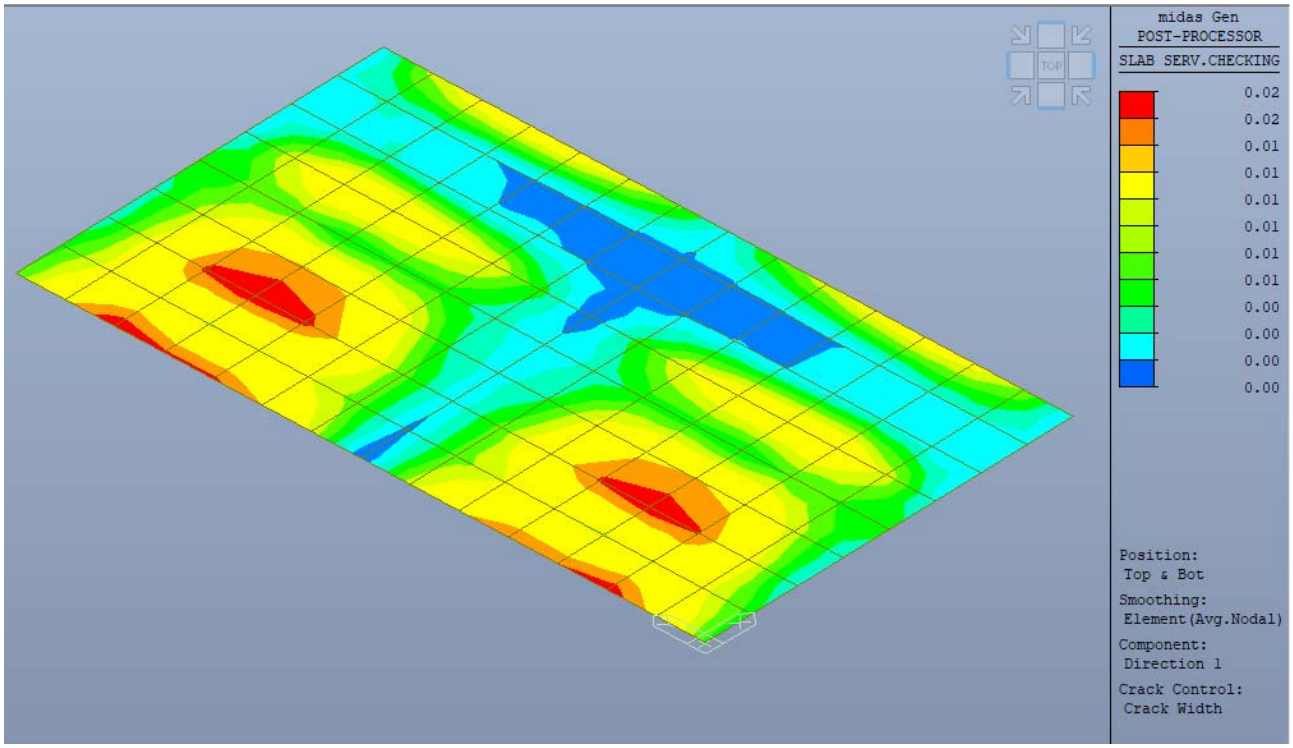
-. Check ratio of neutral axis depth to effective depth.

x/d = 0.040

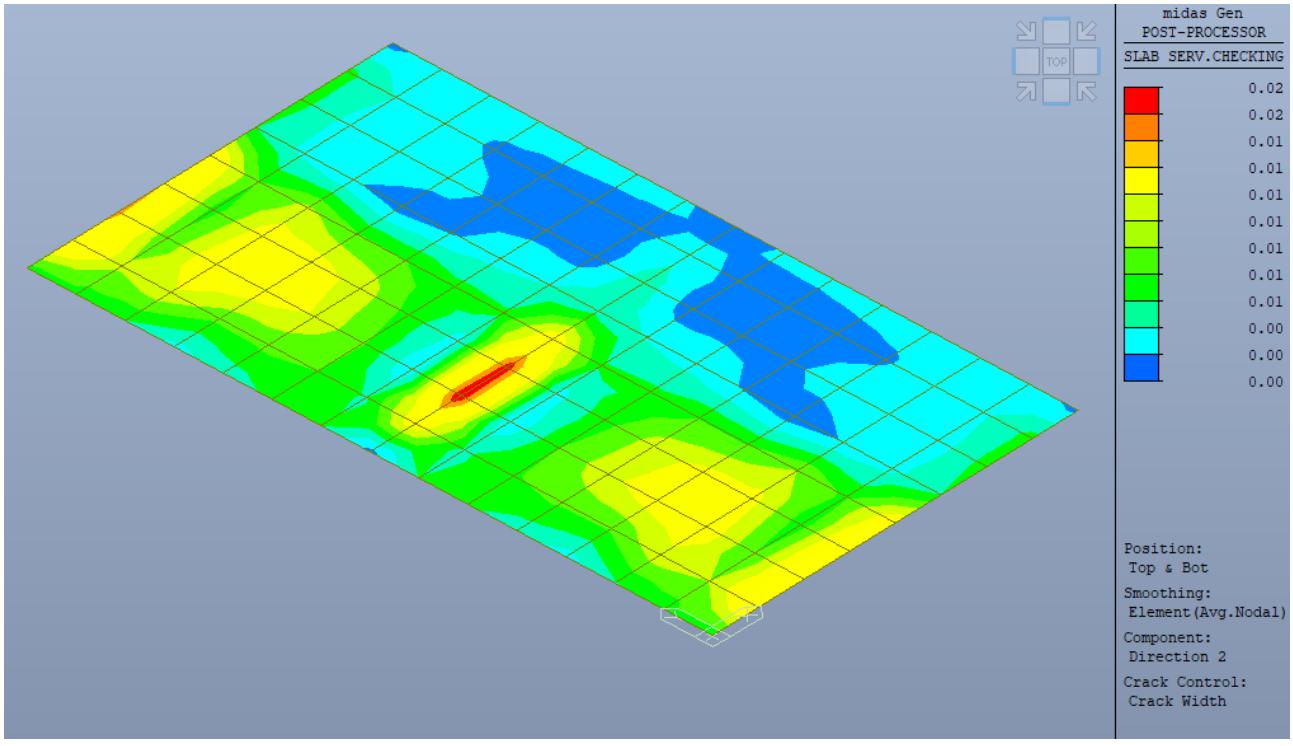
Limit(x/d) = 0.450 (fck <= 50 MPa.)

x/d ratio = 0.040/ 0.450 = 0.089 ---> O.K

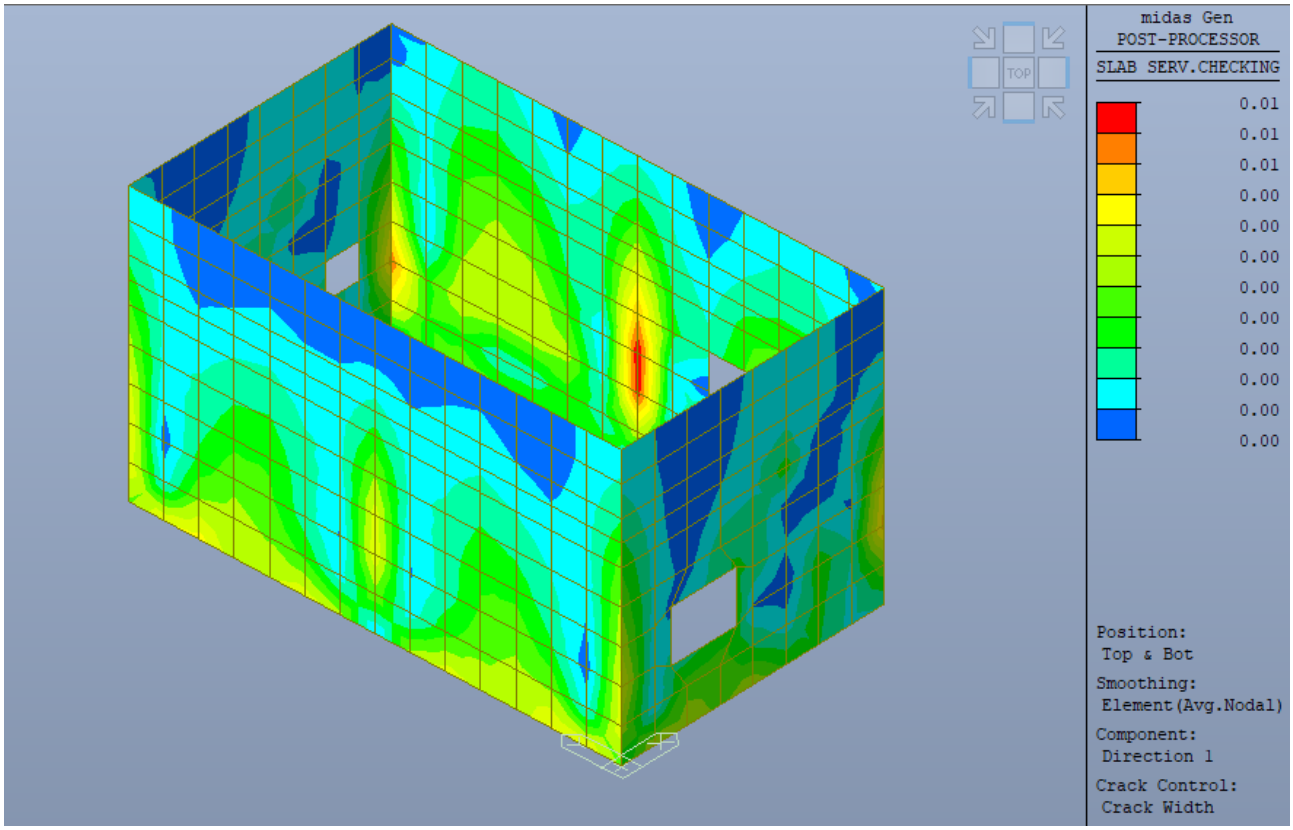
1.9 Verifiche in condizioni di esercizio SLE



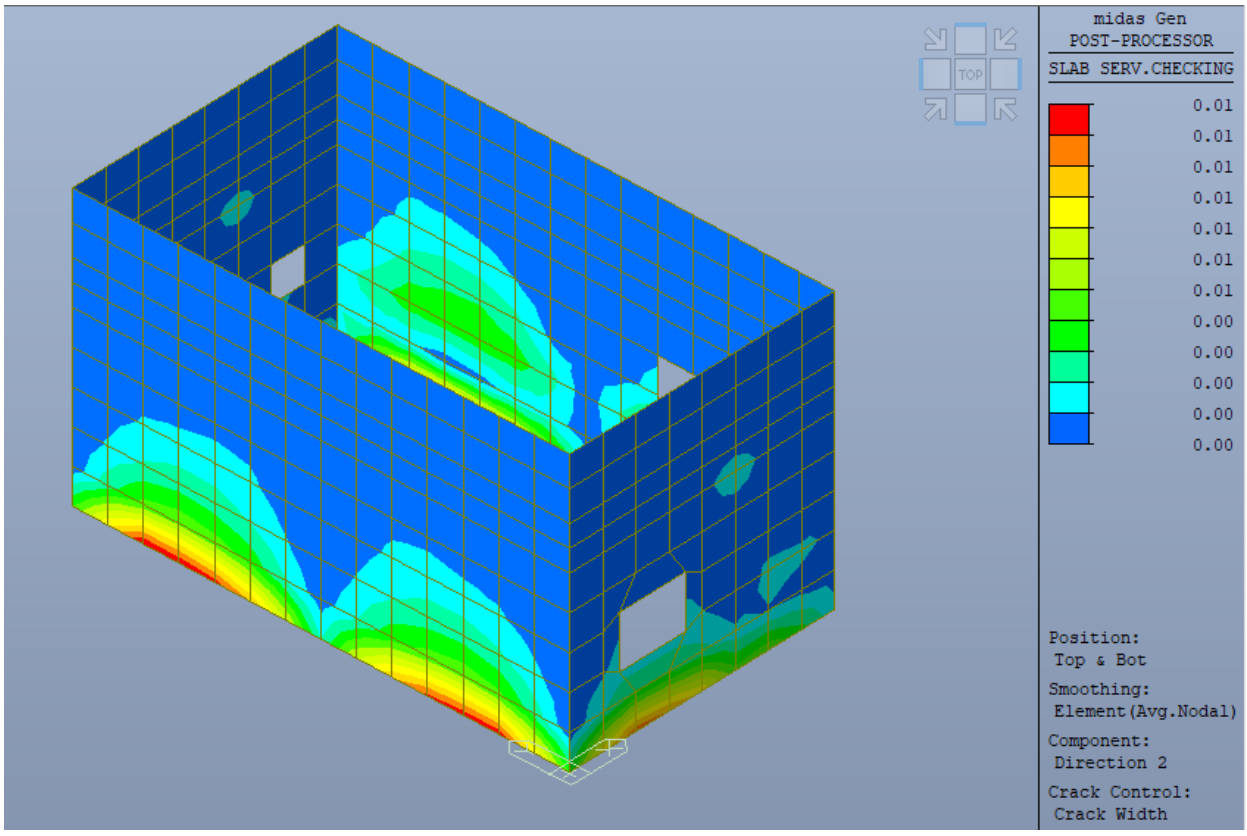
Platea – Verifica a fessurazione SLE - ratio direzione Y



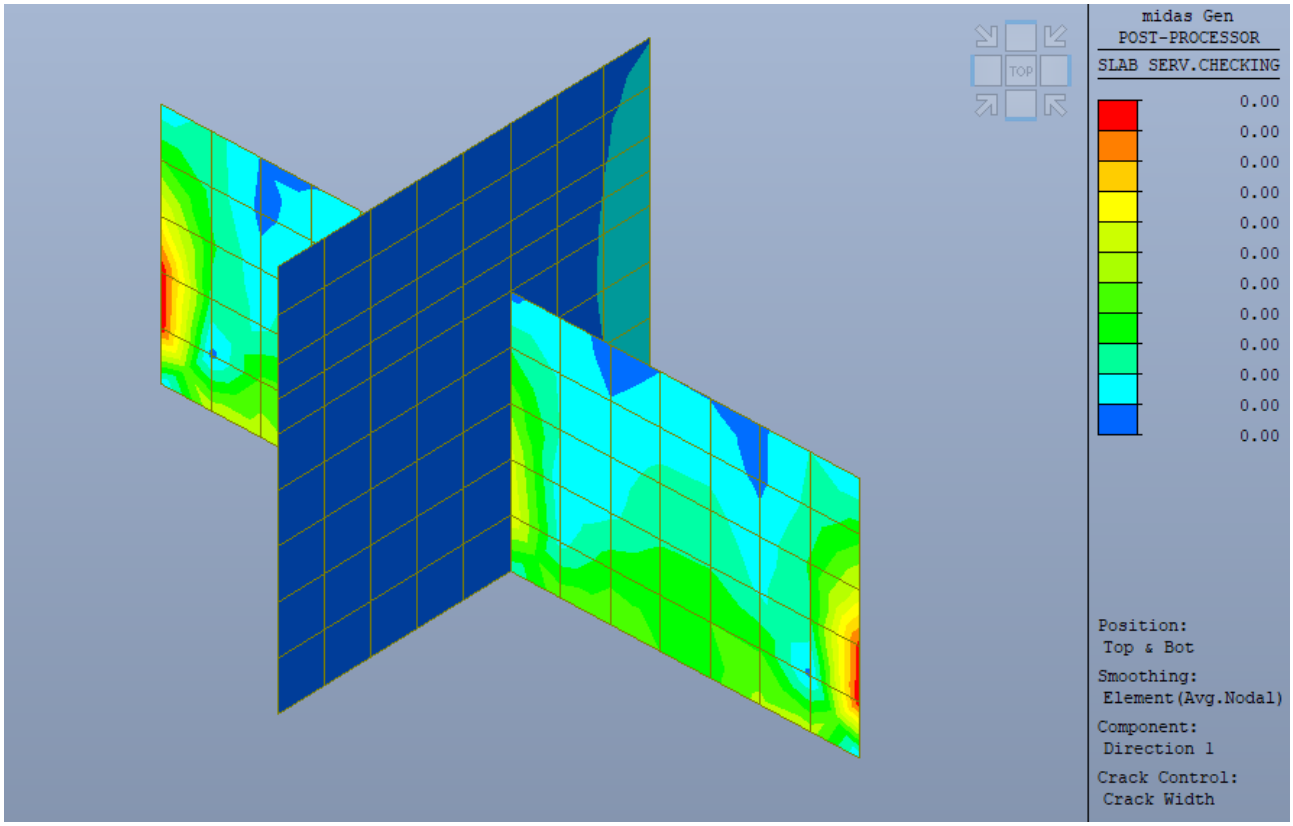
Platea – Verifica a fessurazione SLE - ratio direzione X



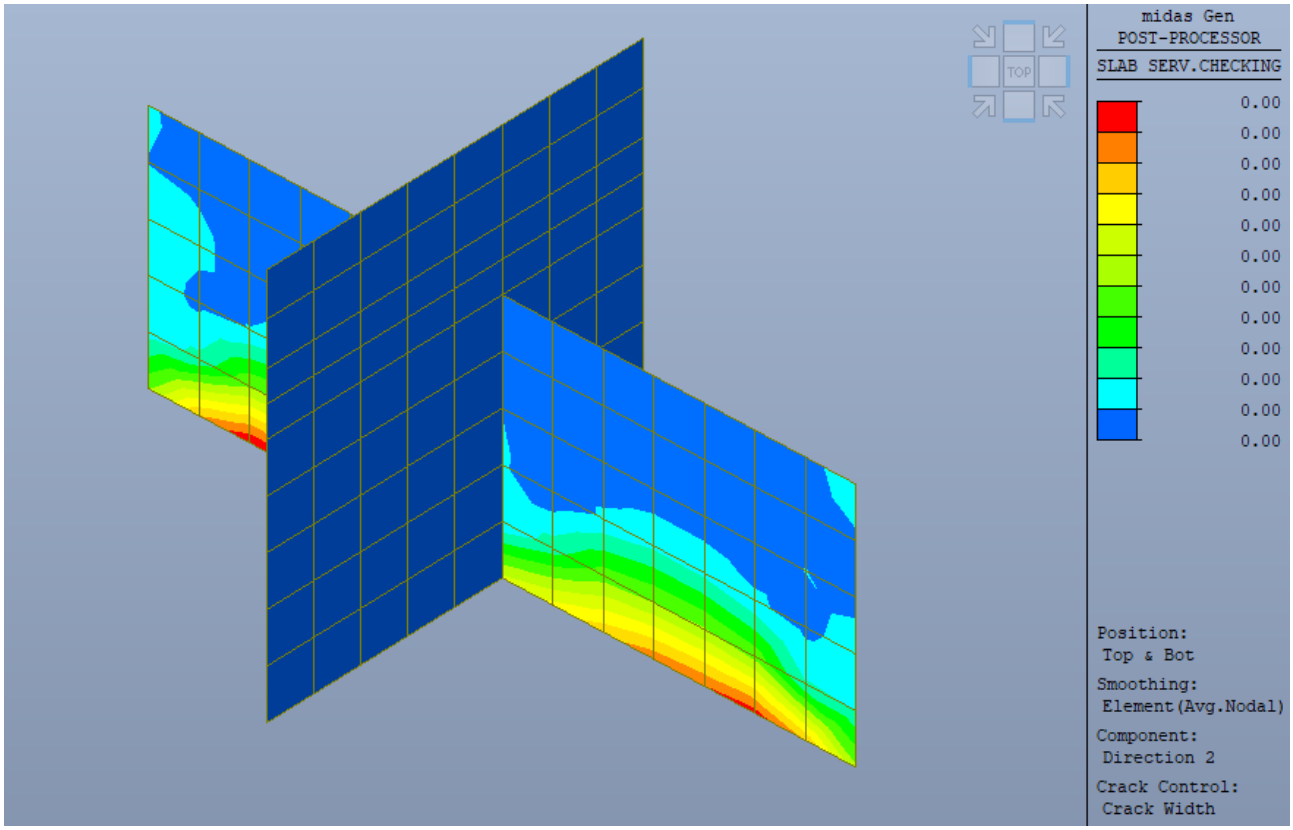
Pareti esterne – Verifica a fessurazione SLE - ratio direzione X



Pareti esterne – 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