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

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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 B

Rev.	AGGIORNAMENTI	DATA

OGGETTO

FASCICOLO DEI CALCOLI – MANUFATTO DI
FILTRAZIONE TERZIARIA

Il Responsabile
Dott. Ing. Riccardo ISOLA

Visto

* Riservato all'Amministrazione

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1 Fascicolo dei calcoli Manufatto di filtrazione terziaria

1.1 Dati della modellazione

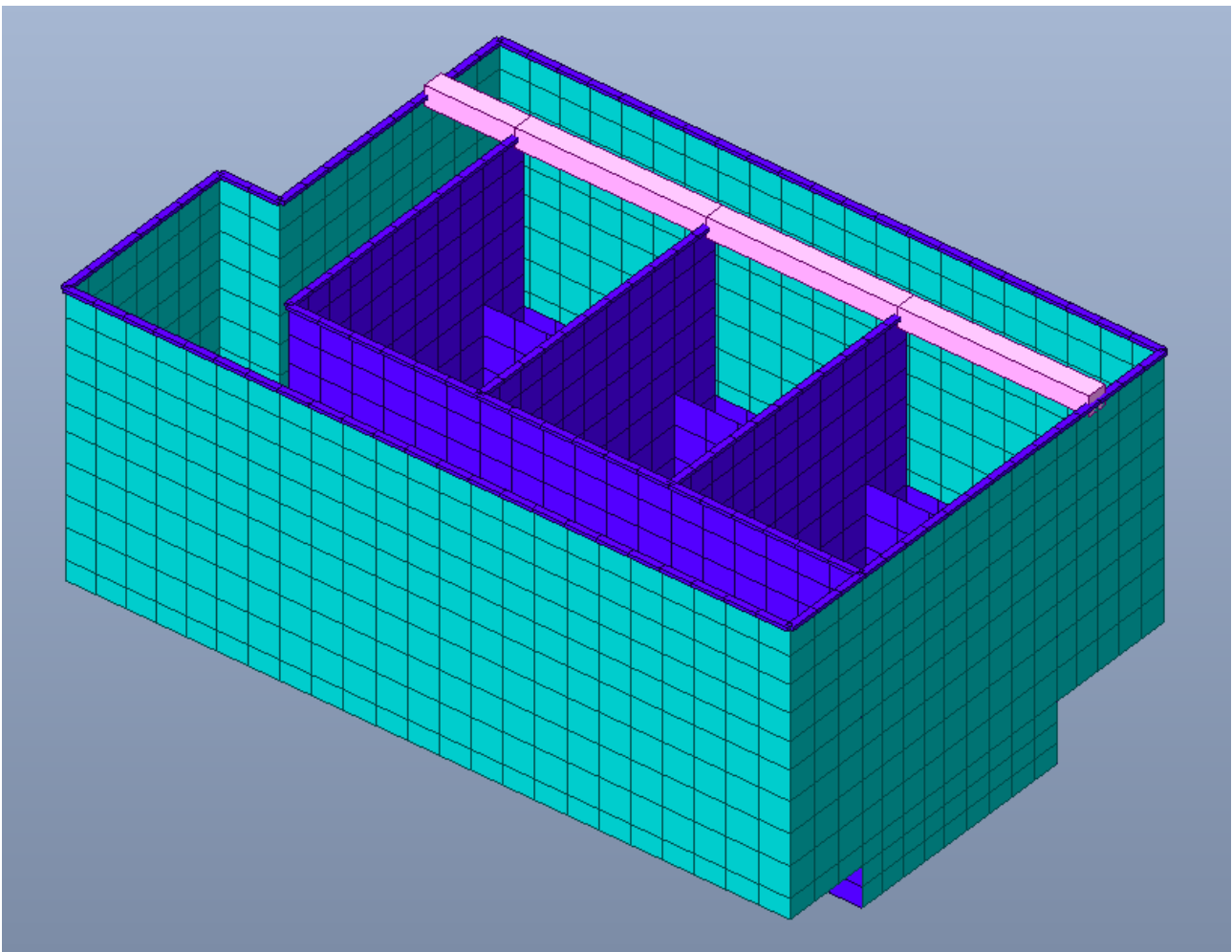
Nelle immagini seguenti viene riportato il modello di calcolo agli elementi finiti, realizzato con Midas Gen, con evidenziati i vari spessori degli elementi strutturali.

Gli elementi finiti adottati sono di tipo plate per le pareti e beam per le travi.

In particolare, gli spessori adottati per gli elementi plate sono i seguenti:

- Platee di fondazione a vari livelli, sp.40 cm;
- Pareti esterne sp.40 cm;
- Pareti interne sp.30 cm.

Le travi di sostegno delle coperture hanno invece sezione 30x30 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 11800 kN/m^3 , ricavata dalle caratteristiche geotecniche del terreno con la formula di Vesic.

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.

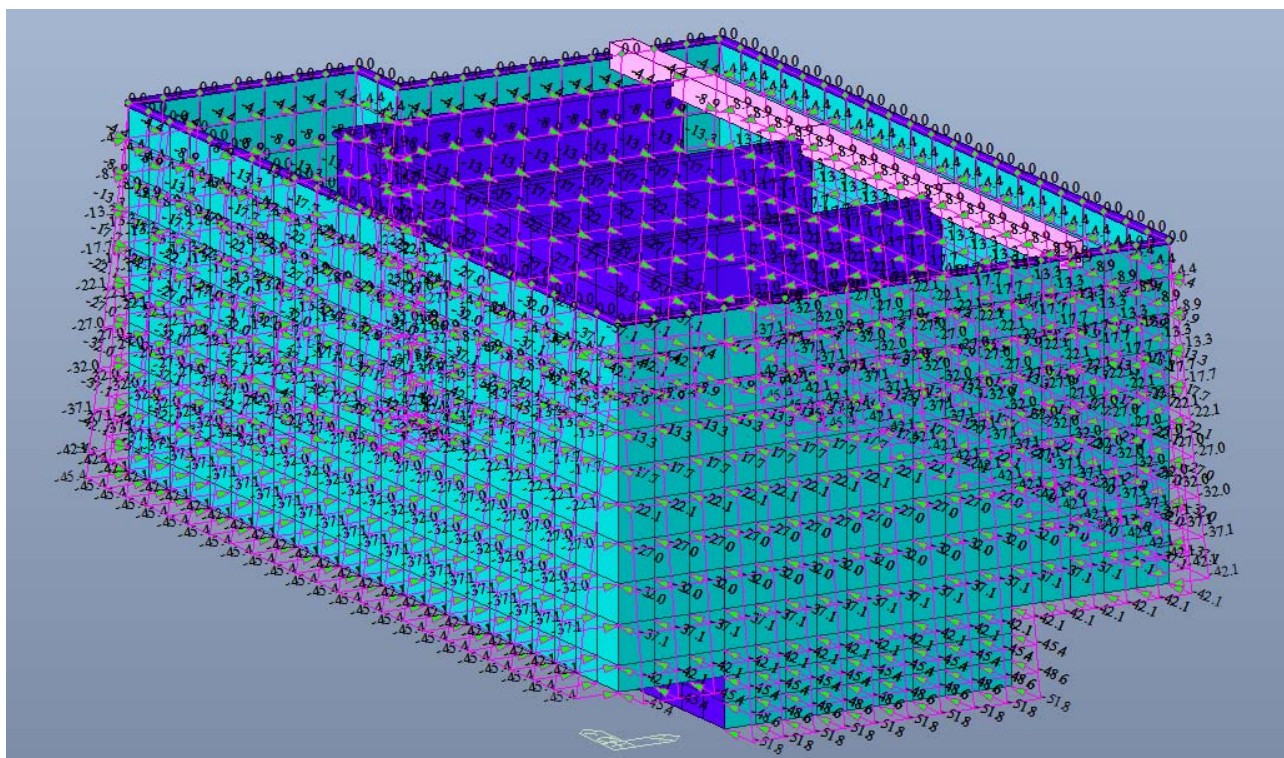
Le condizioni di carico adottate nella modellazione della struttura sono le seguenti:

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 Falda
4	SSL1	Dead Load (D)	Spinta Statica Liquame Config 1
5	SSL2	Dead Load (D)	Spinta Statica Liquame Config 2
6	SSL3	Dead Load (D)	Spinta Statica Liquame Config 3
7	SSS	Live Load (L)	Spinta Statica Sovraccarico
8	VM	Live Load (L)	Variabile Manutenzione
9	PF	Dead Load (D)	Permanente Filtri
10	PP	Dead Load (D)	Permanente Paratoie
11	PC	Dead Load (D)	Permanente Coperture
12	S GAL	Dead Load (D)	Spinta Galleggiamento
13	ET X	Earthquake (E)	Sovrappinta Sismica Terreno X
14	ET Y	Earthquake (E)	Sovrappinta Sismica Terreno Y
15	EL X	Earthquake (E)	Sovrappinta Sismica Liquame X
16	EL Y	Earthquake (E)	Sovrappinta Sismica Liquame Y

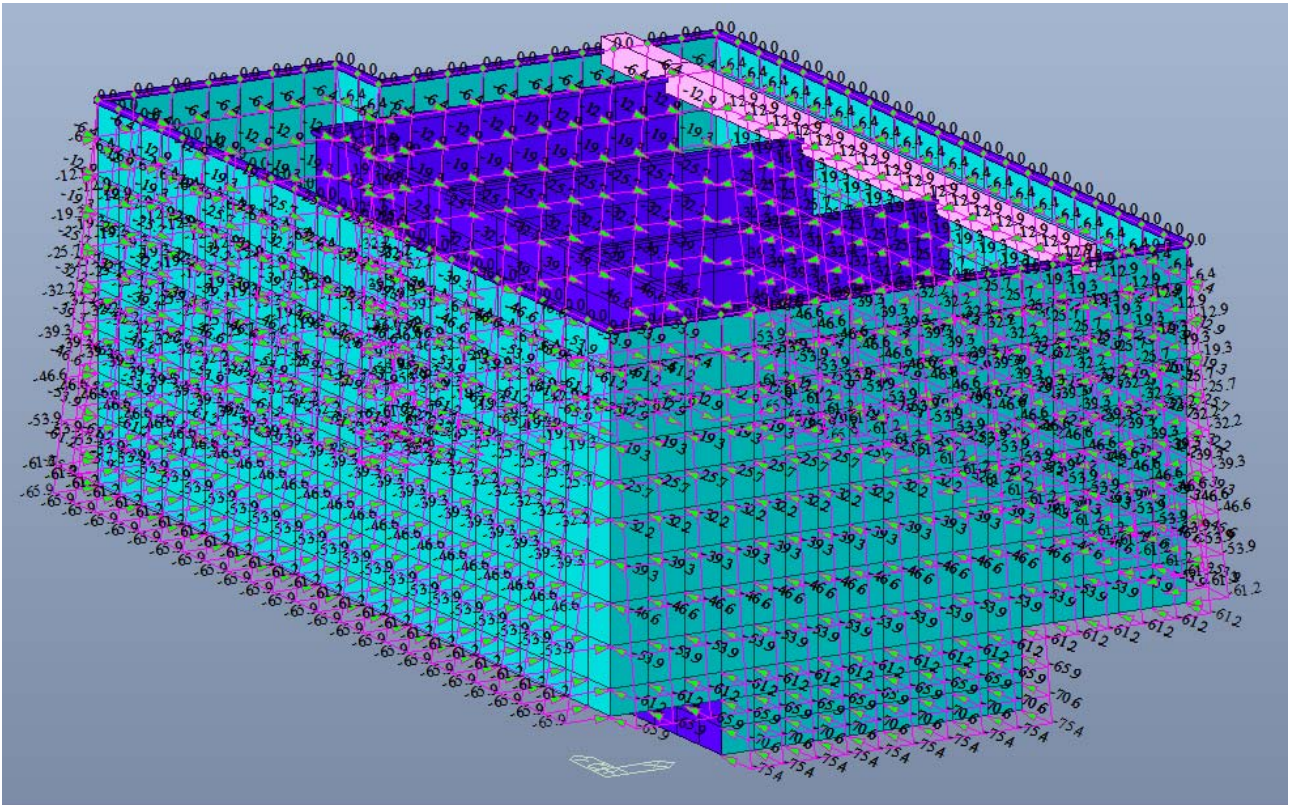
Le combinazioni delle condizioni di carico elementari, realizzate sulla base delle indicazioni del paragrafo 2.5.3 delle NTC 2018, sono le seguenti:

No	Name	DL(ST)	SST(ST)	SSTF(ST)	SSL1(ST)	SSL2(ST)	SSL3(ST)	SSS(ST)	VM(ST)	PF(ST)	PP(ST)	PC(ST)	S GAL(ST)	ET X(ST)	ET Y(ST)	EL X(ST)	EL Y(ST)
1	SLU 1	1.3000	1.3000		1.3000			1.5000		1.3000	1.3000	1.3000					
2	SLU 2	1.3000	1.3000			1.3000		1.5000		1.3000	1.3000	1.3000					
3	SLU 3	1.3000	1.3000				1.3000	1.5000		1.3000	1.3000	1.3000					
4	SLU 4	1.3000		1.3000						1.3000	1.3000	1.3000	1.3000				
5	SLU 5	1.3000		1.3000						1.3000	1.3000	1.3000					
6	SLU 6	1.3000	1.3000		1.3000			1.0500	1.5000	1.3000	1.3000	1.3000					
7	SLU 7	1.3000	1.3000			1.3000		1.0500	1.5000	1.3000	1.3000	1.3000					
8	SLU 8	1.3000	1.3000				1.3000	1.0500	1.5000	1.3000	1.3000	1.3000					
9	SLU 9	1.3000		1.3000				1.0500	1.5000	1.3000	1.3000	1.3000					
10	SLV 1	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		1.0000	0.3000	1.0000	0.3000
11	SLV 2	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		1.0000	-0.3000	1.0000	-0.3000
12	SLV 3	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		0.3000	1.0000	0.3000	1.0000
13	SLV 4	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		-0.3000	1.0000	-0.3000	1.0000
14	SLV 5	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		-1.0000	-0.3000	-1.0000	-0.3000
15	SLV 6	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		-1.0000	0.3000	-1.0000	0.3000
16	SLV 7	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		-0.3000	-1.0000	-0.3000	-1.0000
17	SLV 8	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000		0.3000	-1.0000	0.3000	-1.0000
18	SLE R1	1.0000	1.0000		1.0000			1.0000	0.3000	1.0000	1.0000	1.0000					
19	SLE R2	1.0000	1.0000		1.0000			0.7000	1.0000	1.0000	1.0000	1.0000					
20	SLE R3	1.0000	1.0000				1.0000	1.0000	0.3000	1.0000	1.0000	1.0000					
21	SLE R4	1.0000	1.0000			1.0000		1.0000	0.3000	1.0000	1.0000	1.0000					
22	SLE R5	1.0000	1.0000				1.0000	0.7000	1.0000	1.0000	1.0000	1.0000					
23	SLE R6	1.0000	1.0000			1.0000		0.7000	1.0000	1.0000	1.0000	1.0000					
24	SLE R7	1.0000	1.0000			1.0000		0.5000		1.0000	1.0000	1.0000					
25	SLE R8	1.0000	1.0000			1.0000		0.5000		1.0000	1.0000	1.0000					
26	SLE F1	1.0000	1.0000		1.0000			0.5000		1.0000	1.0000	1.0000					
27	SLE F2	1.0000	1.0000		1.0000			0.3000		1.0000	1.0000	1.0000					
28	SLE F3	1.0000	1.0000			1.0000		0.5000		1.0000	1.0000	1.0000					
29	SLE F4	1.0000	1.0000			1.0000		0.3000		1.0000	1.0000	1.0000					
30	SLE F5	1.0000	1.0000				1.0000	0.5000		1.0000	1.0000	1.0000					
31	SLE F6	1.0000	1.0000				1.0000	0.3000		1.0000	1.0000	1.0000					
32	SLE Qp	1.0000	1.0000		1.0000					1.0000	1.0000	1.0000					

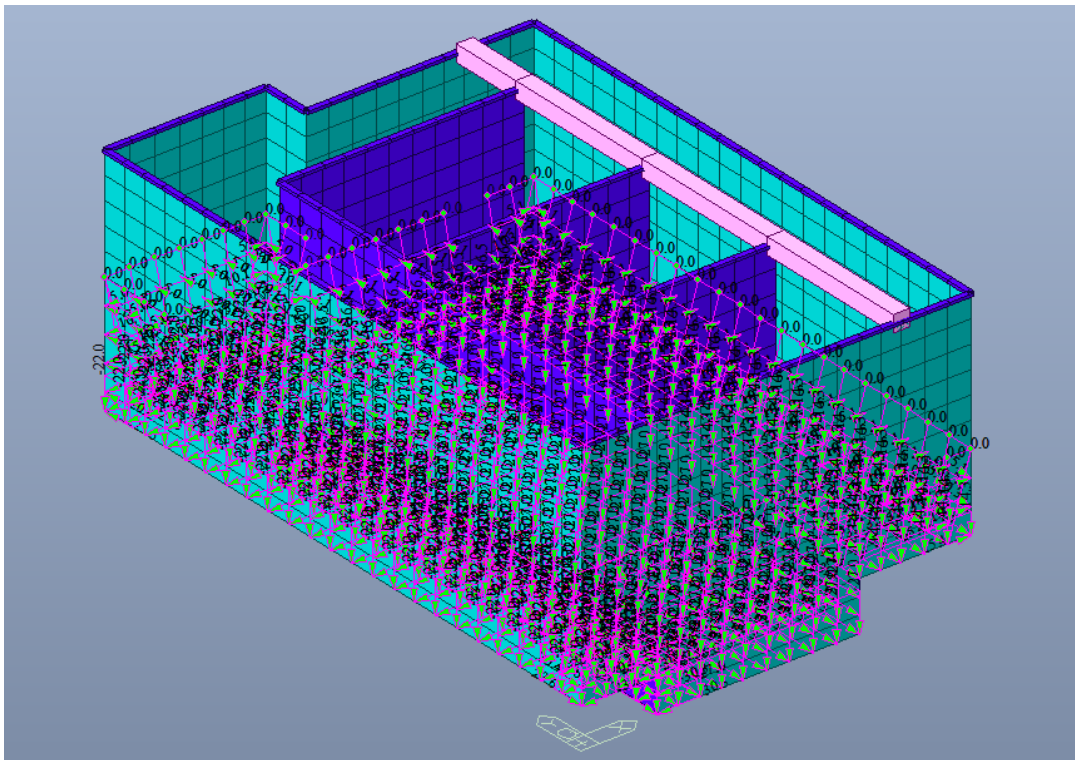
Nelle immagini seguenti si riportano le assegnazioni dei carichi:



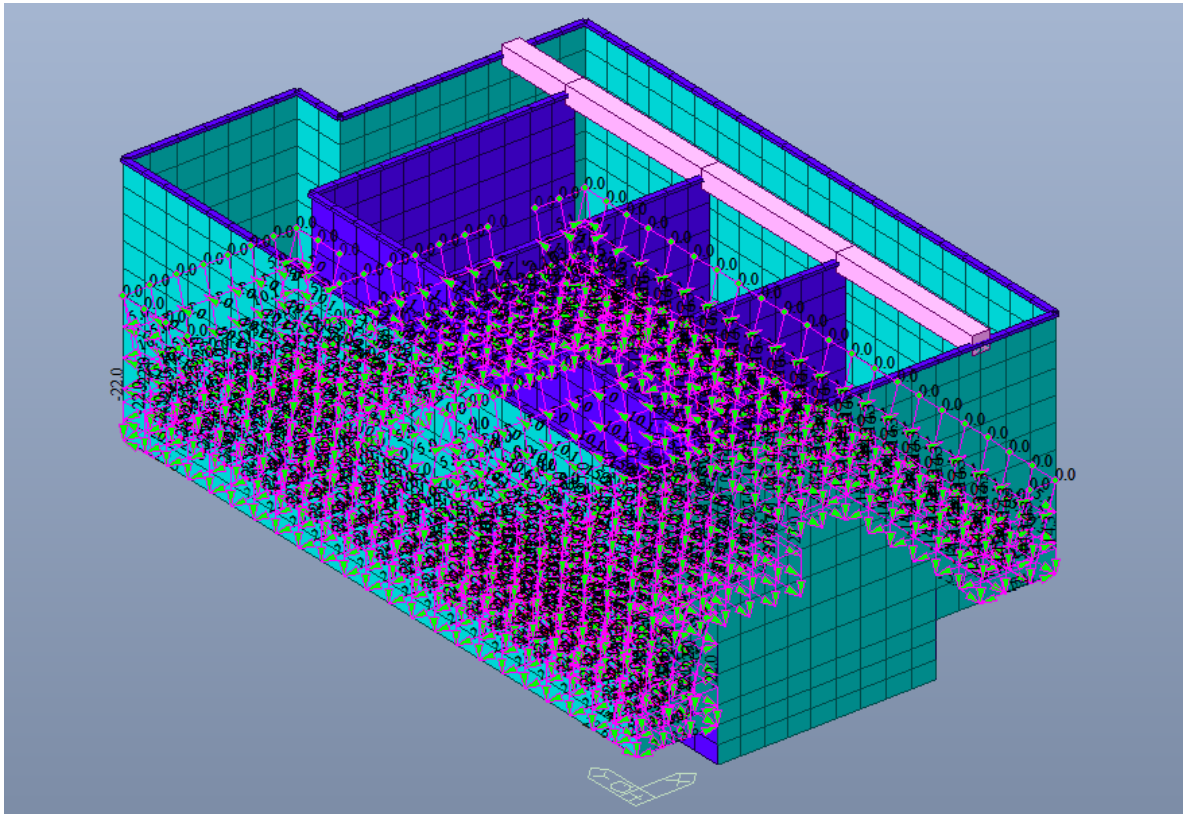
Assegnazione spinta statica del terreno (SST) - [kN/mq]



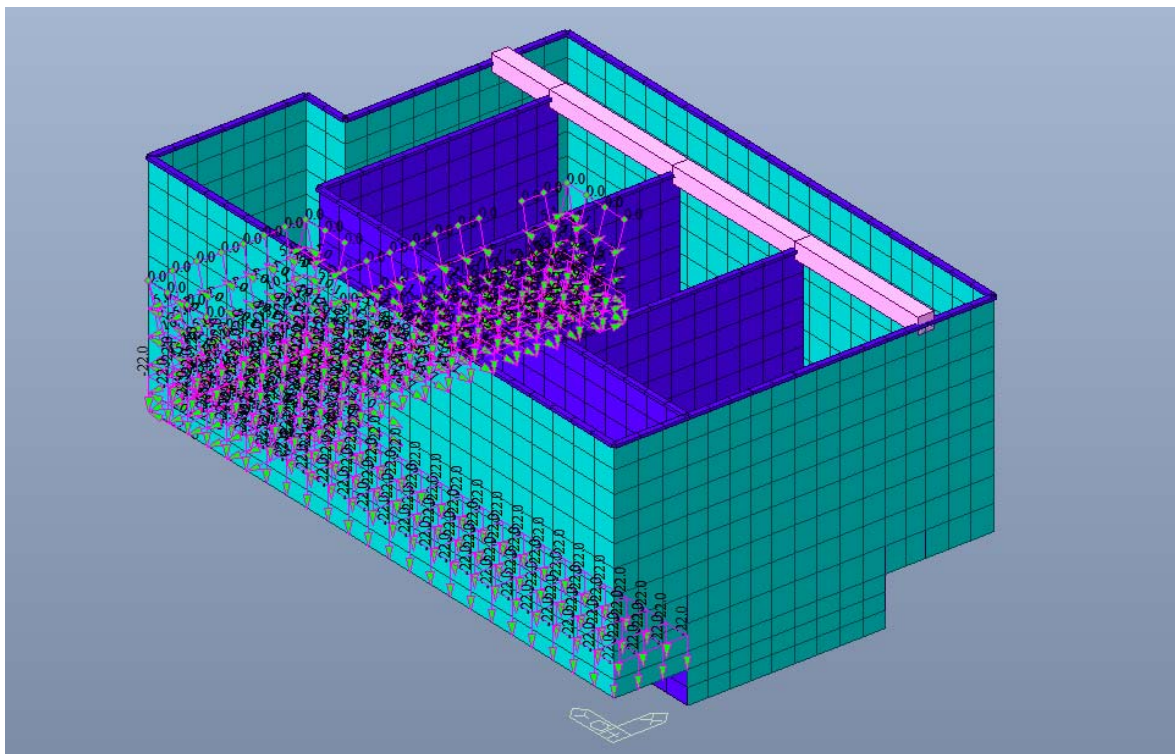
Assegnazione spinta statica del terreno con falda (SSTF) - [kN/mq]



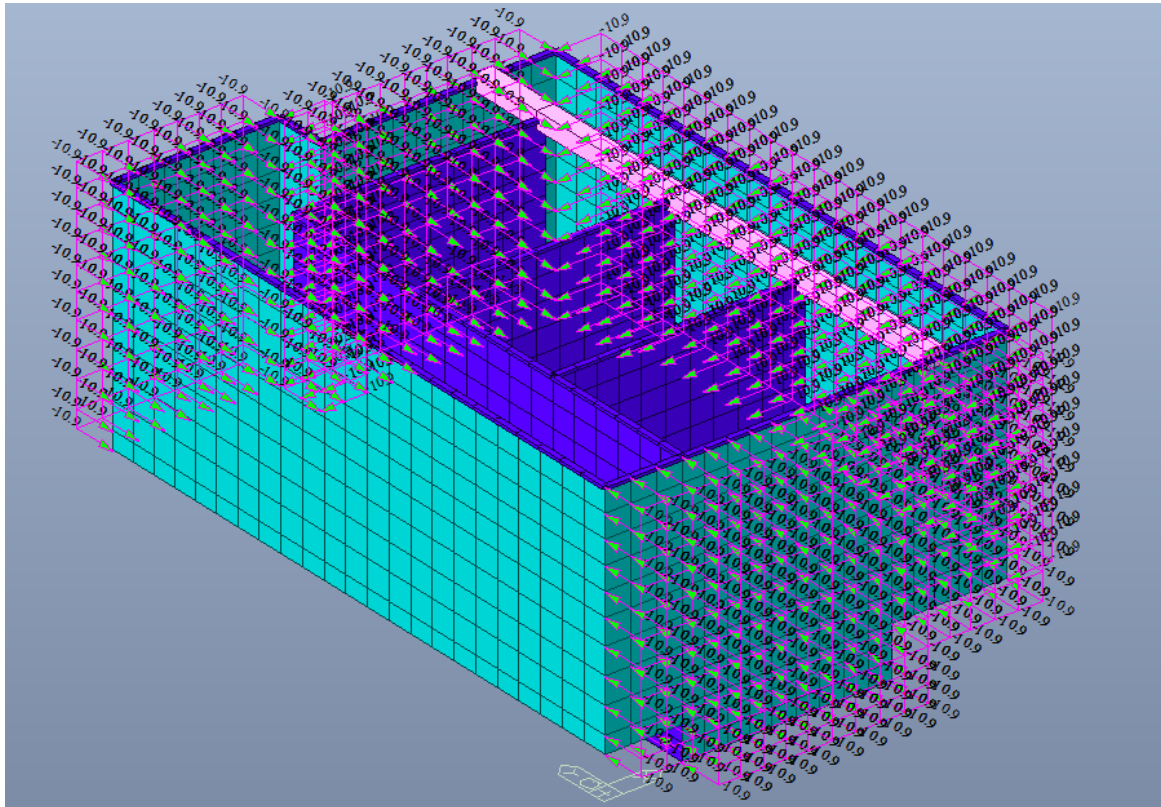
Assegnazione spinta statica del liquame caso 1 (SSL1) - [kN/mq]



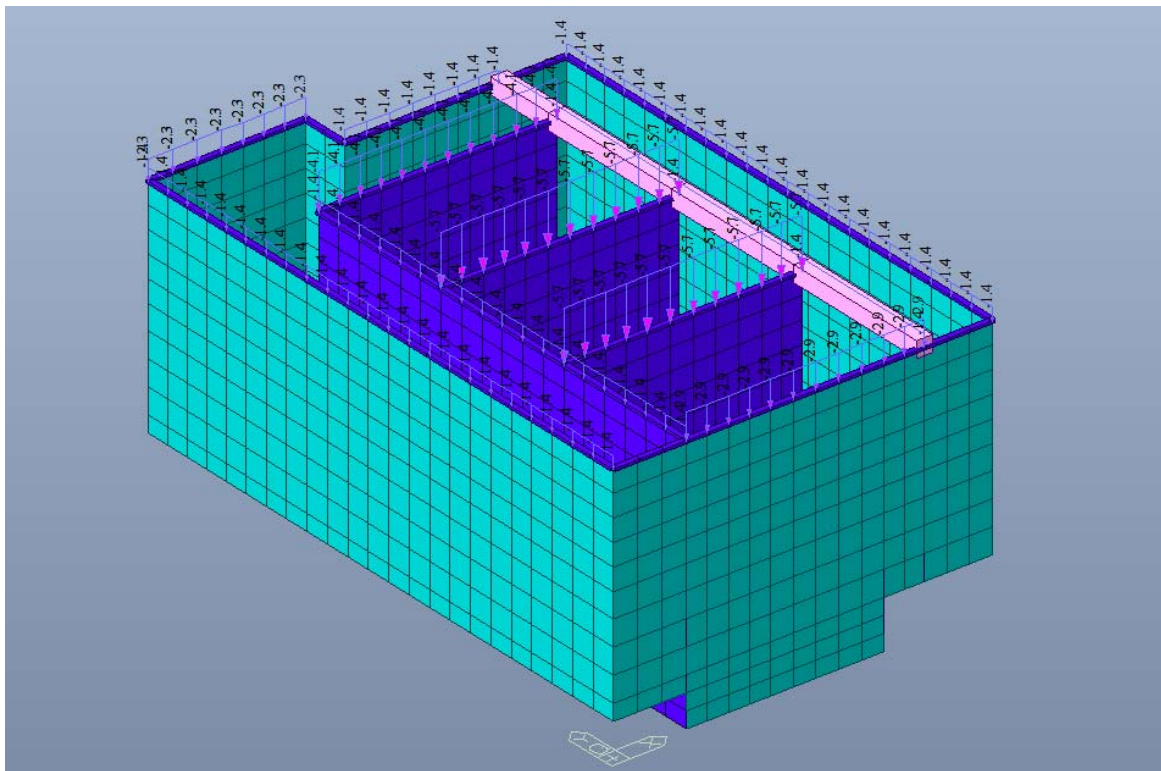
Assegnazione spinta statica del liquame caso 2 (SSL2) - [kN/mq]



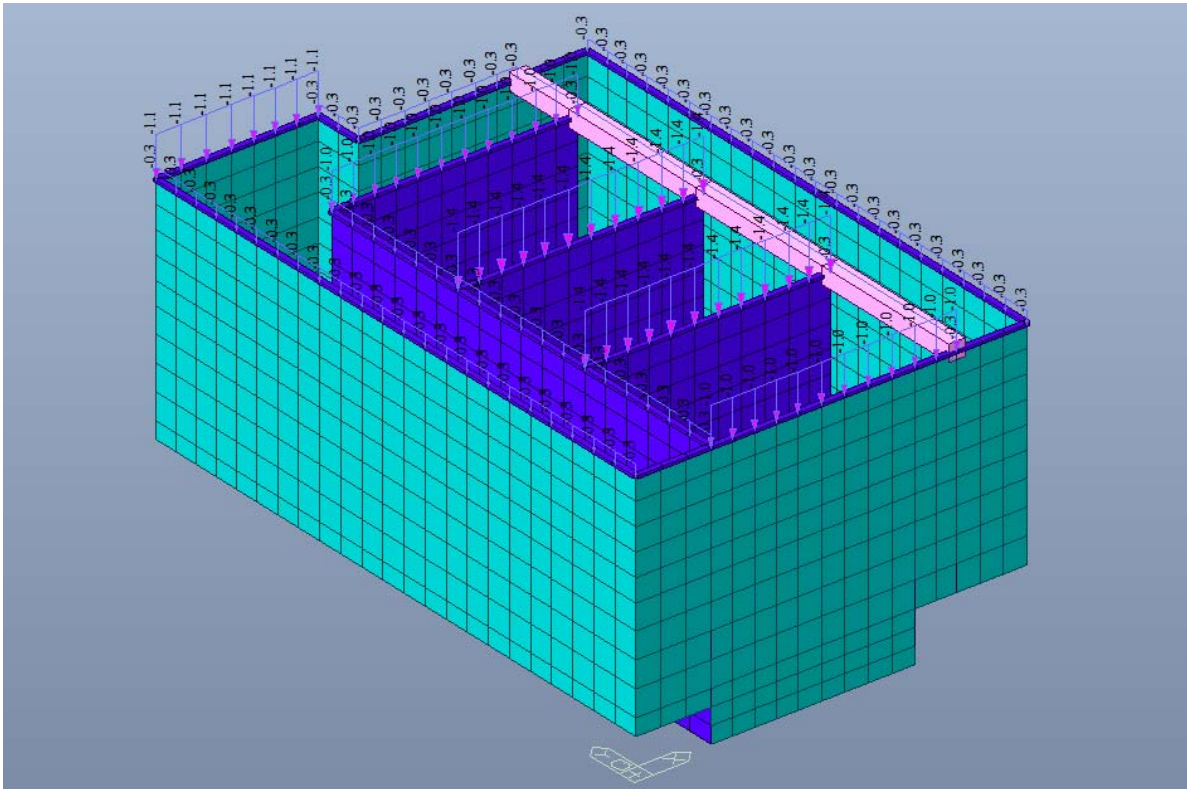
Assegnazione spinta statica del liquame caso 3 (SSL3) - [kN/mq]



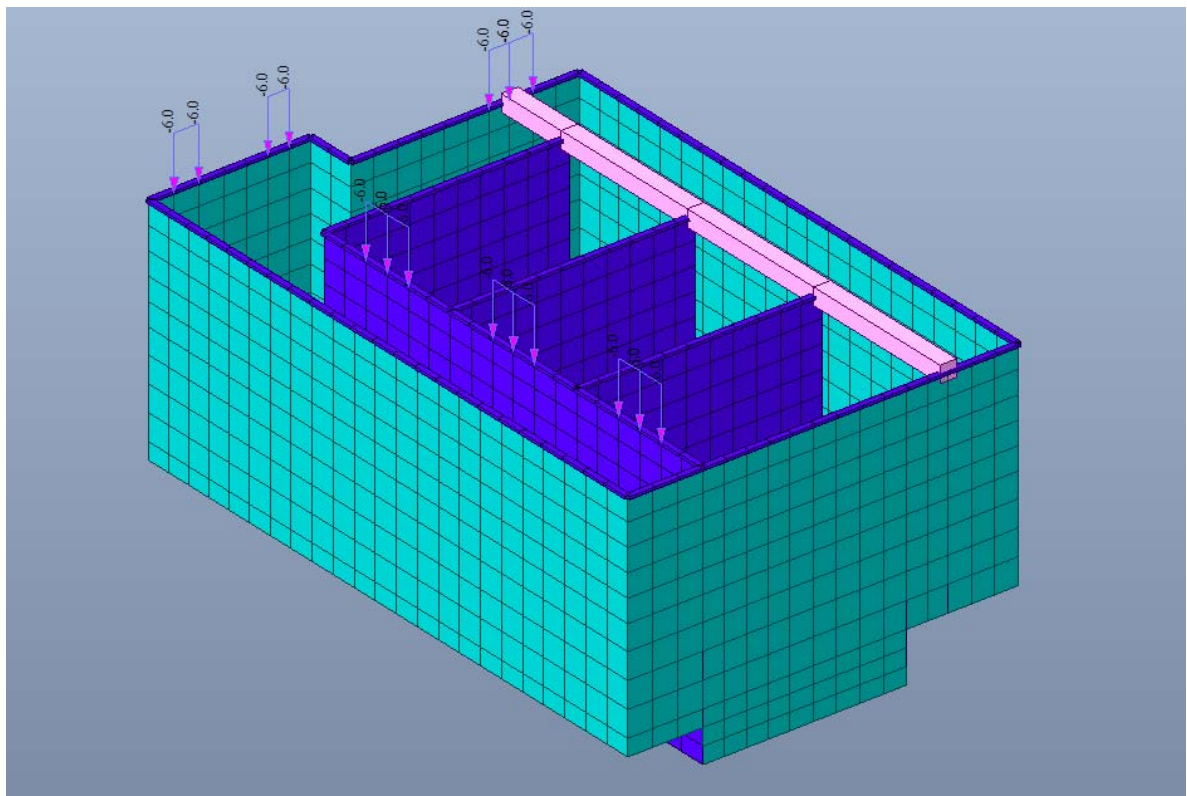
Assegnazione spinta statica del sovraccarico (SSS) - [kN/mq]



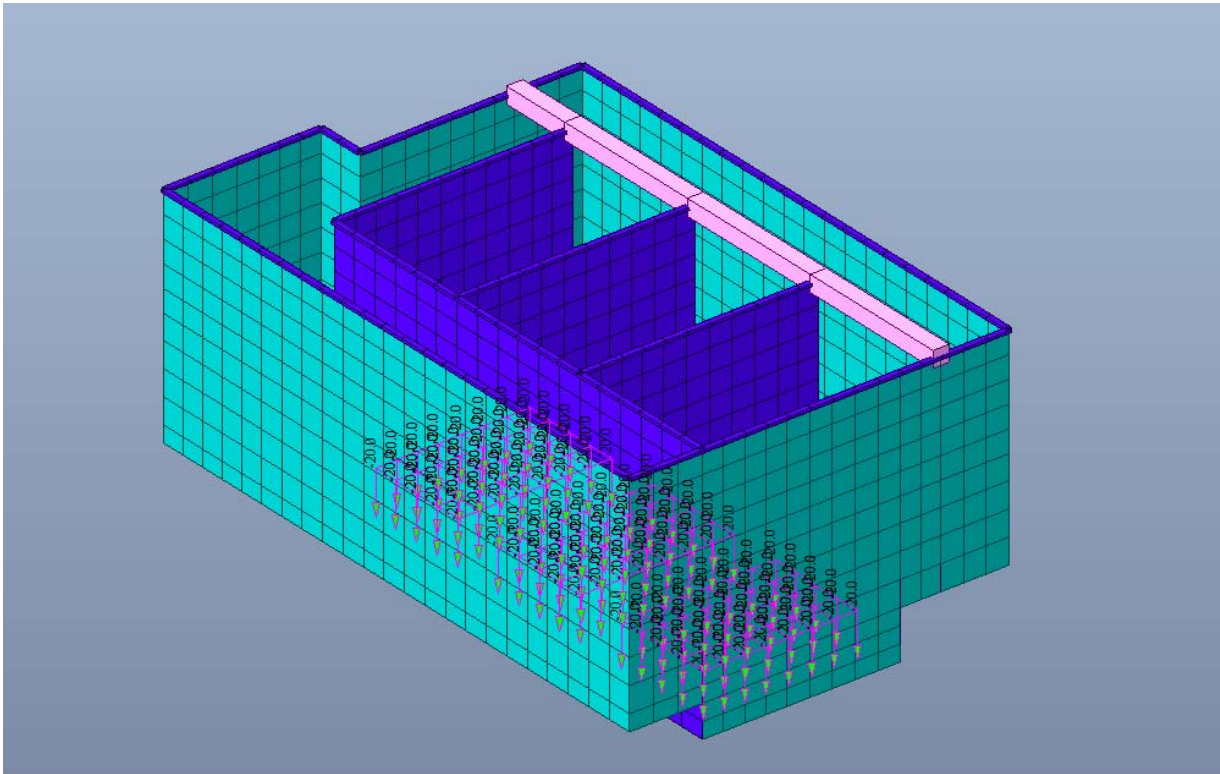
Assegnazione variabile manutenzione (VM) - [kN/m]



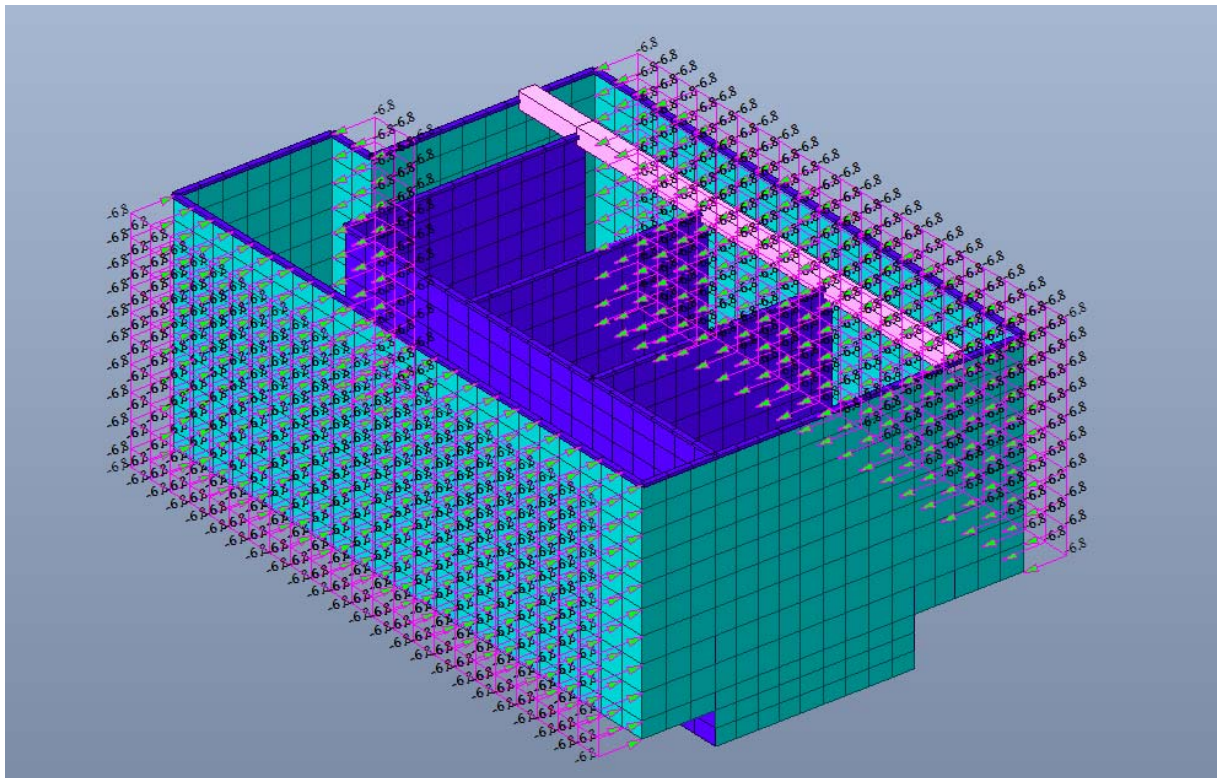
Assegnazione permanente copertura (PC) - [kN/m]



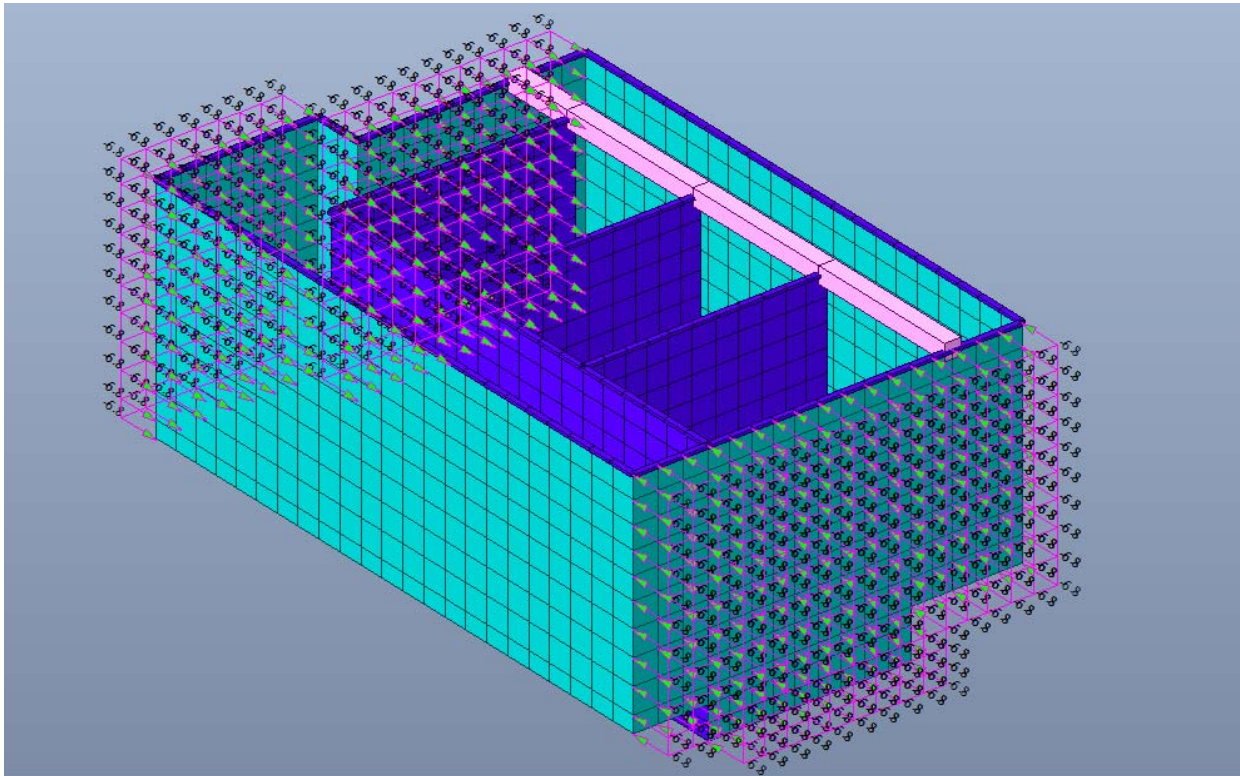
Assegnazione permanente paratoie (PP) - [kN/m]



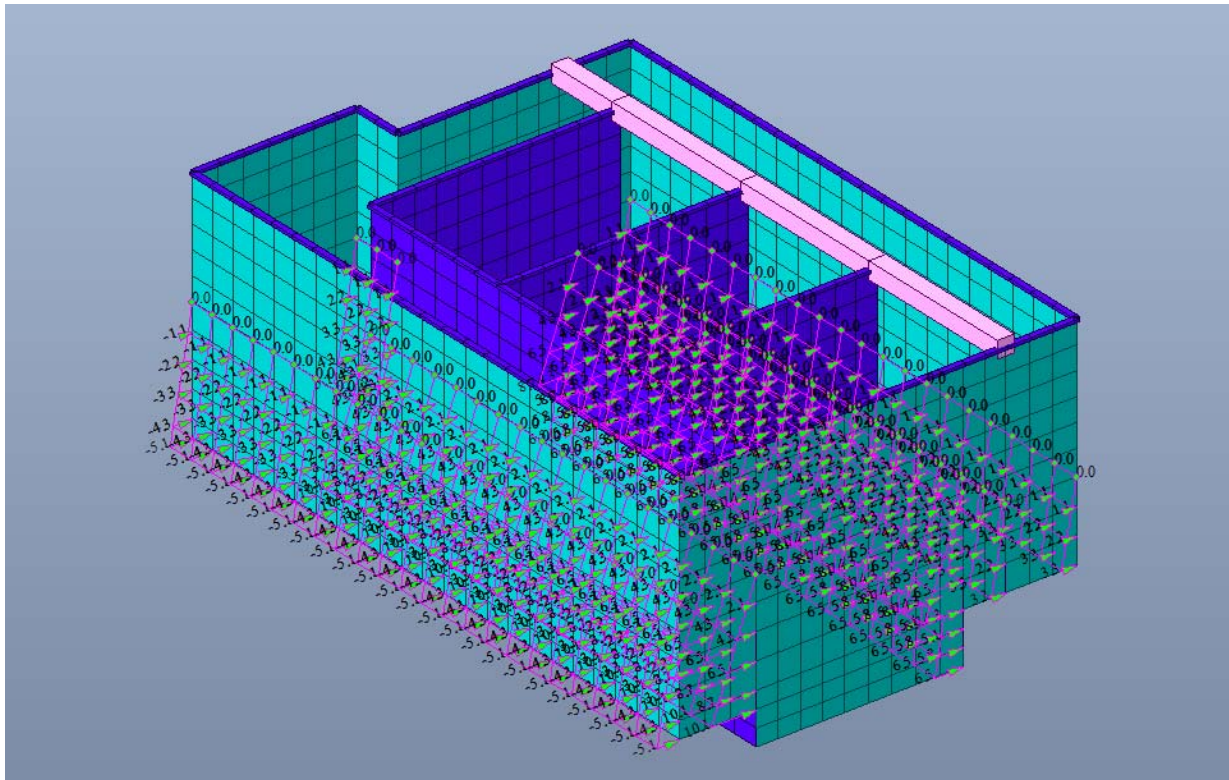
Assegnazione permanente filtri (PF) - [kN/m]



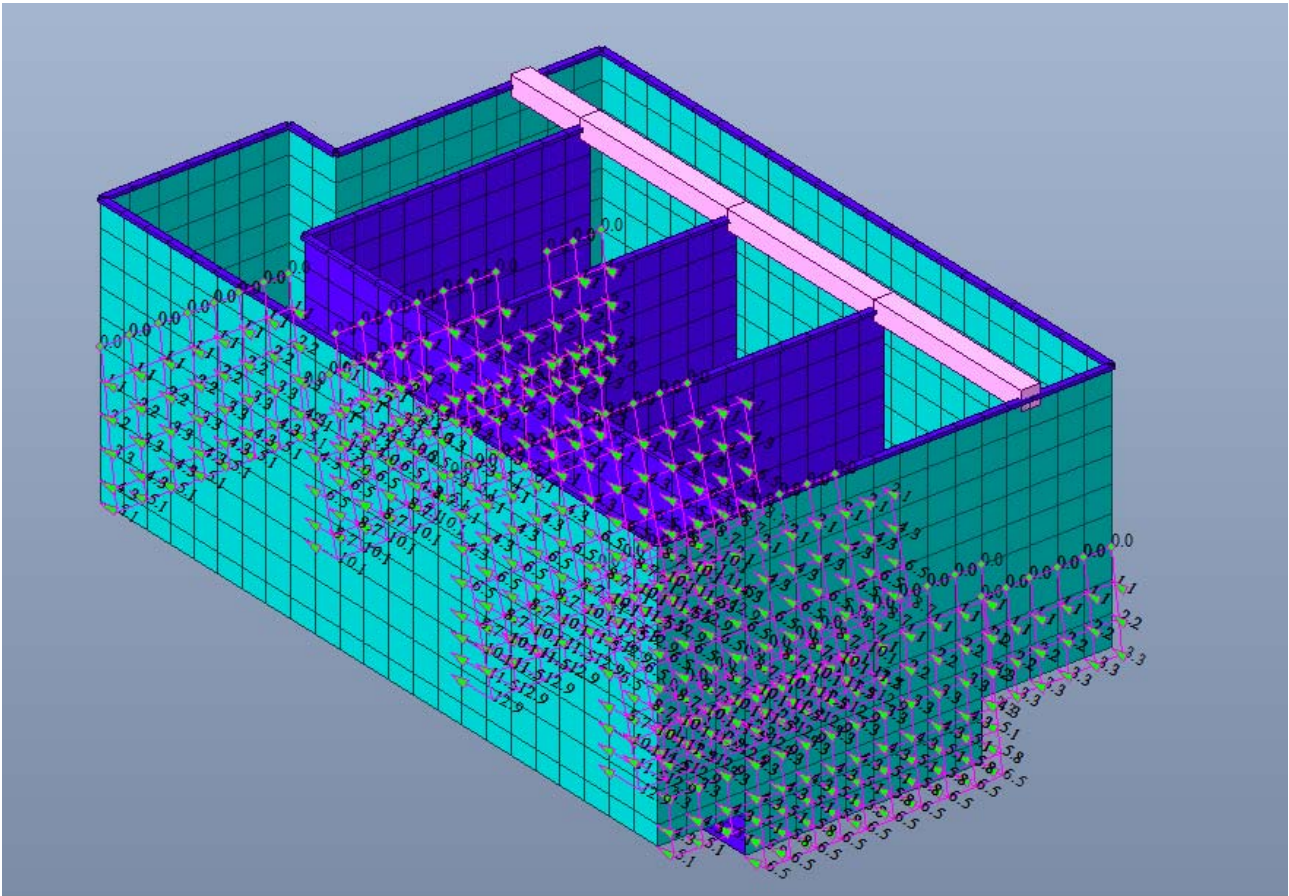
Assegnazione sovra spinta sismica terreno X (ETX) - [kN/mq]



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



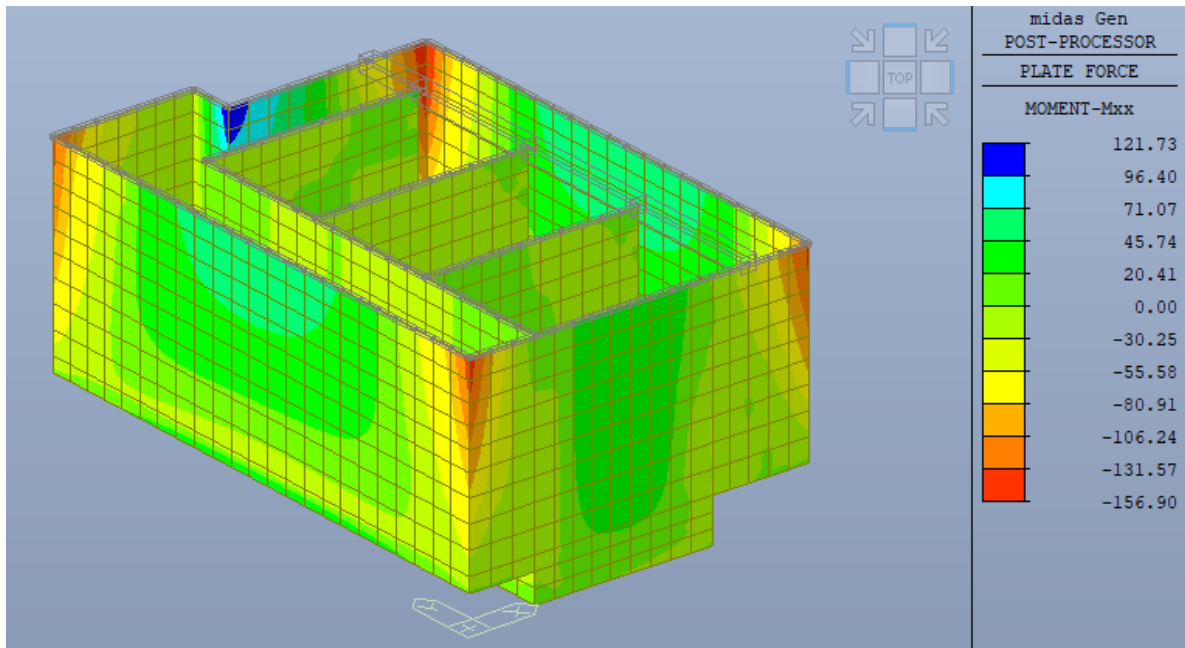
Assegnazione sovra spinta sismica liquame X (ELX) - [kN/mq]



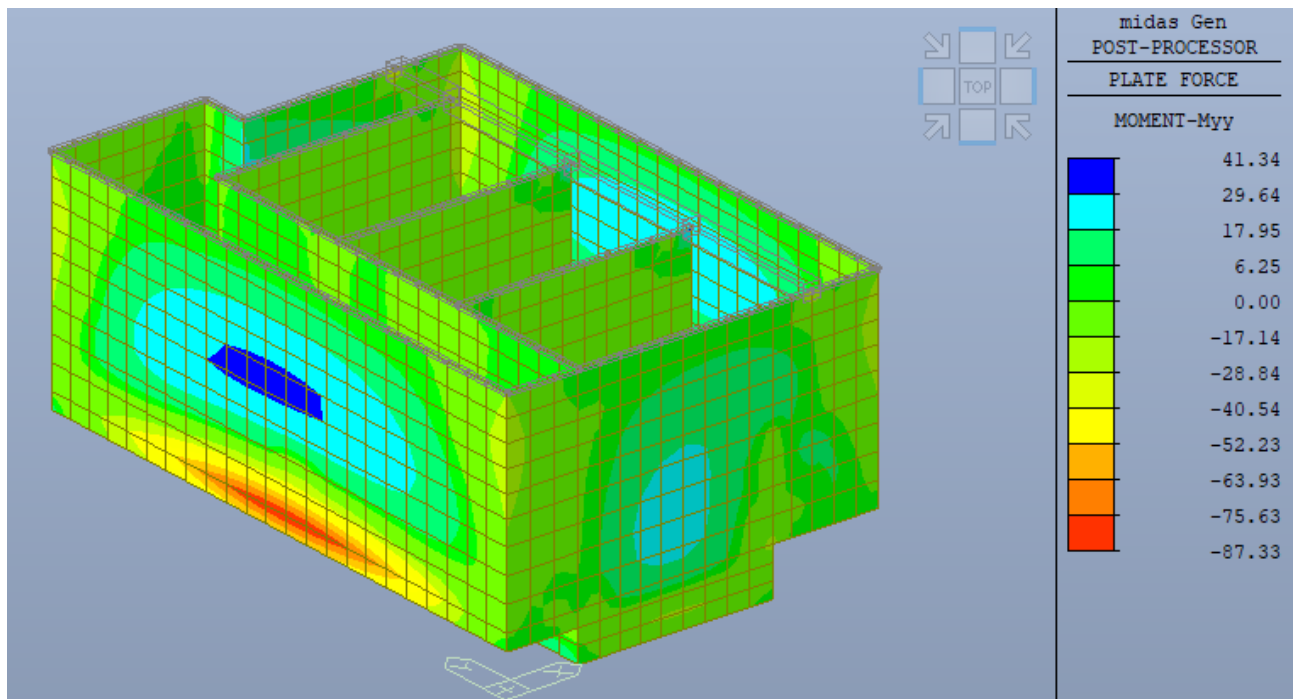
Assegnazione sovra spinta sismica liquame Y (ELY) - [kN/mq]

1.3 Sollecitazioni

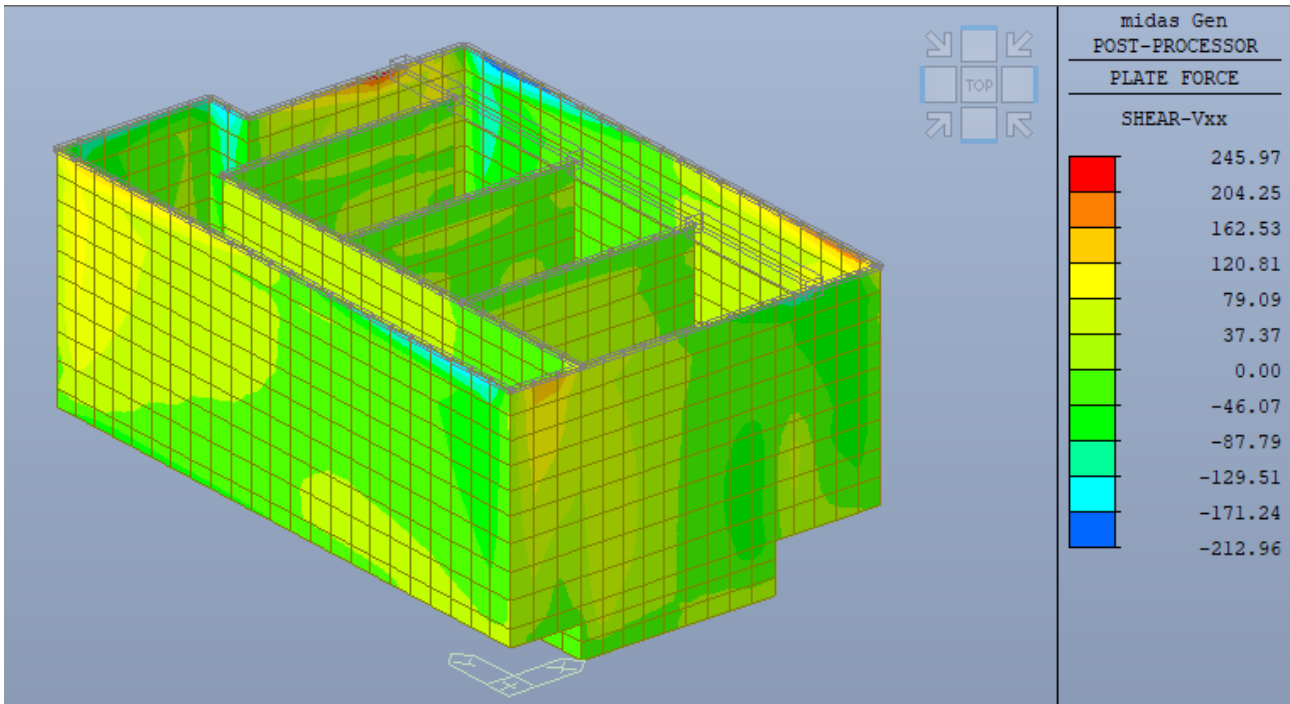
Nel presente paragrafo vengono riportate per via grafica le sollecitazioni sulla struttura indotte dai carichi applicati, per le varie combinazioni di carico statiche e sismiche.



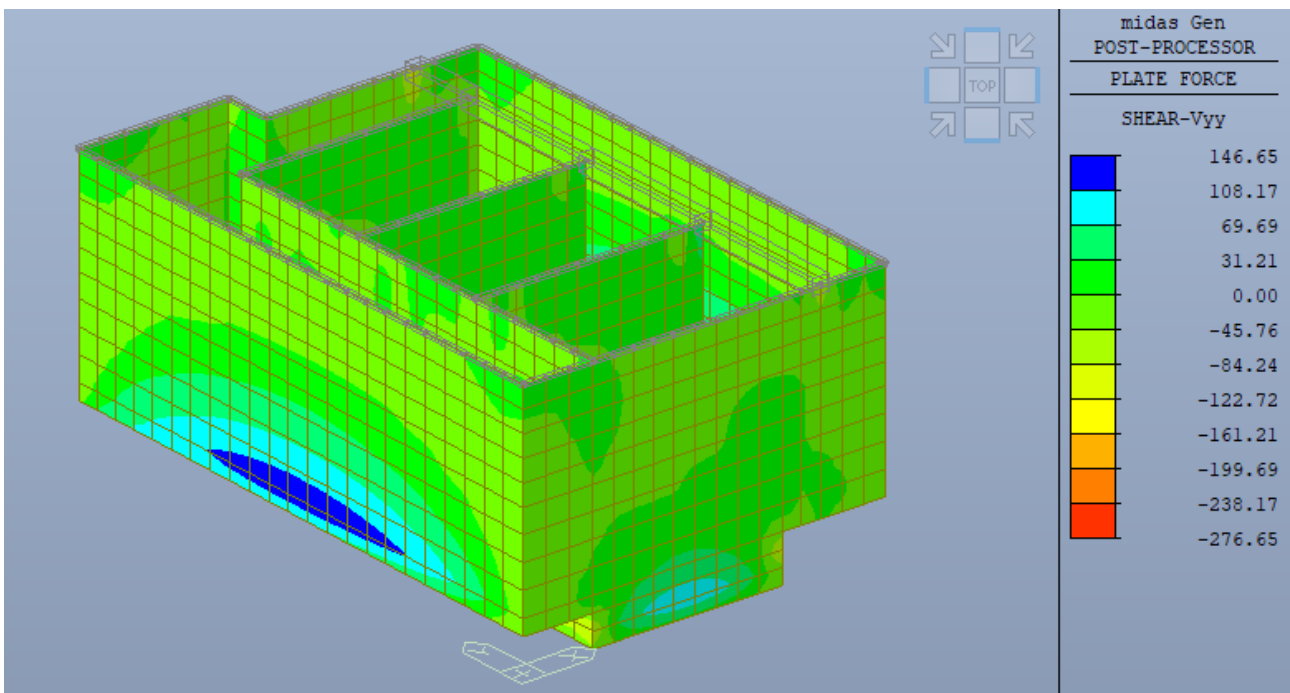
*Momento flettente membranale Mxx – involucro SLU [kN*m/m]*



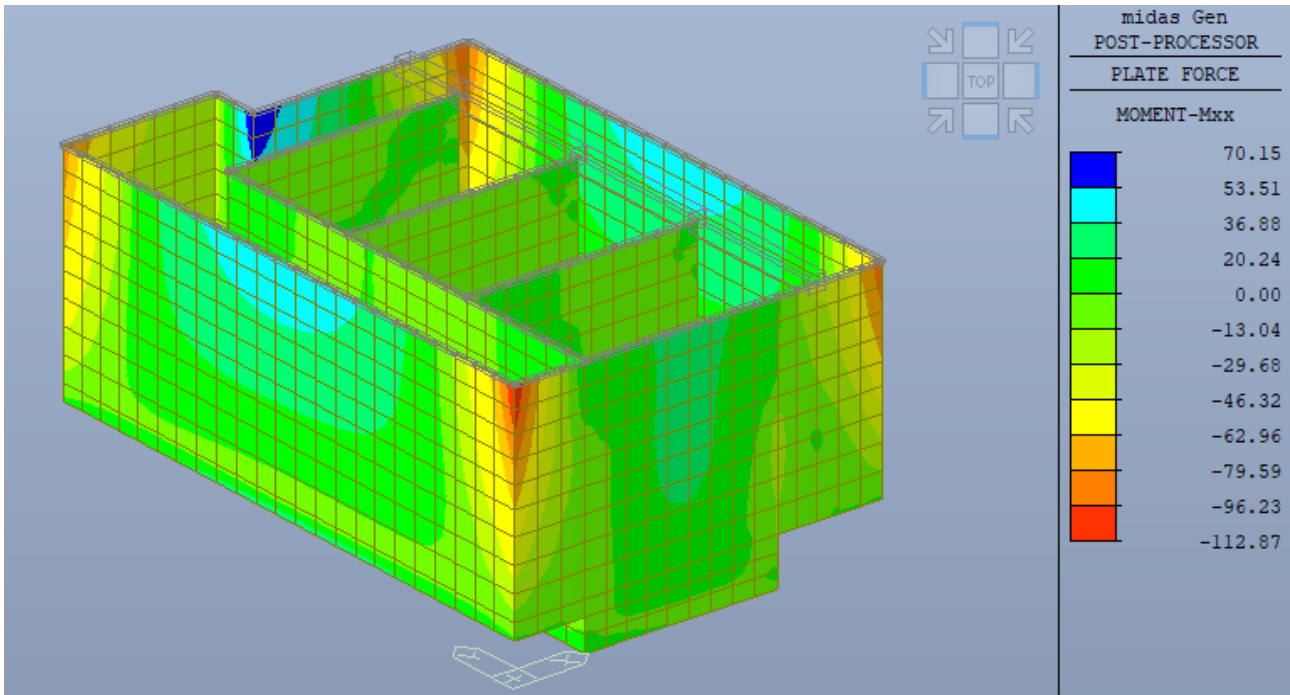
*Momento flettente membranale Myy – involucro SLU [kN*m/m]*



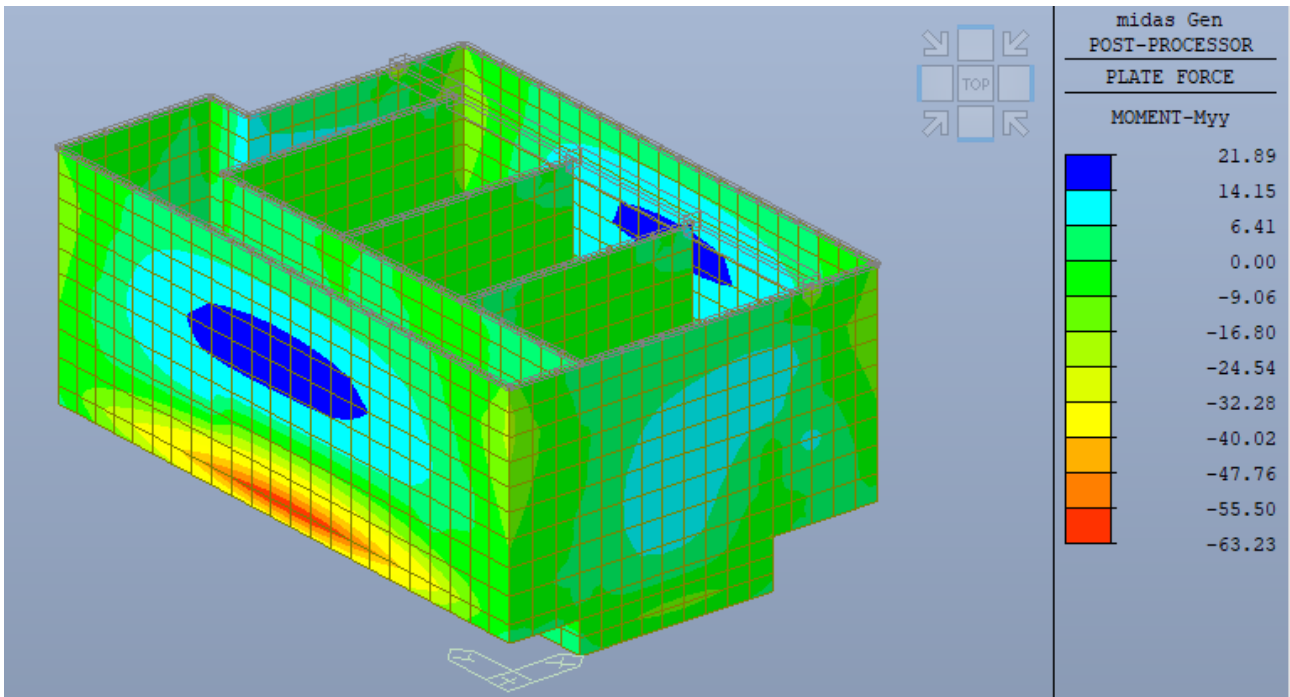
Sollecitazione tagliante Vxx – involucro SLU [kN/m]



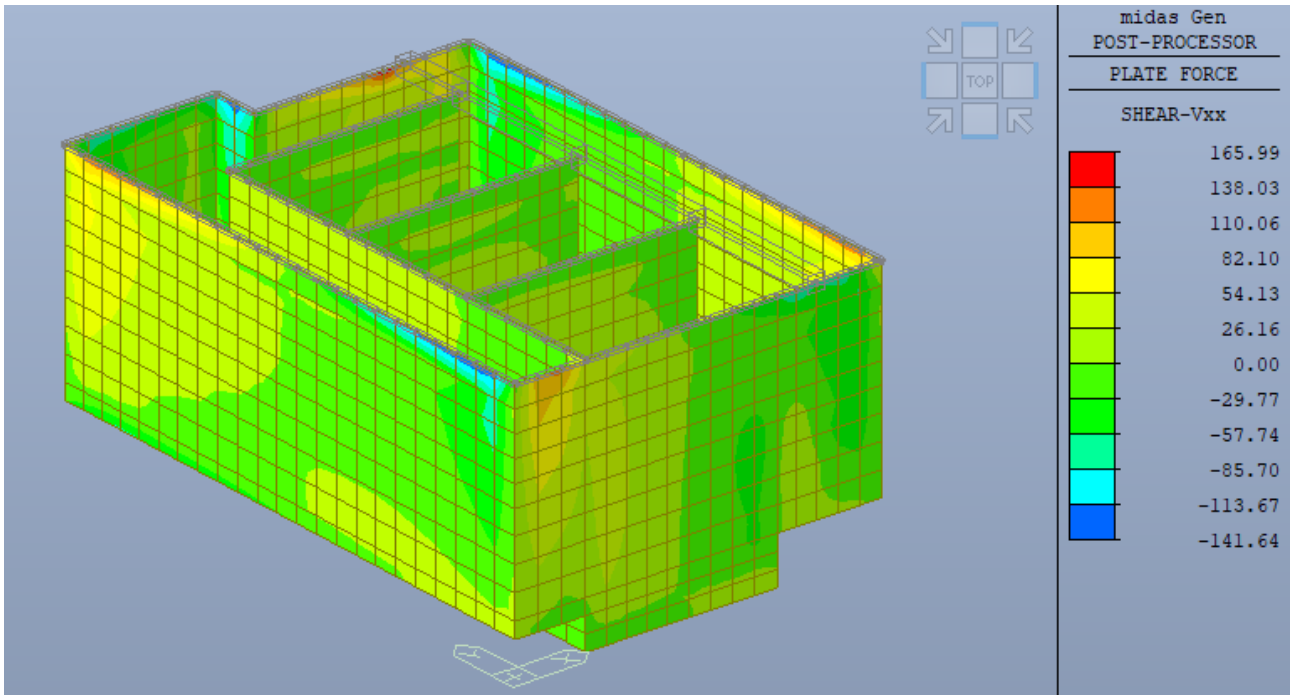
Sollecitazione tagliante Vyy – involucro SLU [kN/m]



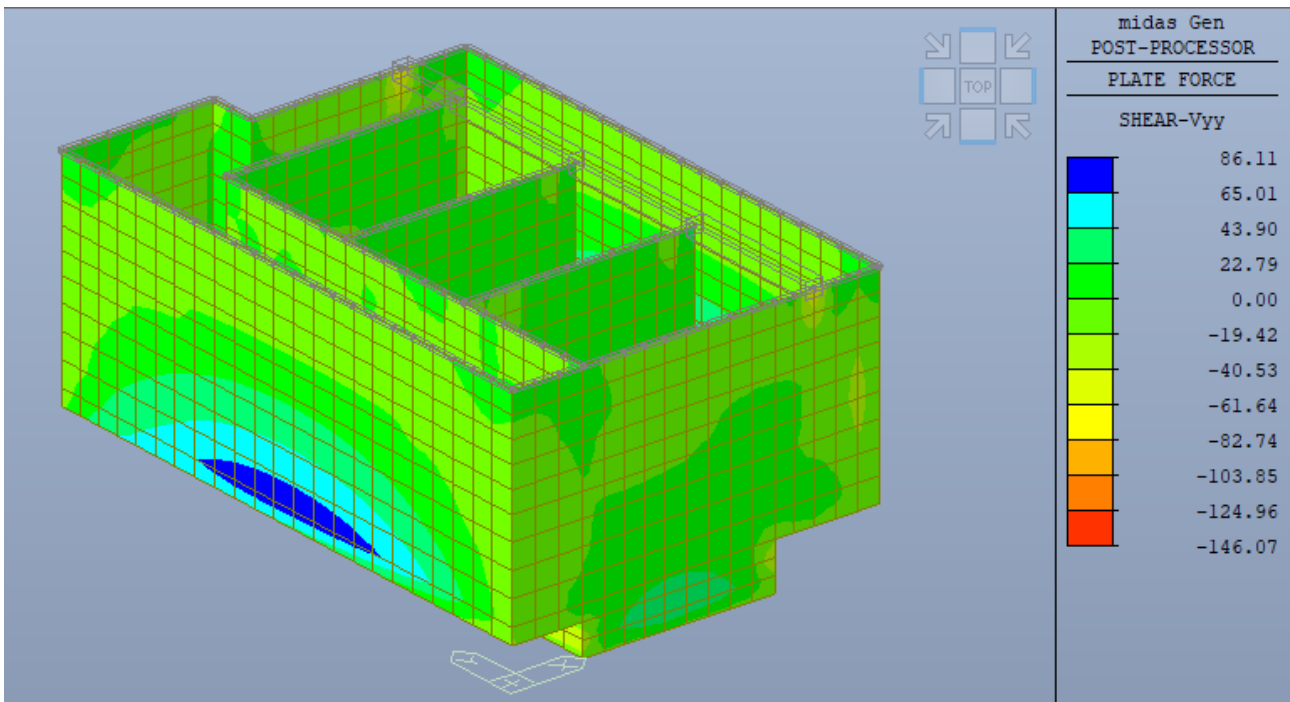
Momento flettente membranale Mxx – involucro SLV [kN*m/m]



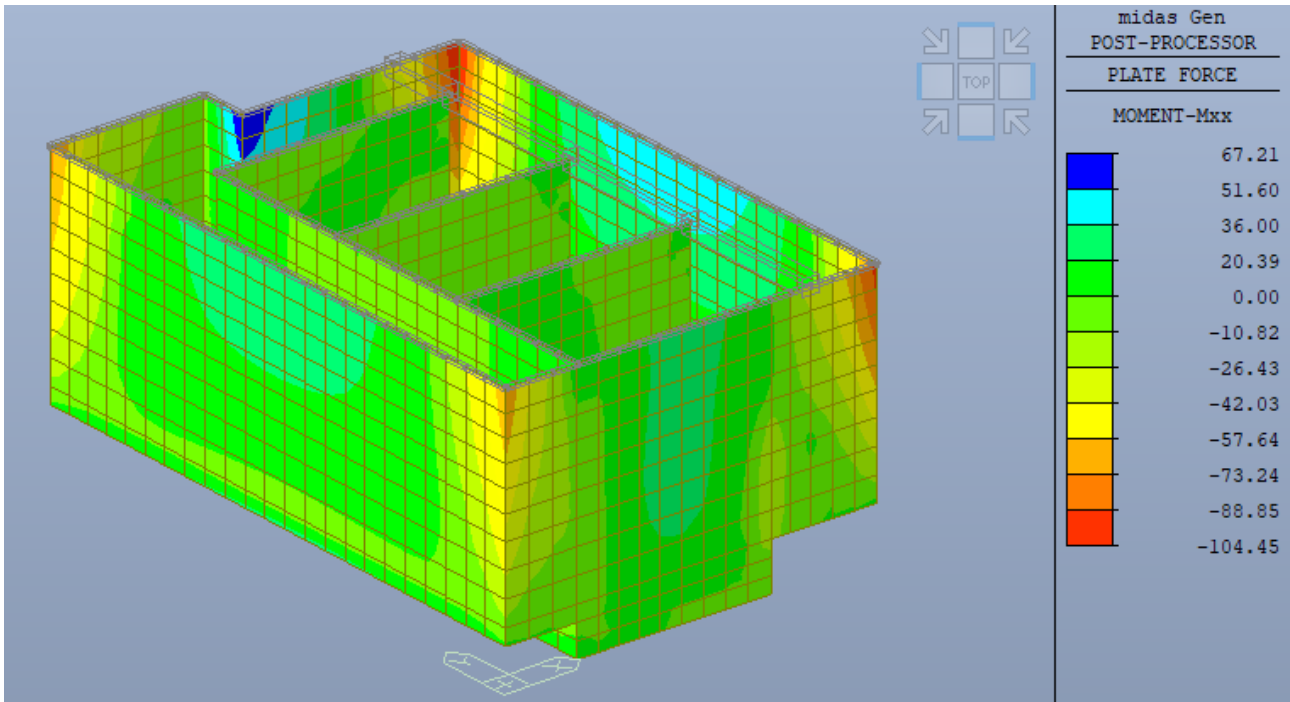
Momento flettente membranale Myy – involucro SLV [kN*m/m]



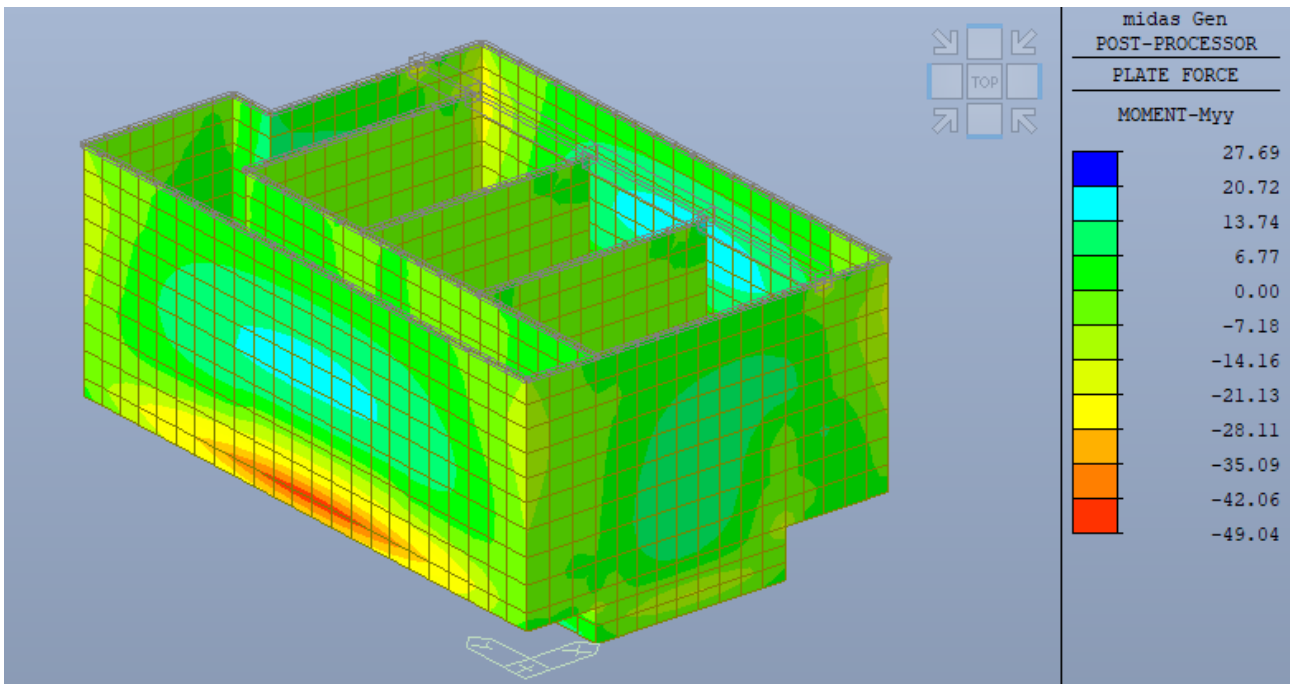
Sollecitazione tagliante Vxx – involucro SLV [kN/m]



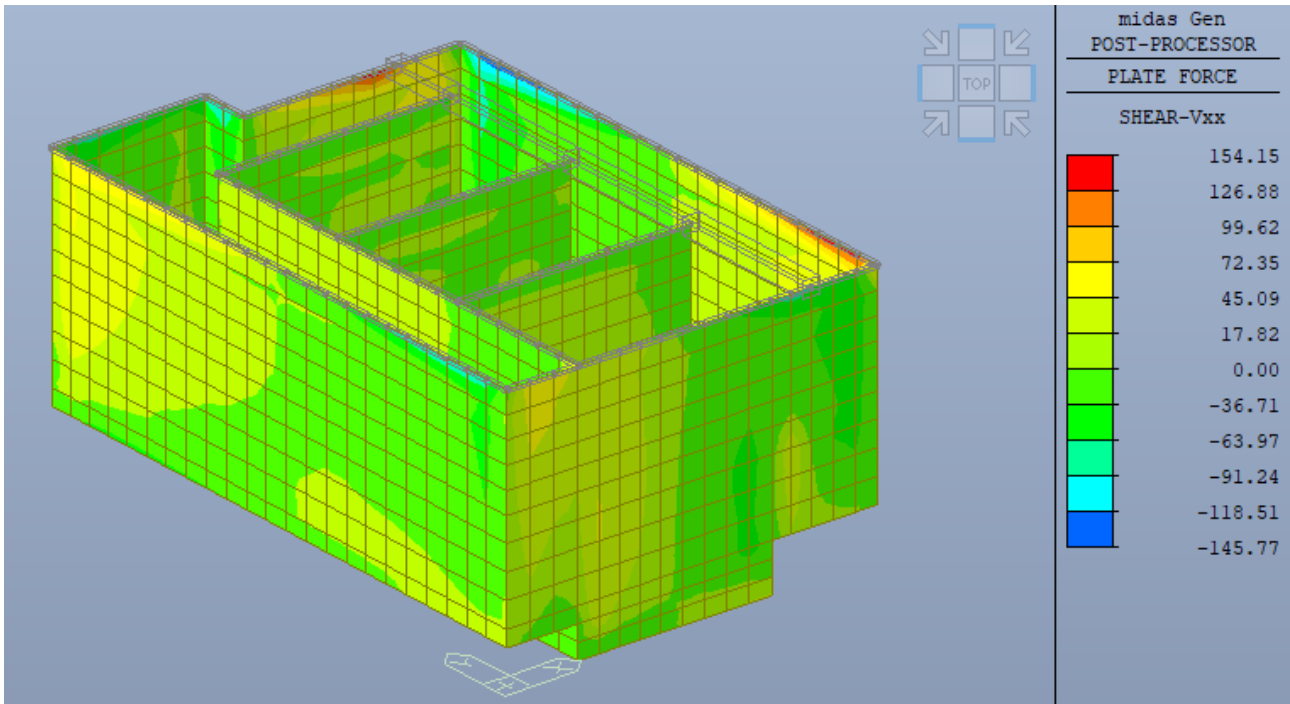
Sollecitazione tagliante Vyy – involucro SLV [kN/m]



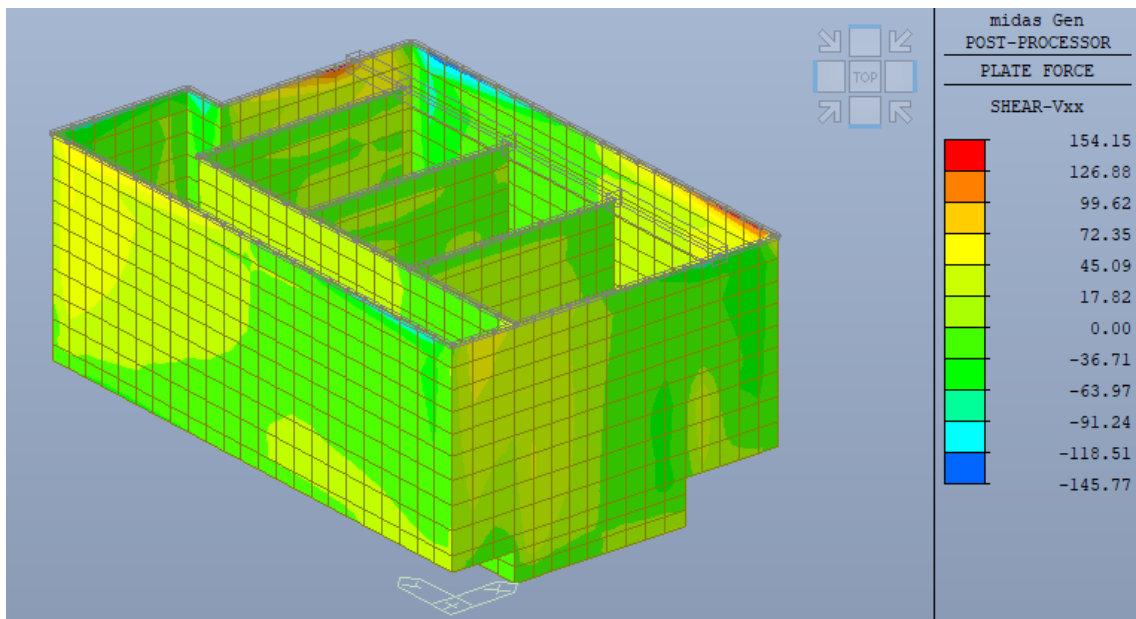
Momento flettente membranale Mxx – involucro SLE [kN*m/m]



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



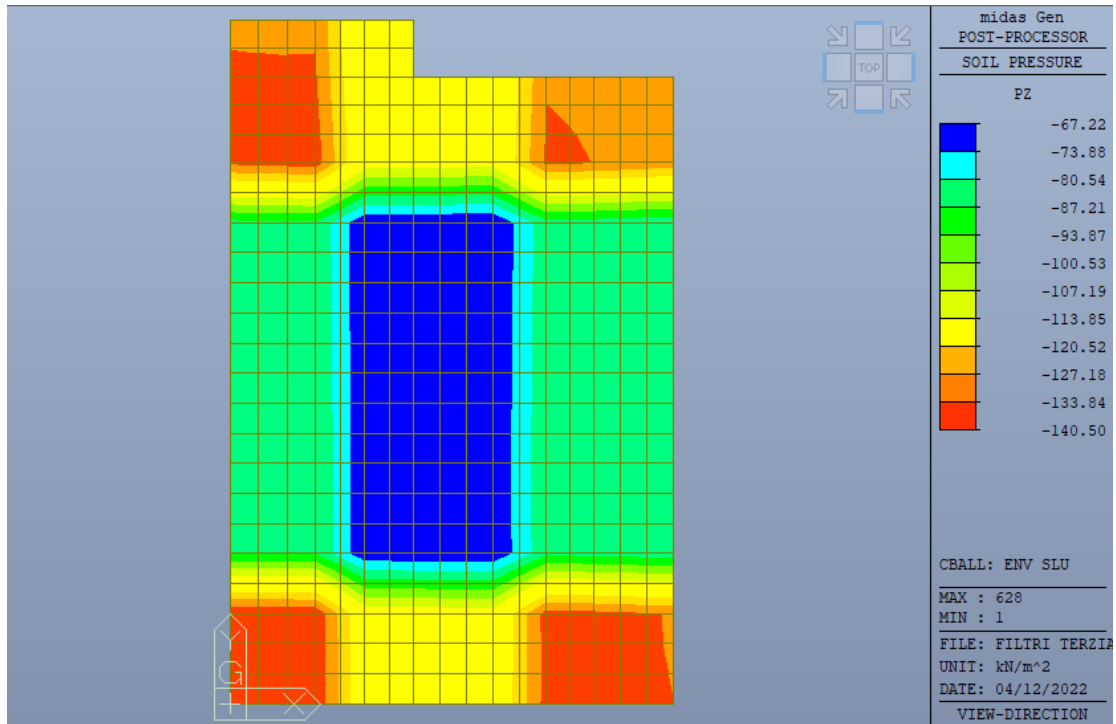
Sollecitazione tagliante Vxx – involucro SLE [kN/m]



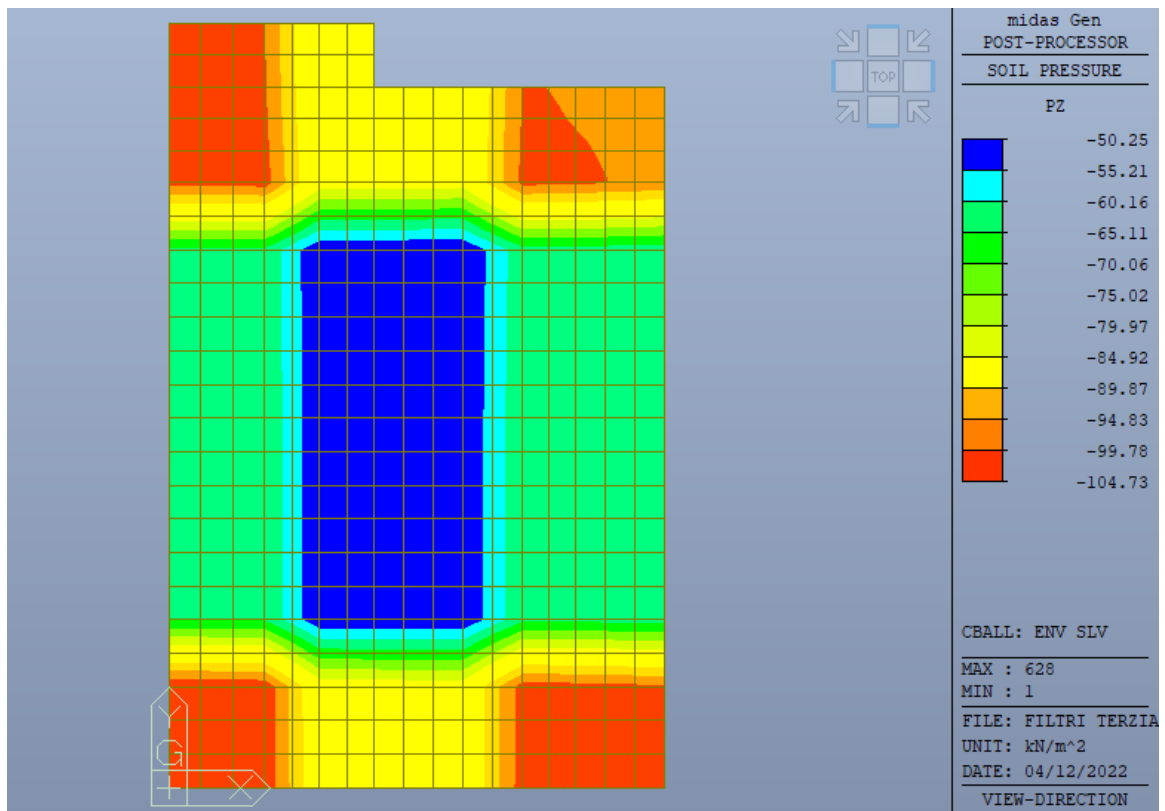
Sollecitazione tagliante Vyy – involucro SLE [kN/m]

1.4 Reazioni vincolari e pressioni sul terreno

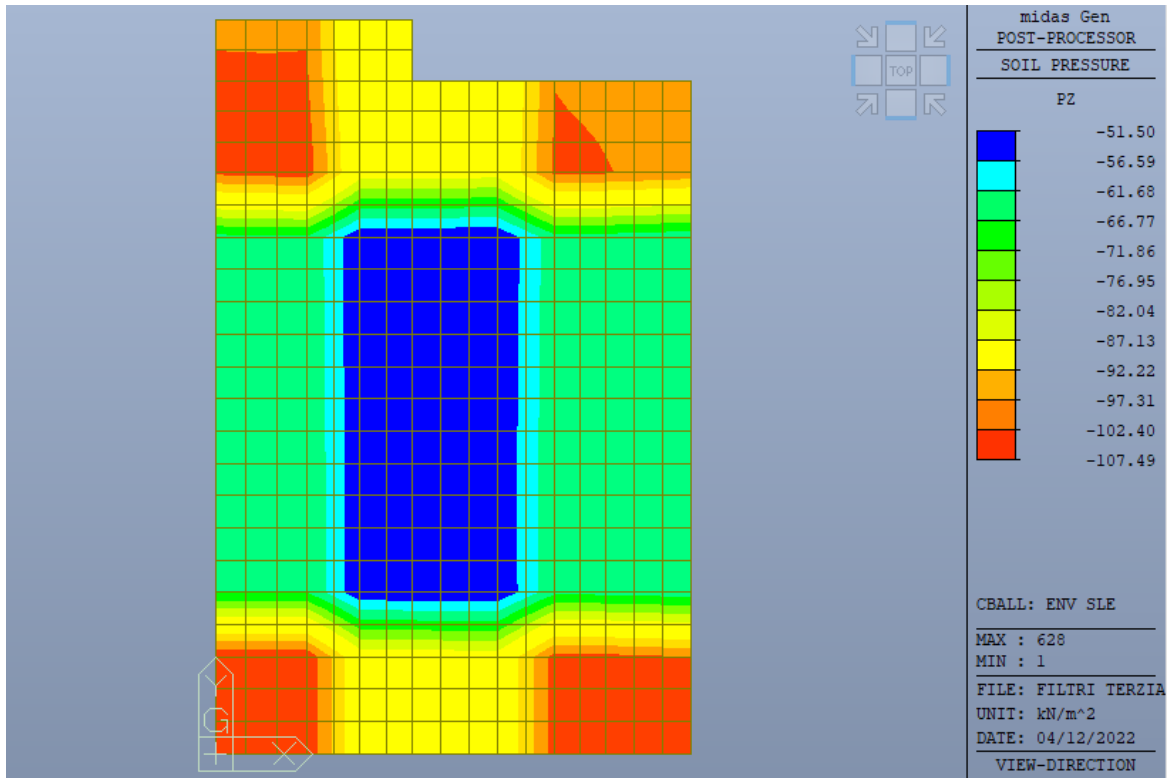
Nel presente paragrafo vengono riportate le reazioni vincolari e le pressioni sul terreno desunte dal modello di calcolo.



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	914.348857	-173.059016	6774.871142	
	SLU 2	725.958870	-153.190954	5971.603986	
	SLU 3	571.854026	-215.327135	5368.059486	
	SLU 4	-212.024183	-221.809833	816.554736	
	SLU 5	-212.024183	-221.809833	4732.603236	
	SLU 6	704.054227	-159.694301	6990.818642	
	SLU 7	515.664240	-139.826239	6187.551486	
	SLU 8	361.559396	-201.962420	5584.006986	
	SLU 9	278.663287	-252.994168	4948.550736	
	SLV 1	-23.943274	-185.988984	5211.439340	
	SLV 2	-23.943274	-29.538277	5211.439340	
	SLV 3	205.844304	-368.514808	5211.439340	
	SLV 4	402.805086	-368.514808	5211.439340	
	SLV 5	632.592664	-29.538277	5211.439340	
	SLV 6	632.592664	-185.988984	5211.439340	
	SLV 7	402.805086	152.987547	5211.439340	
	SLV 8	205.844304	152.987547	5211.439340	
	SLE R1	631.449675	-128.553187	5254.628840	
	SLE R2	491.253255	-119.643377	5355.404340	
	SLE R3	367.992112	-161.067125	4172.466028	
	SLE R4	486.534300	-113.270062	4636.731028	
	SLE R5	227.795692	-152.157315	4273.241528	
	SLE R6	346.337880	-104.360252	4737.506528	
	SLE R7	252.873600	-98.420379	4593.541528	
	SLE R8	252.873600	-98.420379	4593.541528	
	SLE F1	397.788975	-113.703504	5211.439340	
	SLE F2	304.324695	-107.763630	5211.439340	
	SLE F3	252.873600	-98.420379	4593.541528	
	SLE F4	159.409320	-92.480505	4593.541528	
	SLE F5	134.331412	-146.217441	4129.276528	
	SLE F6	40.867132	-140.277568	4129.276528	
	SLE Qp	164.128275	-98.853820	5211.439340	

Reazioni vincolari

1.5 Deformazioni

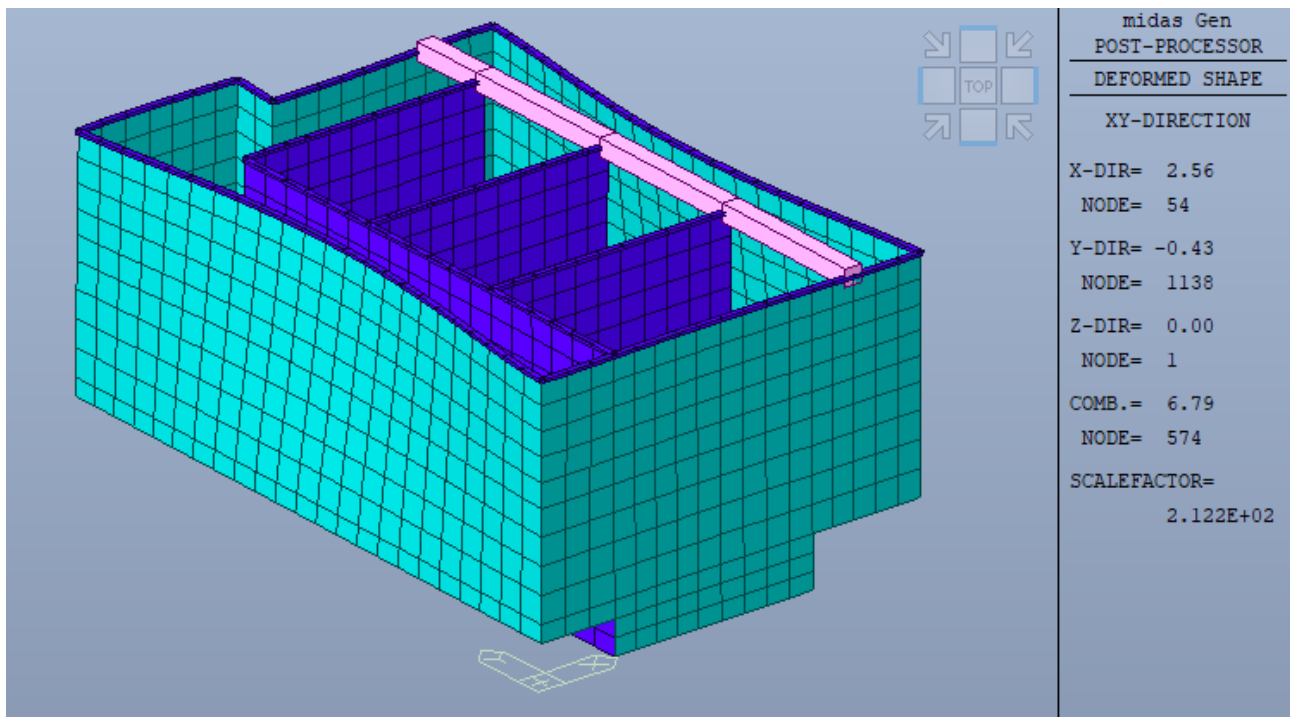
Per le costruzioni ricadenti in classe d'uso IV si deve verificare che l'azione sismica di progetto non produca danni agli elementi costruttivi senza funzione strutturale tali da rendere temporaneamente non operativa la costruzione (rif §7.3.6.1 NTC 2018)

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 dr_p , per effetto della loro deformabilità intrinseca ovvero dei collegamenti alla struttura: $dr \leq dr_p \leq 0,01 h$
- per costruzioni con struttura portante in muratura ordinaria: $dr < 0,003 h$
- per costruzioni con struttura portante in muratura armata: $dr < 0,004 h$

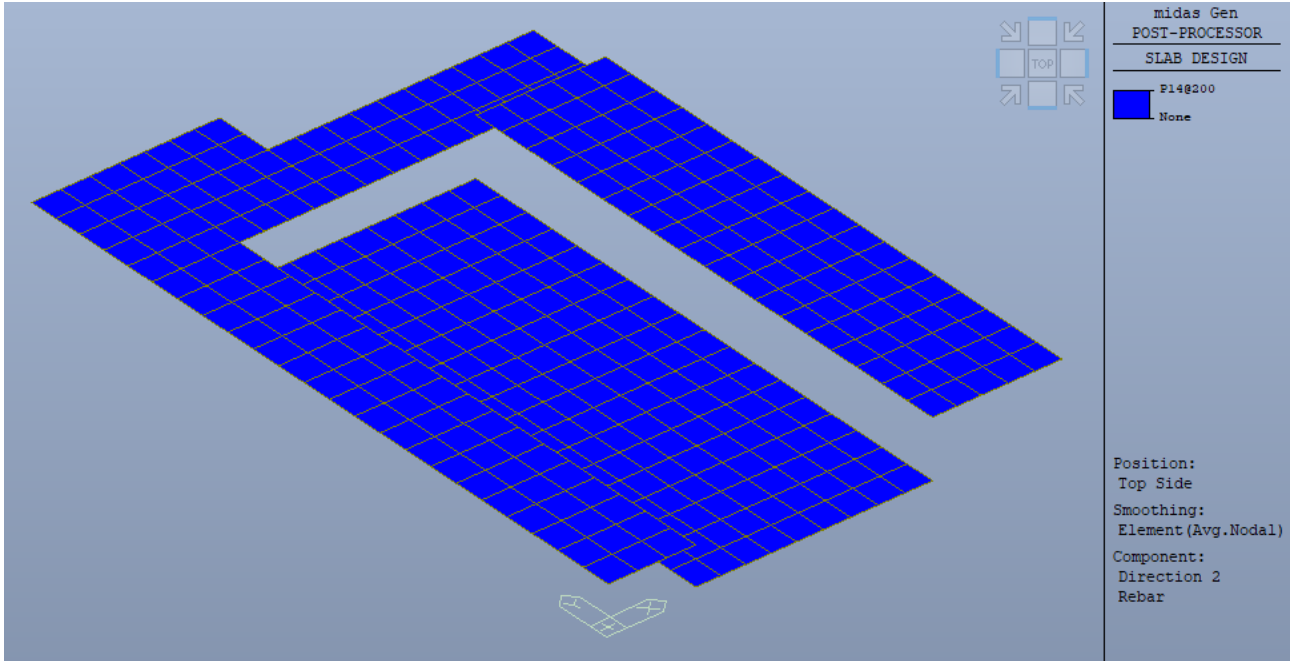
Premesso che l'opera in oggetto è completamente in c.a. e che quindi anche il superamento di questi limiti non produrrebbe alcun effetto, dall'immagine seguente si evince che lo spostamento massimo sotto l'azione sismica a SLV è pari a 2.56 mm (maggiore di quella SLO) che corrisponde a circa 0,0006 h, quindi trascurabile.



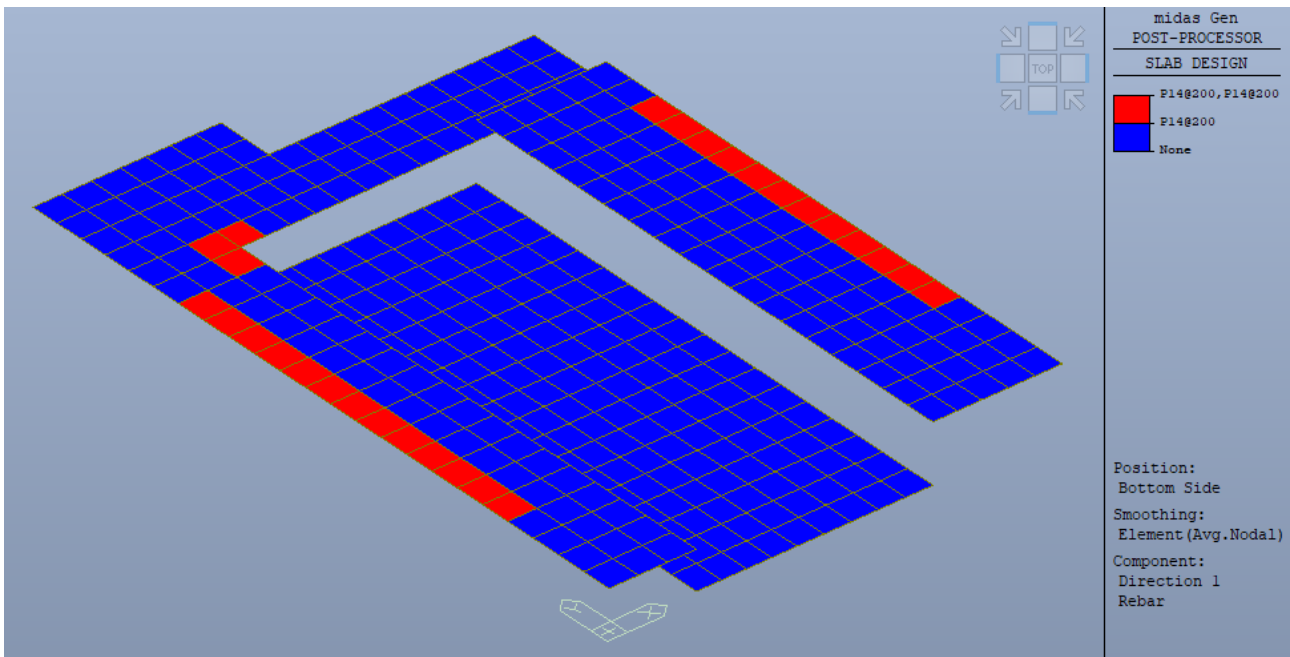
Massime deformazioni SLO combinata XY [mm]

1.6 Armature previste

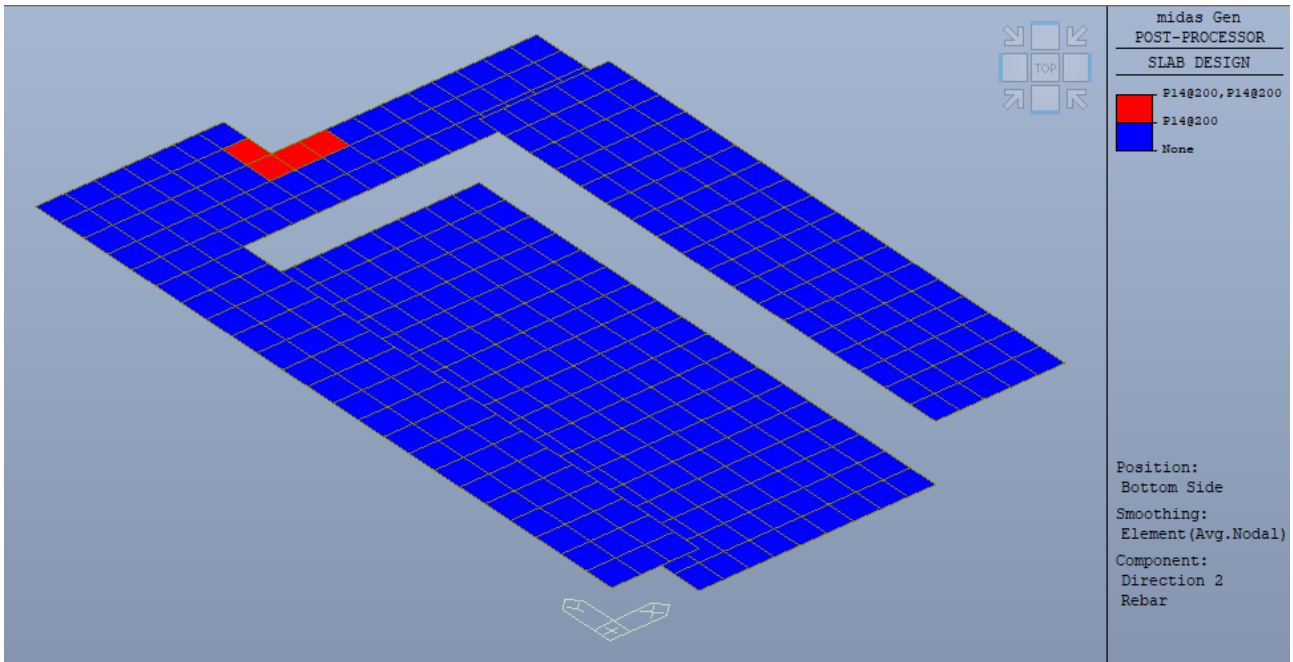
Nelle immagini seguenti vengono riportate le armature previste per i vari elementi strutturali.



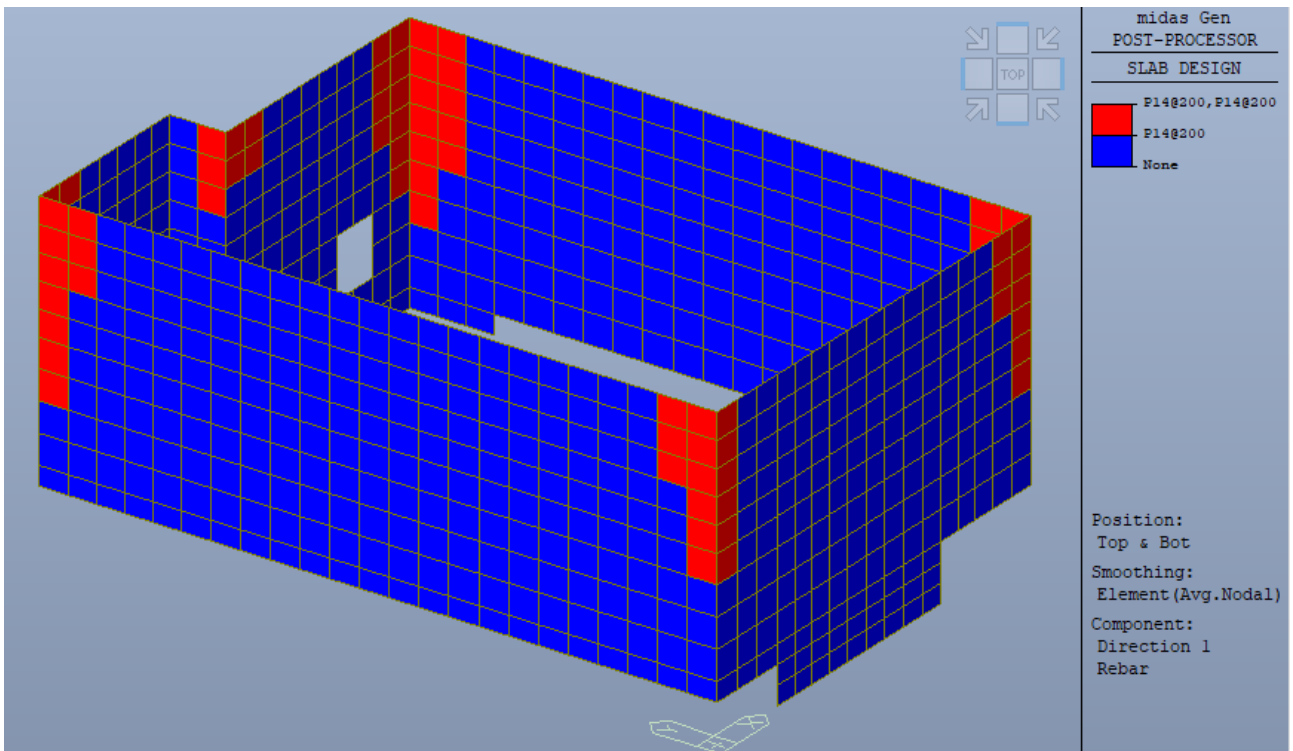
Platee sp.40 cm – armature in direzione X e Y – superiori



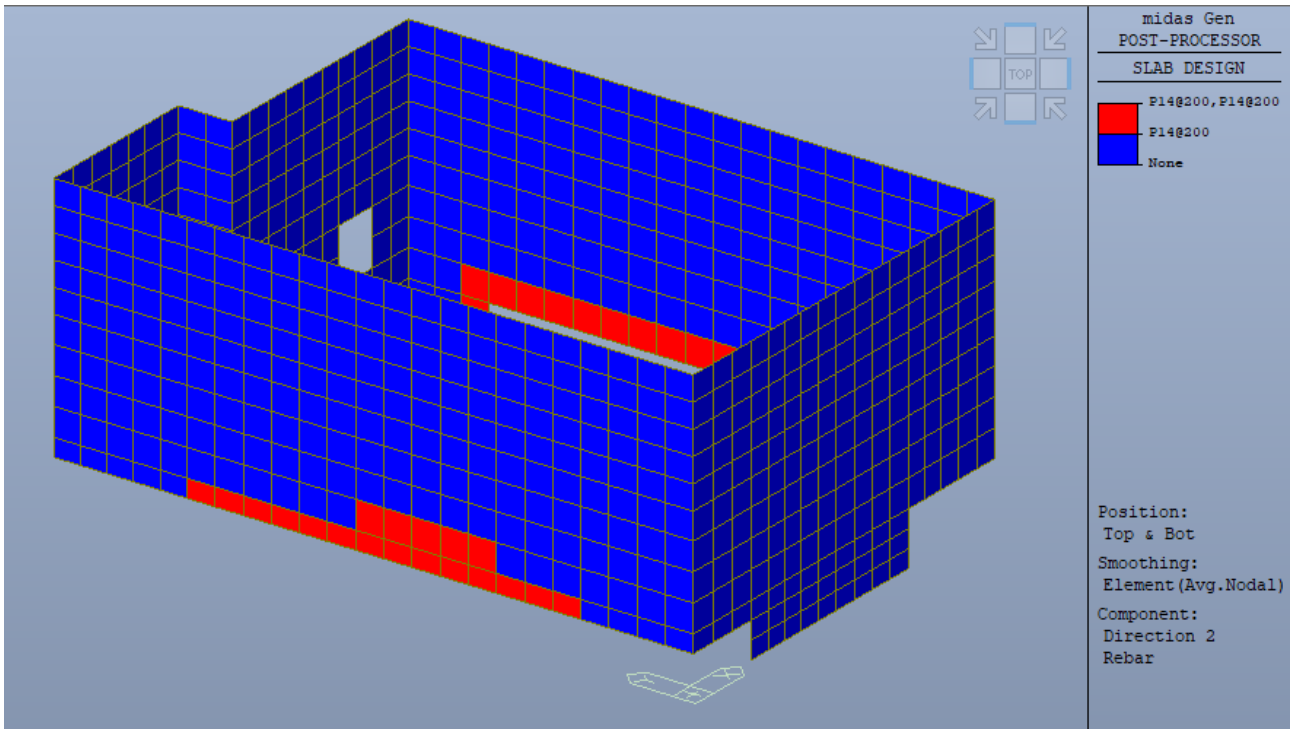
Platee sp.40 cm – armature in direzione X – inferiori



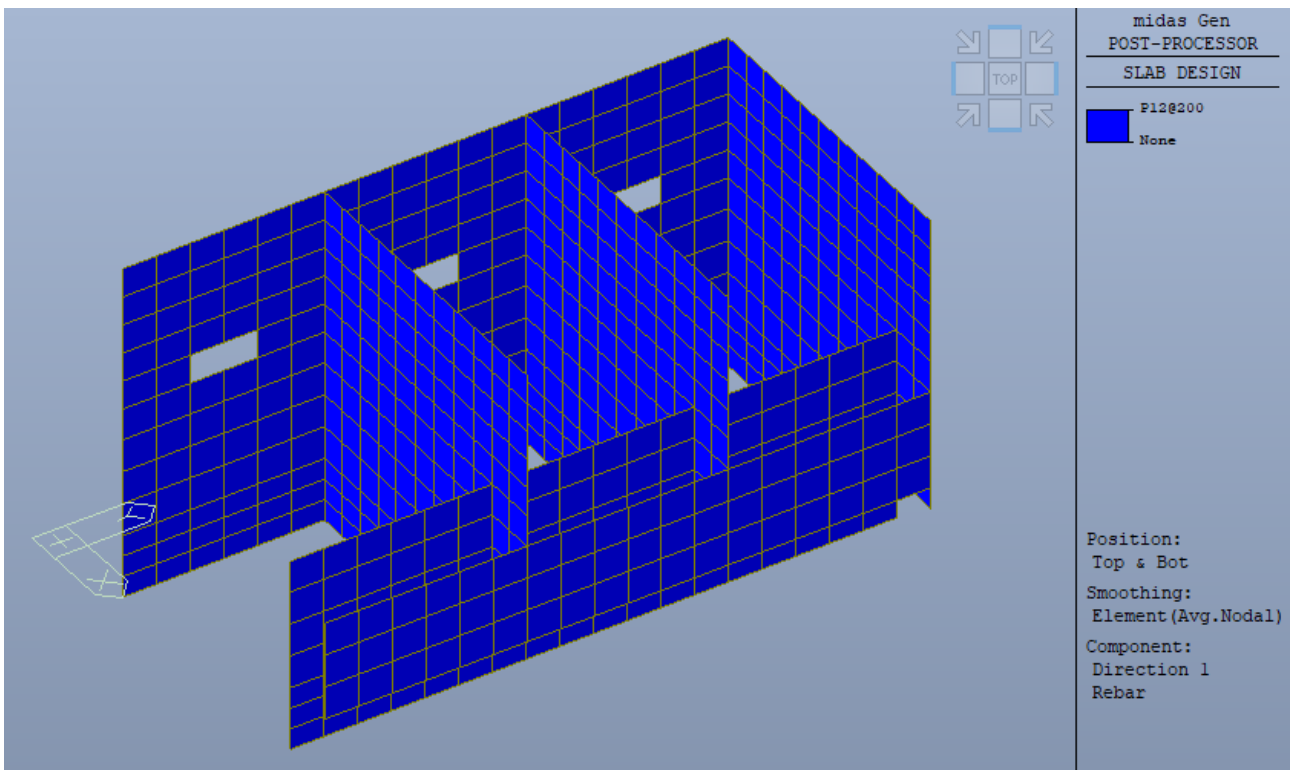
Platee sp.40 cm – armature in direzione Y – inferiori



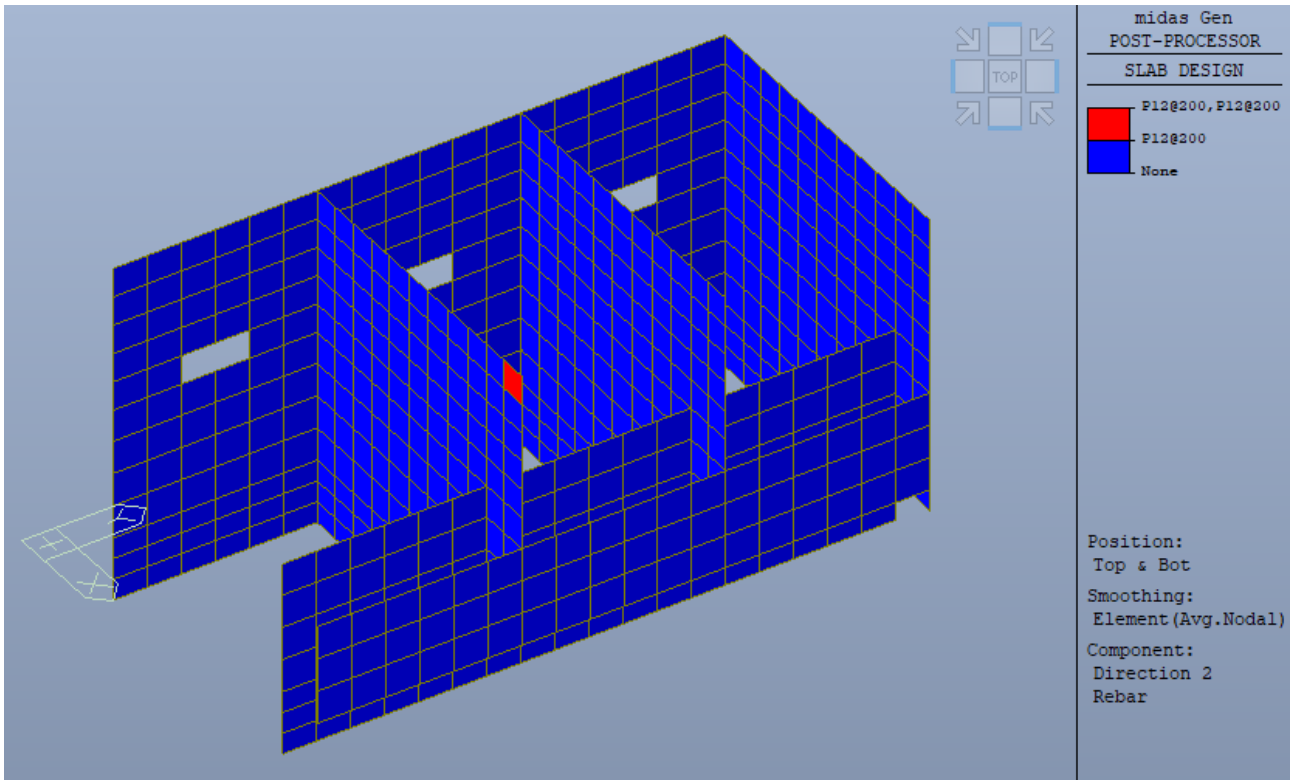
Pareti esterne – armature in direzione orizzontale – ambo i lati



Pareti esterne – armature in direzione verticale – ambo i lati



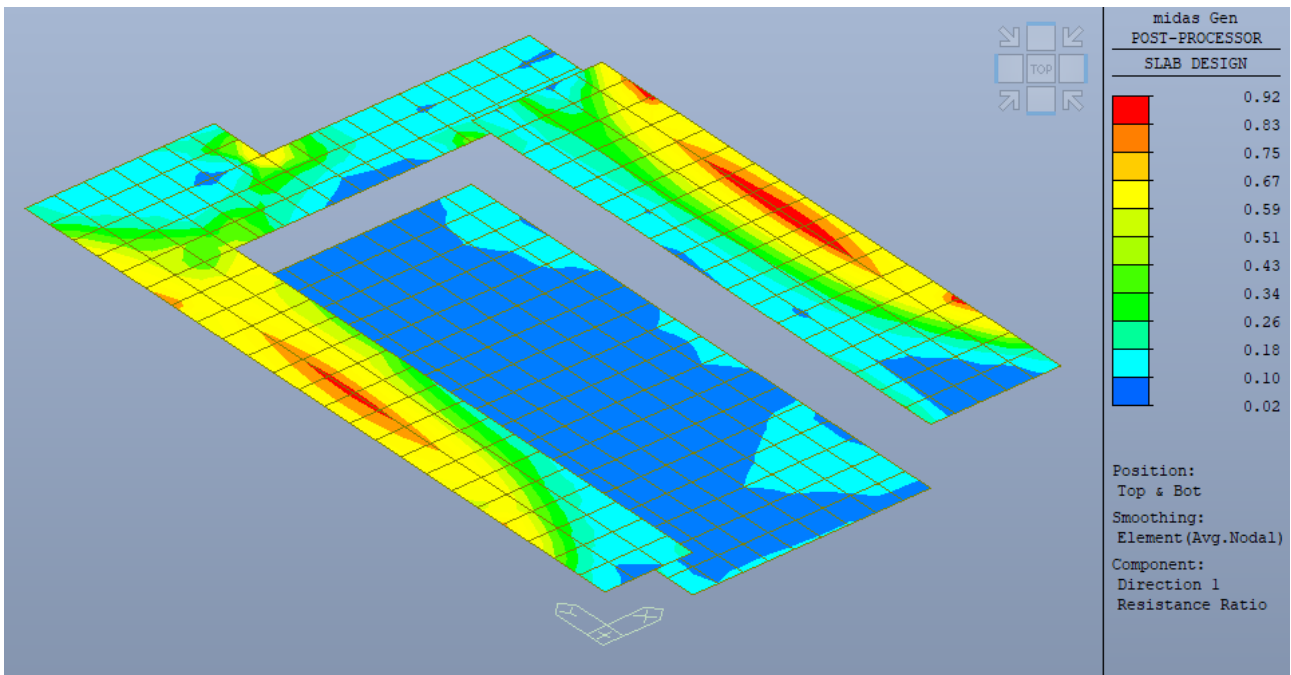
Pareti interne sp.30 – armature in direzione orizzontale – ambo i lati



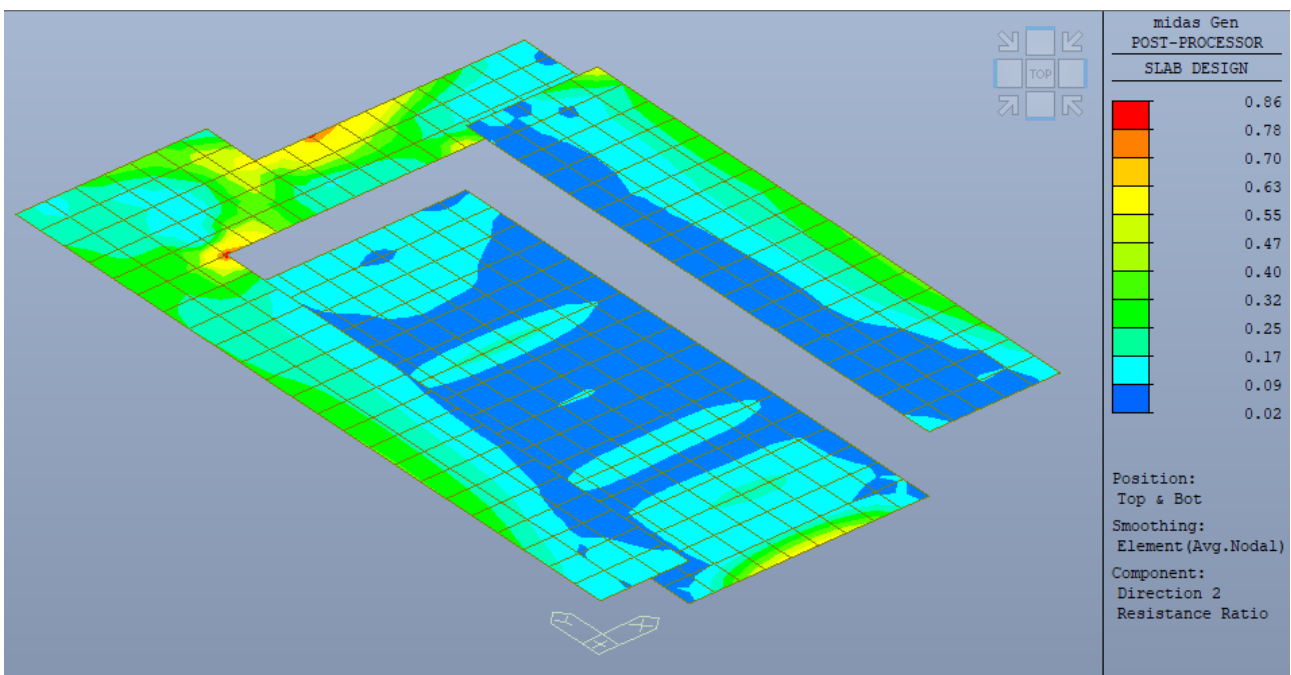
Pareti interne – armature in direzione verticale – ambo i lati

1.7 Verifiche di resistenza SLU grafiche

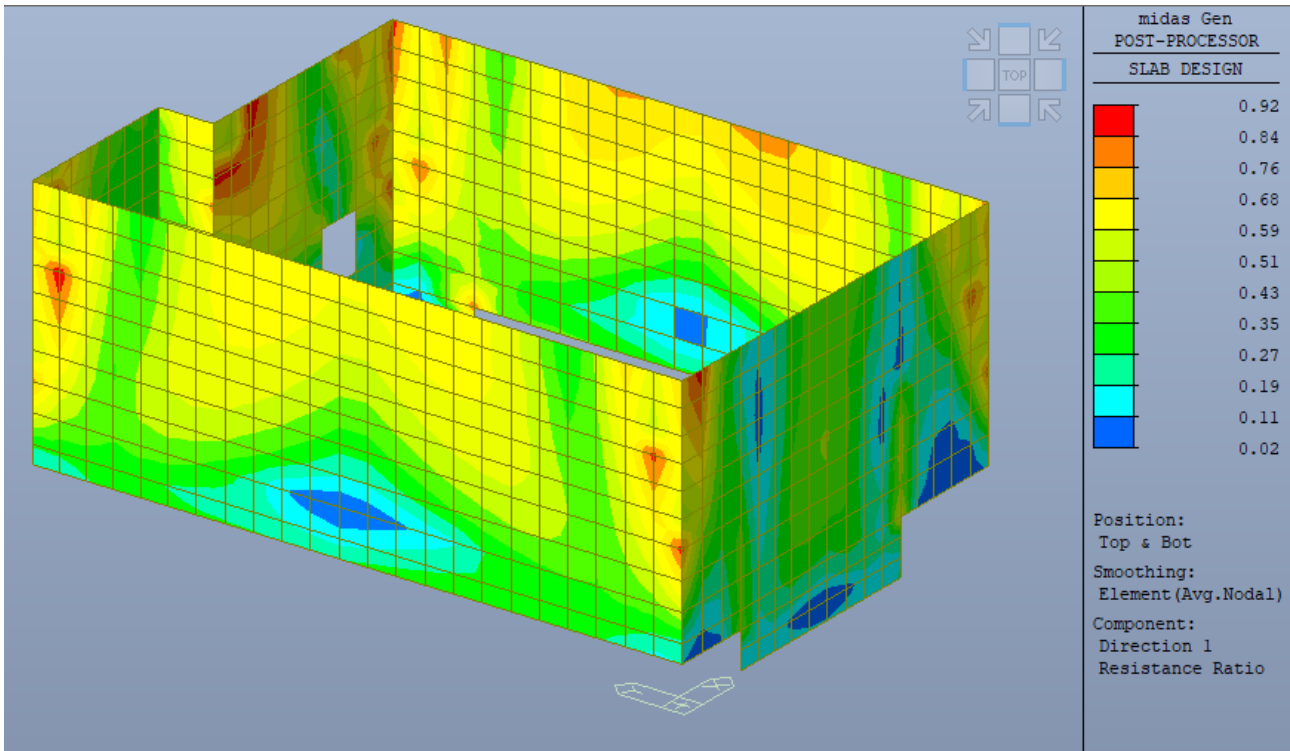
Nelle immagini seguenti vengono riportate le verifiche strutturali per via grafica, come tassi di sfruttamento dell'armatura nelle sezioni di cemento armato, per le sollecitazioni flessionali:



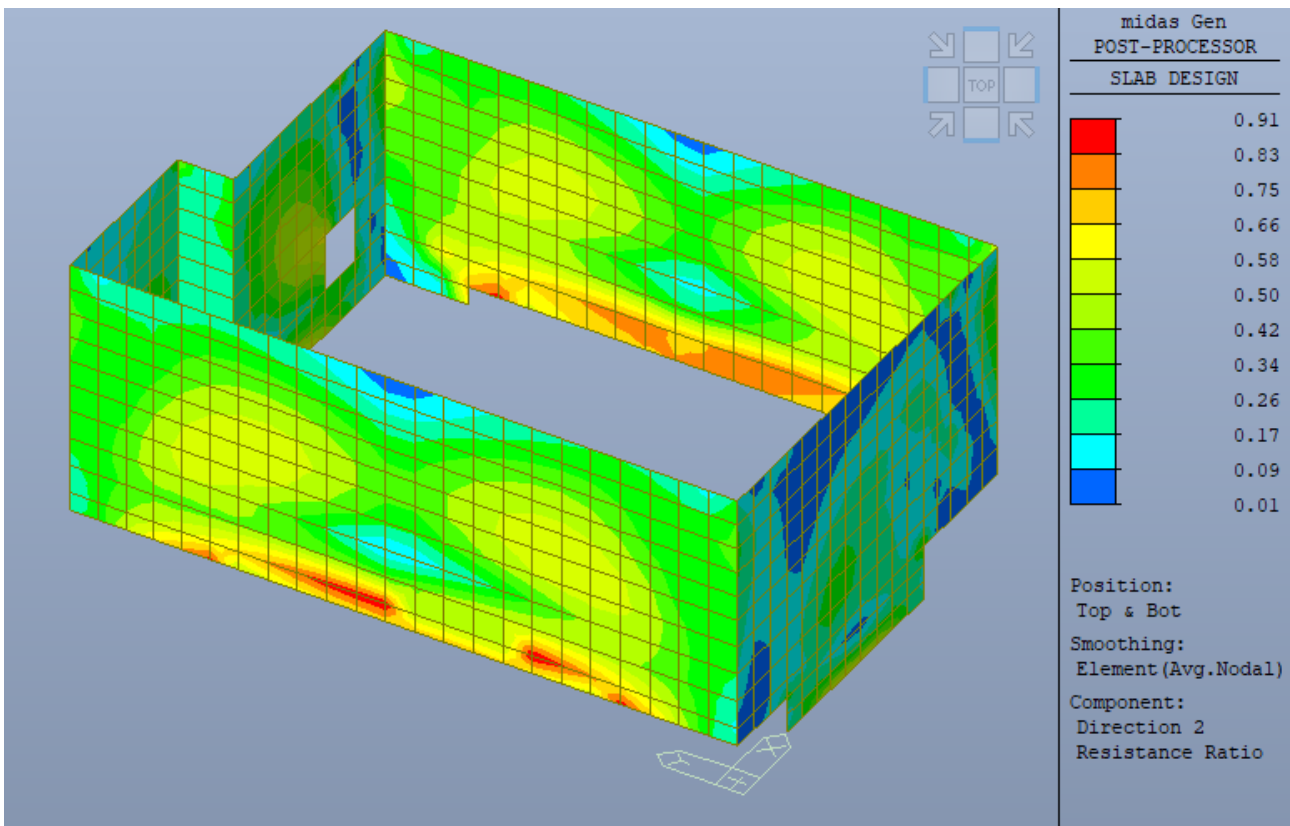
Platee sp.40 - Indici di resistenza a flessione direzione X (involuppo SLU e SLV)



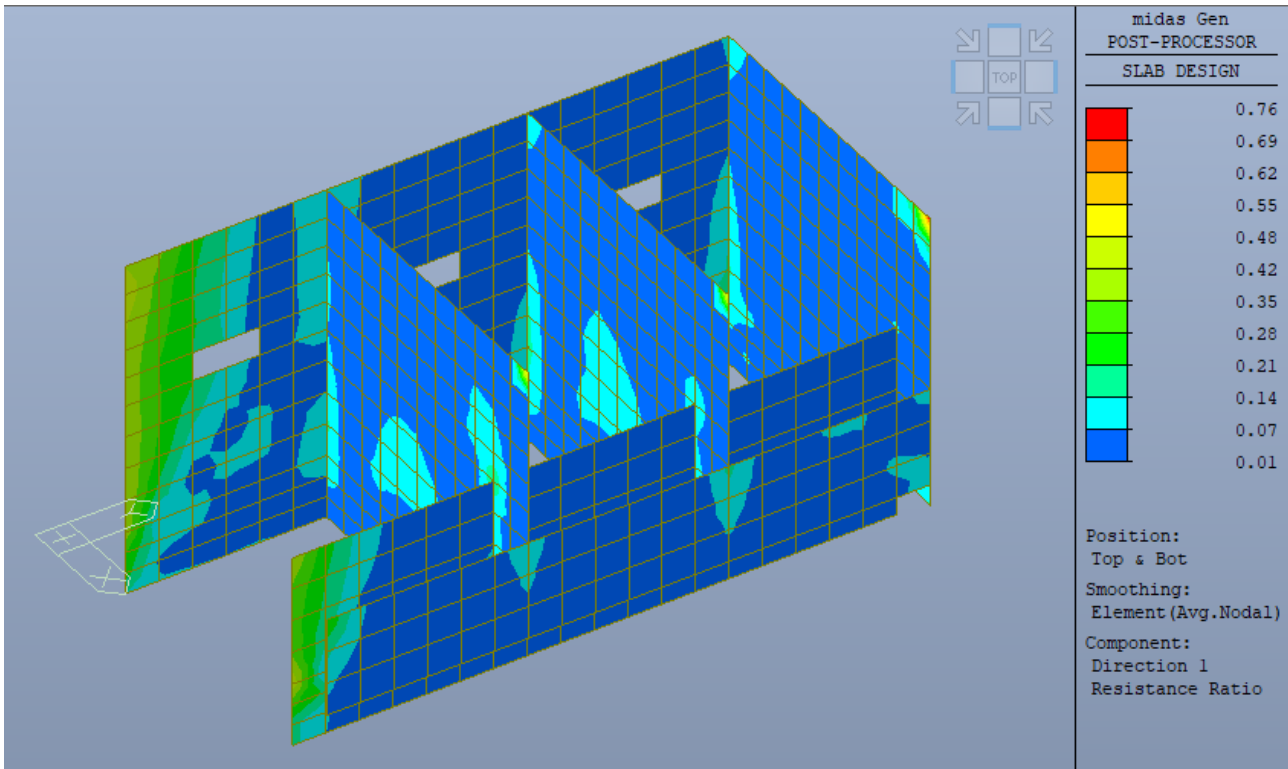
Platee sp.40 - Indici di resistenza a flessione direzione Y (involuppo SLU e SLV)



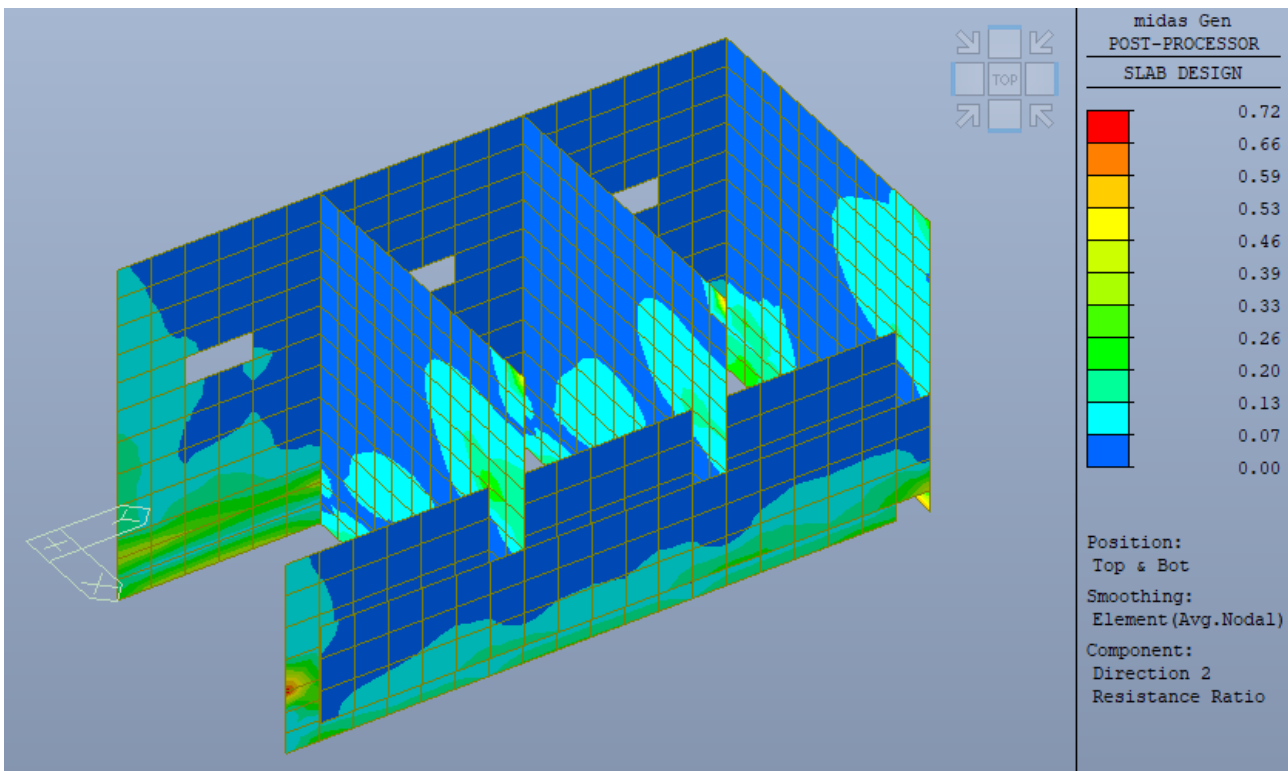
Pareti esterne sp.40 - Indici di resistenza a flessione direzione orizzontale (involuppo SLU e SLV)



Pareti esterne sp.40 - Indici di resistenza a flessione direzione verticale (involuppo SLU e SLV)



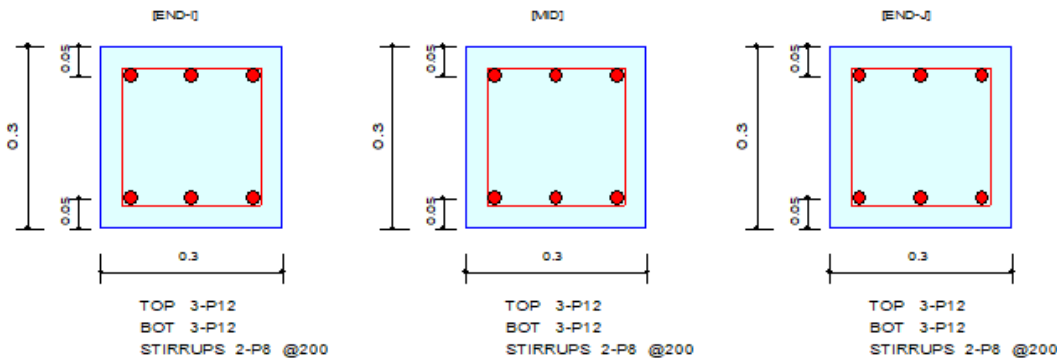
Pareti interne sp.30 - Indici di resistenza a flessione direzione orizzontale (involuppo SLU e SLV)



Pareti interne sp.30 - Indici di resistenza a flessione direzione verticale (involuppo SLU e SLV)

1. Design Information

Design Code	Eurocode2:04 & NTC2018	Unit System	kN, m
Material Data	$f_{ck} = 32000$, $f_{yk} = 450000$, $f_{yw} = 450000$ KPa		
Section Property	30x30 (No : 1)	Beam Span	2.85m



2. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	9	9	9
Moment (M _{Ed})	8.21	5.86	9.60
Factored Strength (M _{Rd})	33.26	33.26	33.26
Check Ratio (M _{Ed} /M _{Rd})	0.2470	0.1763	0.2885
Neutral Axis (x/d)	0.1558	0.1558	0.1558
(+) Load Combination No.	1	9	9
Moment (M _{Ed})	1.98	3.19	3.19
Factored Strength (M _{Rd})	33.26	33.26	33.26
Check Ratio (M _{Ed} /M _{Rd})	0.0597	0.0959	0.0959
Neutral Axis (x/d)	0.1558	0.1558	0.1558
Using Rebar Top (A _{s_top})	0.0003	0.0003	0.0003
Using Rebar Bot (A _{s_bot})	0.0003	0.0003	0.0003

3. Shear Capacity

	END-I	MID	END-J
Load Combination No.	9	9	9
Factored Shear Force (V _{Ed})	10.49	10.16	11.96
V _{Rdc}	41.54	41.54	41.54
V _{Rds}	44.02	44.02	44.02
V _{Rdmax}	360.00	360.00	360.00
Using Shear Reinf. (A _{sw})	0.0005	0.0005	0.0005
Using Stirrups Spacing	2-P8 @200	2-P8 @200	2-P8 @200
V _{Ed} / V _{Rdc}	0.2525	0.2445	0.2878
V _{Ed} / min(V _{Rds} , V _{Rdmax})	0.2383	0.2307	0.2716
Check Ratio	0.2525	0.2445	0.2878

Travi sezione 30x30 sp.30 – Verifiche di resistenza SLU e SLV

1.8 Verifiche di resistenza SLU analitiche

1.8.1 Verifiche Platea

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

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

0.4000 345 BOT 0.0004 0.0008 | 51.9747(9) 96.8116 0.537 OK

343 TOP 0.0003 0.0008 | 18.3653(7) 96.8116 0.190 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 345

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. : 9

-. 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.

$$M_{Rd} = Cc \cdot (d-a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 51.9747 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.537 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.031$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.031 / 0.450 = 0.069 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 343

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 7

-. Information of Design.

$b = 0.0010 \text{ m. (by Code Unit Length)}$.

$d = 0.3300 \text{ m.}$

$\lambda = 0.800$

$a = \lambda * x = 0.014 \text{ m.}$

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$

$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$A_{s_req} = 0.0003 \text{ m}^2/\text{m. (} 0.0003 \text{ m}^2/\text{m.)}$

$M_{Ed} = 18.3653 \text{ kN-m./m.}$

$M_{Rd} = 96.8116 \text{ kN-m./m.}$

$RatM = M_{Ed} / M_{Rd} = 0.190 < 1.0 \text{ ---> O.K !}$

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

$x/d = 0.023$

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

$x/d \text{ ratio} = 0.023 / 0.450 = 0.051 \text{ ---> O.K}$

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

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

0.4000 1437 BOT 0.0009 0.0015 | 105.525(3) 189.412 0.557 OK

1439 TOP 0.0003 0.0008 | 21.6212(3) 96.8116 0.223 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1437

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. : 3

-. Information of Design.

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

d = 0.3300 m.

lambda = 0.800

a = lambda * x = 0.028 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.5995 kN.

M_Rd = Cc*(d-a/2) = 189.4116 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

As_req = 0.0009 m²/m. (0.0009 m²/m.)

M_Ed = 105.5249 kN-m./m.

M_Rd = 189.4116 kN-m./m.

RatM = M_Ed / M_Rd = 0.557 < 1.0 ---> O.K !

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

$$x/d = 0.063$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.063 / 0.450 = 0.140 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1439

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700$ m.

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0003 \text{ m}^2/\text{m. (} 0.0003 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 21.6212 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.223 < 1.0 \text{ ---> O.K !}$$

- Check ratio of neutral axis depth to effective depth.

$$x/d = 0.023$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.023 / 0.450 = 0.051 \text{ ---> O.K}$$

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

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

0.4000 1145 BOT 0.0004 0.0008 | 50.2687(3) 96.8116 0.519 OK

1151 TOP 0.0003 0.0008 | 31.3896(9) 96.8116 0.324 OK

<< BOTTOM >>

- Information of Parameters.

Elem No. : 1145

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m. (} 0.0004 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 50.2687 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.519 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.030$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.030 / 0.450 = 0.067 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1151

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$dT = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0003 \text{ m}^2/\text{m.} \text{ (} 0.0003 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 31.3896 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.324 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.023$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.023 / 0.450 = 0.051 \text{ ---> O.K}$$

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

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

0.4000 345 BOT 0.0004 0.0008 | 51.9747(9) 96.8116 0.537 OK

343 TOP 0.0003 0.0008 | 18.3653(7) 96.8116 0.190 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 345

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. : 9

-. 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 = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 51.9747 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.537 < 1.0 ---> O.K !

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

$$x/d = 0.031$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.031 / 0.450 = 0.069 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 343

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 7

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$Cc = \eta * fcd * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = Cc * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0003 \text{ m}^2/\text{m. (} 0.0003 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 18.3653 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.190 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.023$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.023 / 0.450 = 0.051 \text{ ---> O.K}$$

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

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

0.4000 1437 BOT 0.0009 0.0015 | 105.525(3) 189.412 0.557 OK

1439 TOP 0.0003 0.0008 | 21.6212(3) 96.8116 0.223 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1437

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.028 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.5995 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 189.4116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0009 \text{ m}^2/\text{m. (} 0.0009 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 105.5249 \text{ kN-m./m.}$$

$$M_{Rd} = 189.4116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.557 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.063$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.063 / 0.450 = 0.140 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1439

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

dT = 0.0700 m.

LCB No. : 3

-. 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 = 0.0003 m²/m. (0.0003 m²/m.)

M_Ed = 21.6212 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.223 < 1.0 ---> O.K !

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

x/d = 0.023

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

x/d ratio = 0.023/ 0.450 = 0.051 ---> O.K

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

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

0.4000 1145 BOT 0.0004 0.0008 | 50.2687(3) 96.8116 0.519 OK

1151 TOP 0.0003 0.0008 | 31.3896(9) 96.8116 0.324 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1145

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. : 3

-. 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 = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 50.2687 kN-m./m.

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.519 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.030$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.030 / 0.450 = 0.067 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1151

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * fcd * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

As_req = 0.0003 m²/m. (0.0003 m²/m.)

M_Ed = 31.3896 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.324 < 1.0 ---> O.K !

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

x/d = 0.023

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

x/d ratio = 0.023/ 0.450 = 0.051 ---> O.K

1.8.2 Verifiche Pareti Esterne

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

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

0.4000 900 BOT 0.0006 0.0008 | 44.9764(9) 103.031 0.437 OK

952 TOP 0.0012 0.0015 | 149.604(9) 201.831 0.741 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 900

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. : 9

-. 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 m²/m. (0.0006 m²/m.)

M_Ed = 44.9764 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.437 < 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. : 952

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$f_{cd} = 21333.3333$ KPa.

$f_{yk} = 450000.0000$ KPa.

Covering : $d_B = 0.0500$ m.

$d_T = 0.0500$ m.

LCB No. : 9

-. Information of Design.

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

$d = 0.3500$ m.

$\lambda = 0.800$

$a = \lambda * x = 0.028$ m.

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.6008$ kN.

$M_{Rd} = C_c * (d - a/2) = 201.8307$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$A_{s_req} = 0.0012$ m²/m. (0.0012 m²/m.)

$M_{Ed} = 149.6038$ kN-m./m.

$M_{Rd} = 201.8307$ kN-m./m.

$RatM = M_{Ed} / M_{Rd} = 0.741 < 1.0 \rightarrow$ O.K !

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

$x/d = 0.080$

Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.)

x/d ratio = $0.080 / 0.450 = 0.177 \rightarrow$ O.K

=====
[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 5, Dir 1.

=====

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

0.4000 635 BOT 0.0011 0.0015 | 131.129(9) 201.831 0.650 OK

640 TOP 0.0006 0.0008 | 48.3274(4) 103.031 0.469 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 635

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. : 9

-. Information of Design.

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

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.028 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.6008 kN.

M_Rd = Cc*(d-a/2) = 201.8307 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

As_req = 0.0011 m²/m. (0.0011 m²/m.)

M_Ed = 131.1287 kN-m./m.

M_Rd = 201.8307 kN-m./m.

RatM = M_Ed / M_Rd = 0.650 < 1.0 ---> O.K !

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

x/d = 0.070

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

x/d ratio = 0.070/ 0.450 = 0.155 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 640

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.

$$M_{Rd} = Cc \cdot (d-a/2) = 103.0306 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m.} \quad (\quad 0.0006 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 48.3274 \text{ kN-m./m.}$$

$$M_{Rd} = 103.0306 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.469 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

=====
[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 6, Dir 1.
=====

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

0.4000 1073 BOT 0.0012 0.0015 | 143.167(9) 201.831 0.709 OK

1098 TOP 0.0006 0.0008 | 33.6697(1) 103.031 0.327 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1073

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

$$\text{Covering : } dB = 0.0500 \text{ m.}$$

$$dT = 0.0500 \text{ m.}$$

$$\text{LCB No. : } 9$$

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.028 \text{ m.}$$

$$\eta = 1.000$$

$$Cc = \eta * fcd * b * a = 0.6008 \text{ kN.}$$

$$M_{Rd} = Cc * (d - a/2) = 201.8307 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0012 \text{ m}^2/\text{m.} (0.0012 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 143.1674 \text{ kN-m./m.}$$

$$M_{Rd} = 201.8307 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.709 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.076$$

$$\text{Limit}(x/d) = 0.450 (fck \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.076 / 0.450 = 0.169 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1098

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$f_{cd} = 21333.3333$ KPa.

$f_{yk} = 450000.0000$ KPa.

Covering : $d_B = 0.0500$ m.

$d_T = 0.0500$ m.

LCB No. : 1

-. Information of Design.

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

$d = 0.3500$ m.

$\lambda = 0.800$

$a = \lambda * x = 0.014$ m.

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.3004$ kN.

$M_{Rd} = C_c * (d - a/2) = 103.0306$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

$A_{s_req} = 0.0006$ m²/m. (0.0006 m²/m.)

$M_{Ed} = 33.6697$ kN-m./m.

$M_{Rd} = 103.0306$ kN-m./m.

$RatM = M_{Ed} / M_{Rd} = 0.327 < 1.0$ ---> O.K !

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

$x/d = 0.040$

Limit(x/d) = 0.450 ($f_{ck} \leq 50$ 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

0.4000 1182 BOT 0.0014 0.0015 | 168.549(9) 201.831 0.835 OK

770 TOP 0.0010 0.0015 | 118.774(9) 201.831 0.588 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1182

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. : 9

-. Information of Design.

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

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.028 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.6008 kN.

M_Rd = Cc*(d-a/2) = 201.8307 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

As_req = 0.0014 m²/m. (0.0014 m²/m.)

M_Ed = 168.5491 kN-m./m.

M_Rd = 201.8307 kN-m./m.

RatM = M_Ed / M_Rd = 0.835 < 1.0 ---> O.K !

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

x/d = 0.090

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

x/d ratio = 0.090/ 0.450 = 0.199 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 770

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. : 9

-. Information of Design.

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

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.028 m.

$$\eta = 1.000$$

$$C_c = \eta \cdot f_{cd} \cdot b \cdot a = 0.6008 \text{ kN.}$$

$$M_{Rd} = C_c \cdot (d - a/2) = 201.8307 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0010 \text{ m}^2/\text{m.} \quad (\quad 0.0010 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 118.7738 \text{ kN-m./m.}$$

$$M_{Rd} = 201.8307 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.588 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.063$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.063 / 0.450 = 0.140 \text{ ---> O.K}$$

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

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

0.4000 1738 BOT 0.0007 0.0008 | 80.6613(9) 103.031 0.783 OK

1652 TOP 0.0014 0.0015 | 178.497(9) 201.831 0.884 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1738

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$f_{cd} = 21333.3333$ KPa.

$f_{yk} = 450000.0000$ KPa.

Covering : $d_B = 0.0500$ m.

$d_T = 0.0500$ m.

LCB No. : 9

-. Information of Design.

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

$d = 0.3500$ m.

$\lambda = 0.800$

$a = \lambda * x = 0.014$ m.

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.3004$ kN.

$M_{Rd} = C_c * (d - a/2) = 103.0306$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

$A_{s_req} = 0.0007$ m²/m. (0.0007 m²/m.)

$M_{Ed} = 80.6613$ kN-m./m.

$M_{Rd} = 103.0306$ kN-m./m.

$RatM = M_{Ed} / M_{Rd} = 0.783 < 1.0 \rightarrow$ O.K !

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

$x/d = 0.043$

Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.)

x/d ratio = $0.043 / 0.450 = 0.095 \rightarrow$ O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 1652

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. : 9

-. Information of Design.

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

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.028 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.6008 kN.

M_Rd = Cc*(d-a/2) = 201.8307 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

As_req = 0.0014 m²/m. (0.0014 m²/m.)

M_Ed = 178.4966 kN-m./m.

M_Rd = 201.8307 kN-m./m.

RatM = M_Ed / M_Rd = 0.884 < 1.0 ---> O.K !

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

x/d = 0.095

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

$x/d \text{ ratio} = 0.095 / 0.450 = 0.211 \rightarrow \text{O.K}$

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

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

0.4000 495 BOT 0.0013 0.0015 | 155.789(5) 201.831 0.772 OK

360 TOP 0.0006 0.0008 | 68.9318(9) 103.031 0.669 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 495

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. : 5

-. Information of Design.

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

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.028 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.6008 kN.

$$M_{Rd} = Cc \cdot (d-a/2) = 201.8307 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0013 \text{ m}^2/\text{m.} \quad (\quad 0.0013 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 155.7893 \text{ kN-m./m.}$$

$$M_{Rd} = 201.8307 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.772 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.083$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.083 / 0.450 = 0.184 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 360

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0500 \text{ m.}$

$$dT = 0.0500 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m.} \quad (\text{by Code Unit Length}) .$$

$$d = 0.3500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.3004 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 103.0306 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m.} \quad (\quad 0.0006 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 68.9318 \text{ kN-m./m.}$$

$$M_{Rd} = 103.0306 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.669 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

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

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

0.4000 650 BOT 0.0006 0.0008 | 27.7462(9) 96.8116 0.287 OK

570 TOP 0.0006 0.0008 | 55.6824(9) 96.8116 0.575 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 650

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000$ KPa. $f_{cd} = 21333.3333$ KPa. $f_{yk} = 450000.0000$ KPa.Covering : $d_B = 0.0700$ m. $d_T = 0.0700$ m.

LCB No. : 9

-. Information of Design.

 $b = 0.0010$ m. (by Code Unit Length). $d = 0.3300$ m. $\lambda = 0.800$ $a = \lambda * x = 0.014$ m. $\eta = 1.000$ $C_c = \eta * f_{cd} * b * a = 0.2997$ kN. $M_{Rd} = C_c * (d - a/2) = 96.8116$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P14 @200

 $A_{s_req} = 0.0006$ m²/m. (0.0006 m²/m.) $M_{Ed} = 27.7462$ kN-m./m. $M_{Rd} = 96.8116$ kN-m./m. $RatM = M_{Ed} / M_{Rd} = 0.287 < 1.0 \rightarrow$ O.K !

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

 $x/d = 0.040$ Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.) x/d ratio = $0.040 / 0.450 = 0.089 \rightarrow$ O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 570

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. : 9

-. 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 m²/m. (0.0006 m²/m.)

M_Ed = 55.6824 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.575 < 1.0 ---> O.K !

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

=====
[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 5, Dir 2.
=====

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

0.4000 635 BOT 0.0006 0.0008 | 29.8749(4) 96.8116 0.309 OK

571 TOP 0.0008 0.0015 | 90.5017(9) 189.412 0.478 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 635

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

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m.} \quad (\quad 0.0006 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 29.8749 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.309 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 571

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.028 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.5995 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 189.4116 \text{ kN-m./m.}$$

- Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0008 \text{ m}^2/\text{m. (} 0.0008 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 90.5017 \text{ kN-m./m.}$$

$$M_{Rd} = 189.4116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.478 < 1.0 \text{ ---> O.K !}$$

- Check ratio of neutral axis depth to effective depth.

$$x/d = 0.054$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.054 / 0.450 = 0.120 \text{ ---> O.K}$$

=====
[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete EXT 6, Dir 2.
=====

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

0.4000 944 BOT 0.0006 0.0008 | 34.6554(2) 96.8116 0.358 OK

991 TOP 0.0006 0.0008 | 35.5271(9) 96.8116 0.367 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 944

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 m²/m. (0.0006 m²/m.)

M_Ed = 34.6554 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.358 < 1.0 ---> O.K !

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

x/d = 0.040

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 991

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$Cc = \eta * fcd * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = Cc * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m. (} 0.0006 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 35.5271 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.367 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

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

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

0.4000 673 BOT 0.0010 0.0015 | 121.049(3) 189.412 0.639 OK

1035 TOP 0.0006 0.0008 | 59.2340(9) 96.8116 0.612 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 673

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.028 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.5995 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 189.4116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0010 \text{ m}^2/\text{m.} \quad (\quad 0.0010 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 121.0493 \text{ kN-m./m.}$$

$$M_{Rd} = 189.4116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.639 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.072$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.072 / 0.450 = 0.161 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1035

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m. (} 0.0006 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 59.2340 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.612 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

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

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

0.4000 1303 BOT 0.0006 0.0008 | 62.3805(3) 96.8116 0.644 OK

1358 TOP 0.0012 0.0015 | 144.570(9) 189.412 0.763 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1303

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. : 3

-. 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 m²/m. (0.0006 m²/m.)

M_Ed = 62.3805 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.644 < 1.0 ---> O.K !

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1358

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700$ m.

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.028 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.5995 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 189.4116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0012 \text{ m}^2/\text{m. (} 0.0012 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 144.5696 \text{ kN-m./m.}$$

$$M_{Rd} = 189.4116 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.763 < 1.0 \text{ ---> O.K !}$$

- Check ratio of neutral axis depth to effective depth.

$$x/d = 0.086$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.086 / 0.450 = 0.192 \text{ ---> O.K}$$

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

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

0.4000 1862 BOT 0.0012 0.0015 | 137.211(4) 189.412 0.724 OK

524 TOP 0.0006 0.0008 | 54.4641(5) 96.8116 0.563 OK

<< BOTTOM >>

- Information of Parameters.

Elem No. : 1862

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 4

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.028 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.5995 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 189.4116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200 / P14 @200

$$A_{s_req} = 0.0012 \text{ m}^2/\text{m. (} 0.0012 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 137.2114 \text{ kN-m./m.}$$

$$M_{Rd} = 189.4116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.724 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.082$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.082 / 0.450 = 0.182 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 524

Thickness : 0.4000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$dT = 0.0700 \text{ m.}$$

LCB No. : 5

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.3300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.014 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2997 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 96.8116 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P14 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m. (} 0.0006 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 54.4641 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8116 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.563 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

1.8.3 Verifiche Pareti Interne

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

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

0.3000 1501 BOT 0.0004 0.0006 | 25.2474(9) 54.0653 0.467 OK

1299 TOP 0.0004 0.0006 | 9.98132(9) 54.0653 0.185 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1501

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. : 9

-. 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 m²/m. (0.0004 m²/m.)

M_Ed = 25.2474 kN-m./m.

$$M_{Rd} = 54.0653 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.467 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1299

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0500 m.

$$dT = 0.0500 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * fcd * b * a = 0.2208 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 54.0653 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 9.9813 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.185 < 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 6, Dir 1.
=====

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

0.3000 1564 BOT 0.0004 0.0006 | 5.96126(1) 54.0653 0.110 OK

1494 TOP 0.0004 0.0006 | 15.6120(9) 54.0653 0.289 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1564

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

$$dT = 0.0500 \text{ m.}$$

LCB No. : 1

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2208 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 54.0653 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m. (0.0004 m}^2/\text{m.)}$$

$$M_{Ed} = 5.9613 \text{ kN-m./m.}$$

$$M_{Rd} = 54.0653 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.110 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1494

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

$$\text{Covering : } dB = 0.0500 \text{ m.}$$

$$dT = 0.0500 \text{ m.}$$

$$\text{LCB No. : } 9$$

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$Cc = \eta * fcd * b * a = 0.2208 \text{ kN.}$$

$$M_{Rd} = Cc * (d - a/2) = 54.0653 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 15.6120 \text{ kN-m./m.}$$

$$M_{Rd} = 54.0653 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.289 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \quad (fck \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

=====
[[[*]]] SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete INT 5, Dir 1.
=====

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

0.3000 925 BOT 0.0004 0.0006 | 9.08368(3) 54.0653 0.168 OK

1613 TOP 0.0004 0.0006 | 25.1417(3) 54.0653 0.465 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 925

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

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m}. (0.0004 \text{ m}^2/\text{m}.)$$

$$M_{Ed} = 9.0837 \text{ kN-m./m.}$$

$$M_{Rd} = 54.0653 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.168 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 (f_{ck} \leq 50 \text{ MPa}.)$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1613

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa}.$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0500 \text{ m}.$

$$d_T = 0.0500 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2208 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 54.0653 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 25.1417 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.465 < 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 1.

=====

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

0.3000	1945	BOT	0.0004	0.0006	11.0247(2)	54.0653	0.204	OK
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1936	TOP	0.0004	0.0006	28.6738(9)	54.0653	0.530	OK
------	-----	--------	--------	-------------	---------	-------	----

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1945

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

$$f_{yk} = 450000.0000 \text{ KPa.}$$

$$\text{Covering} : d_B = 0.0500 \text{ m.}$$

$$d_T = 0.0500 \text{ m.}$$

$$\text{LCB No.} : 2$$

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2500 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2208 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 54.0653 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} (0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 11.0247 \text{ kN-m./m.}$$

$$M_{Rd} = 54.0653 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.204 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

$$\text{Elem No.} : 1936$$

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$f_{cd} = 21333.3333$ KPa.

$f_{yk} = 450000.0000$ KPa.

Covering : $d_B = 0.0500$ m.

$d_T = 0.0500$ m.

LCB No. : 9

-. Information of Design.

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

$d = 0.2500$ m.

$\lambda = 0.800$

$a = \lambda * x = 0.010$ m.

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.2208$ kN.

$M_{Rd} = C_c * (d - a/2) = 54.0653$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

$A_{s_req} = 0.0004$ m²/m. (0.0004 m²/m.)

$M_{Ed} = 28.6738$ kN-m./m.

$M_{Rd} = 54.0653$ kN-m./m.

$RatM = M_{Ed} / M_{Rd} = 0.530 < 1.0 \rightarrow$ O.K !

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

$x/d = 0.040$

Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.)

x/d ratio = $0.040 / 0.450 = 0.089 \rightarrow$ 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 2089 BOT 0.0004 0.0006 | 7.35820(9) 54.0653 0.136 OK

1864 TOP 0.0004 0.0006 | 28.8179(9) 54.0653 0.533 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 2089

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. : 9

-. 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

$A_{s_req} = 0.0004 \text{ m}^2/\text{m}. (0.0004 \text{ m}^2/\text{m}.)$

$M_{Ed} = 7.3582 \text{ kN-m./m}.$

$M_{Rd} = 54.0653 \text{ kN-m./m}.$

$RatM = M_{Ed} / M_{Rd} = 0.136 < 1.0 \text{ ---> O.K !}$

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

$x/d = 0.040$

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

$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$

<< TOP >>

-. Information of Parameters.

Elem No. : 1864

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

$f_{cd} = 21333.3333 \text{ KPa}.$

$f_{yk} = 450000.0000 \text{ KPa}.$

Covering : dB = 0.0500 m.

$d_T = 0.0500 \text{ m}.$

LCB No. : 9

-. Information of Design.

$b = 0.0010 \text{ m}. (\text{by Code Unit Length}).$

$d = 0.2500 \text{ m}.$

$\lambda = 0.800$

$a = \lambda * x = 0.010 \text{ m}.$

$\eta = 1.000$

$$C_c = \eta * f_{cd} * b * a = 0.2208 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 54.0653 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 28.8179 \text{ kN-m./m.}$$

$$M_{Rd} = 54.0653 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.533 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.040$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.040 / 0.450 = 0.089 \text{ ---> O.K}$$

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

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

0.3000 1273 BOT 0.0004 0.0006 | 10.0806(3) 54.0653 0.186 OK

1272 TOP 0.0005 0.0006 | 41.0131(3) 54.0653 0.759 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1273

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$f_{cd} = 21333.3333$ KPa.

$f_{yk} = 450000.0000$ KPa.

Covering : $d_B = 0.0500$ m.

$d_T = 0.0500$ 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.

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.2208$ kN.

$M_{Rd} = C_c * (d - a/2) = 54.0653$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

$A_{s_req} = 0.0004$ m²/m. (0.0004 m²/m.)

$M_{Ed} = 10.0806$ kN-m./m.

$M_{Rd} = 54.0653$ kN-m./m.

$RatM = M_{Ed} / M_{Rd} = 0.186 < 1.0 \rightarrow O.K !$

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

$x/d = 0.040$

Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.)

x/d ratio = $0.040 / 0.450 = 0.089 \rightarrow O.K$

<< TOP >>

-. Information of Parameters.

Elem No. : 1272

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000$ KPa. $f_{cd} = 21333.3333$ KPa. $f_{yk} = 450000.0000$ KPa.Covering : $d_B = 0.0500$ m. $d_T = 0.0500$ 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. $\eta = 1.000$ $C_c = \eta * f_{cd} * b * a = 0.2208$ kN. $M_{Rd} = C_c * (d - a/2) = 54.0653$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

 $A_{s_req} = 0.0005$ m²/m. (0.0005 m²/m.) $M_{Ed} = 41.0131$ kN-m./m. $M_{Rd} = 54.0653$ kN-m./m. $RatM = M_{Ed} / M_{Rd} = 0.759 < 1.0 \rightarrow$ O.K !

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

 $x/d = 0.043$ Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.) x/d ratio = $0.043 / 0.450 = 0.095 \rightarrow$ O.K

=====
[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete INT 4, Dir 2.
=====

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

0.3000 726 BOT 0.0004 0.0006 | 20.5284(3) 49.5572 0.414 OK

1140 TOP 0.0004 0.0006 | 20.4852(3) 49.5572 0.413 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 726

Thickness : 0.3000 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. : 3

-. Information of Design.

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

d = 0.2300 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2204 kN.

$$M_{Rd} = Cc \cdot (d-a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 20.5284 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.414 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1140

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2204 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 20.4852 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.413 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

=====
[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete INT 6, Dir 2.
=====

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

0.3000 1564 BOT 0.0004 0.0006 | 22.7047(1) 49.5572 0.458 OK

1494 TOP 0.0004 0.0006 | 6.58796(9) 49.5572 0.133 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1564

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000$ KPa.

$f_{cd} = 21333.3333$ KPa.

$f_{yk} = 450000.0000$ KPa.

Covering : $d_B = 0.0700$ m.

$d_T = 0.0700$ m.

LCB No. : 1

-. Information of Design.

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

$d = 0.2300$ m.

$\lambda = 0.800$

$a = \lambda * x = 0.010$ m.

$\eta = 1.000$

$C_c = \eta * f_{cd} * b * a = 0.2204$ kN.

$M_{Rd} = C_c * (d - a/2) = 49.5572$ kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

$A_{s_req} = 0.0004$ m²/m. (0.0004 m²/m.)

$M_{Ed} = 22.7047$ kN-m./m.

$M_{Rd} = 49.5572$ kN-m./m.

$RatM = M_{Ed} / M_{Rd} = 0.458 < 1.0$ ---> O.K !

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

$x/d = 0.056$

Limit(x/d) = 0.450 ($f_{ck} \leq 50$ MPa.)

x/d ratio = $0.056 / 0.450 = 0.125$ ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 1494

Thickness : 0.3000 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. : 9

-. Information of Design.

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

d = 0.2300 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2204 kN.

M_Rd = Cc*(d-a/2) = 49.5572 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 6.5880 kN-m./m.

M_Rd = 49.5572 kN-m./m.

RatM = M_Ed / M_Rd = 0.133 < 1.0 ---> O.K !

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

x/d = 0.056

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

x/d ratio = 0.056/ 0.450 = 0.125 ----> O.K

=====
[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete INT 5, Dir 2.
=====

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

0.3000 588 BOT 0.0004 0.0006 | 13.2449(1) 49.5572 0.267 OK

1613 TOP 0.0004 0.0006 | 35.7312(3) 49.5572 0.721 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 588

Thickness : 0.3000 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. : 1

-. Information of Design.

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

d = 0.2300 m.

lambda = 0.800

a = lambda * x = 0.010 m.

$$\eta = 1.000$$

$$C_c = \eta \cdot f_{cd} \cdot b \cdot a = 0.2204 \text{ kN.}$$

$$M_{Rd} = C_c \cdot (d - a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 13.2449 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.267 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1613

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 3

-. Information of Design.

$$b = 0.0010 \text{ m.} \quad (\text{by Code Unit Length}) .$$

$$d = 0.2300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2204 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 35.7312 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.721 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

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

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

0.3000 1595 BOT 0.0004 0.0006 | 19.3807(7) 49.5572 0.391 OK

1936 TOP 0.0006 0.0011 | 45.8517(9) 96.8370 0.473 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1595

Thickness : 0.3000 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. : 7

-. Information of Design.

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

d = 0.2300 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2204 kN.

M_Rd = Cc*(d-a/2) = 49.5572 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 19.3807 kN-m./m.

M_Rd = 49.5572 kN-m./m.

RatM = M_Ed / M_Rd = 0.391 < 1.0 ---> O.K !

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

x/d = 0.056

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

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1936

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.021 \text{ m.}$$

$$\eta = 1.000$$

$$Cc = \eta * fcd * b * a = 0.4408 \text{ kN.}$$

$$M_{Rd} = Cc * (d - a/2) = 96.8370 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200 / P12 @200

$$A_{s_req} = 0.0006 \text{ m}^2/\text{m.} \text{ (} 0.0006 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 45.8517 \text{ kN-m./m.}$$

$$M_{Rd} = 96.8370 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.473 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.113$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.113 / 0.450 = 0.250 \text{ ---> O.K}$$

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

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

0.3000 2089 BOT 0.0004 0.0006 | 10.0374(9) 49.5572 0.203 OK

1864 TOP 0.0004 0.0006 | 35.2794(9) 49.5572 0.712 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 2089

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2204 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m.} \quad (\quad 0.0004 \text{ m}^2/\text{m.})$$

$$M_{Ed} = 10.0374 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.203 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \quad (f_{ck} \leq 50 \text{ MPa.})$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1864

Thickness : 0.3000 m.

Materials : $f_{ck} = 32000.0000 \text{ KPa.}$

$$f_{cd} = 21333.3333 \text{ KPa.}$$

$$f_{yk} = 450000.0000 \text{ KPa.}$$

Covering : $d_B = 0.0700 \text{ m.}$

$$d_T = 0.0700 \text{ m.}$$

LCB No. : 9

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$C_c = \eta * f_{cd} * b * a = 0.2204 \text{ kN.}$$

$$M_{Rd} = C_c * (d - a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m. (} 0.0004 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 35.2794 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$RatM = M_{Ed} / M_{Rd} = 0.712 < 1.0 \text{ ---> O.K !}$$

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

=====
[[[*]]] SLAB CHECKING MAXIMUM RESULT DATA : DOMAIN 1-Parete INT 3, Dir 2.
=====

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

0.3000 783 BOT 0.0004 0.0006 | 11.6146(5) 49.5572 0.234 OK

1313 TOP 0.0004 0.0006 | 31.1098(1) 49.5572 0.628 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 783

Thickness : 0.3000 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. : 5

-. Information of Design.

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

d = 0.2300 m.

lambda = 0.800

a = lambda * x = 0.010 m.

eta = 1.000

Cc = eta*fcd*b*a = 0.2204 kN.

M_Rd = Cc*(d-a/2) = 49.5572 kN-m./m.

-. Information of Moments and Result.

Rein. Bar : P12 @200

As_req = 0.0004 m²/m. (0.0004 m²/m.)

M_Ed = 11.6146 kN-m./m.

M_Rd = 49.5572 kN-m./m.

RatM = M_Ed / M_Rd = 0.234 < 1.0 ---> O.K !

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

$$x/d = 0.056$$

$$\text{Limit}(x/d) = 0.450 \text{ (fck } \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

<< TOP >>

-. Information of Parameters.

Elem No. : 1313

Thickness : 0.3000 m.

Materials : fck = 32000.0000 KPa.

$$fcd = 21333.3333 \text{ KPa.}$$

$$fyk = 450000.0000 \text{ KPa.}$$

Covering : dB = 0.0700 m.

$$dT = 0.0700 \text{ m.}$$

LCB No. : 1

-. Information of Design.

$$b = 0.0010 \text{ m. (by Code Unit Length).}$$

$$d = 0.2300 \text{ m.}$$

$$\lambda = 0.800$$

$$a = \lambda * x = 0.010 \text{ m.}$$

$$\eta = 1.000$$

$$Cc = \eta * fcd * b * a = 0.2204 \text{ kN.}$$

$$M_{Rd} = Cc * (d - a/2) = 49.5572 \text{ kN-m./m.}$$

-. Information of Moments and Result.

Rein. Bar : P12 @200

$$A_{s_req} = 0.0004 \text{ m}^2/\text{m. (} 0.0004 \text{ m}^2/\text{m.)}$$

$$M_{Ed} = 31.1098 \text{ kN-m./m.}$$

$$M_{Rd} = 49.5572 \text{ kN-m./m.}$$

$$\text{RatM} = M_{Ed} / M_{Rd} = 0.628 < 1.0 \text{ ---> O.K!}$$

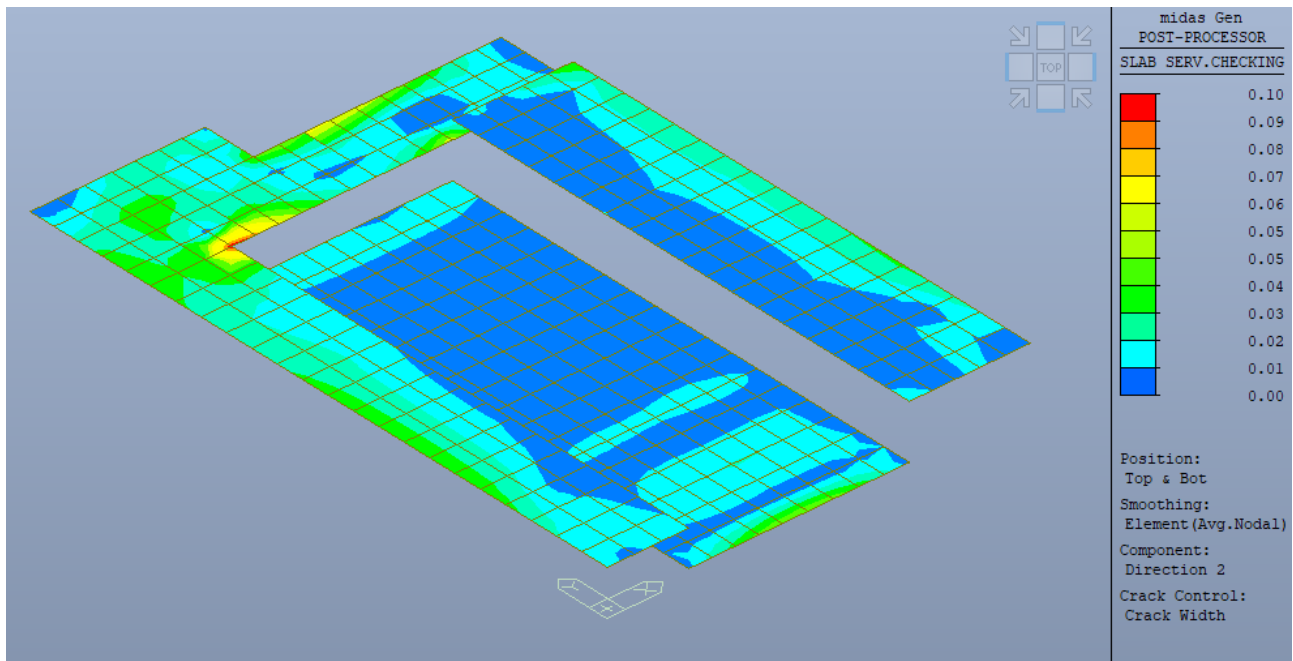
- Check ratio of neutral axis depth to effective depth.

$$x/d = 0.056$$

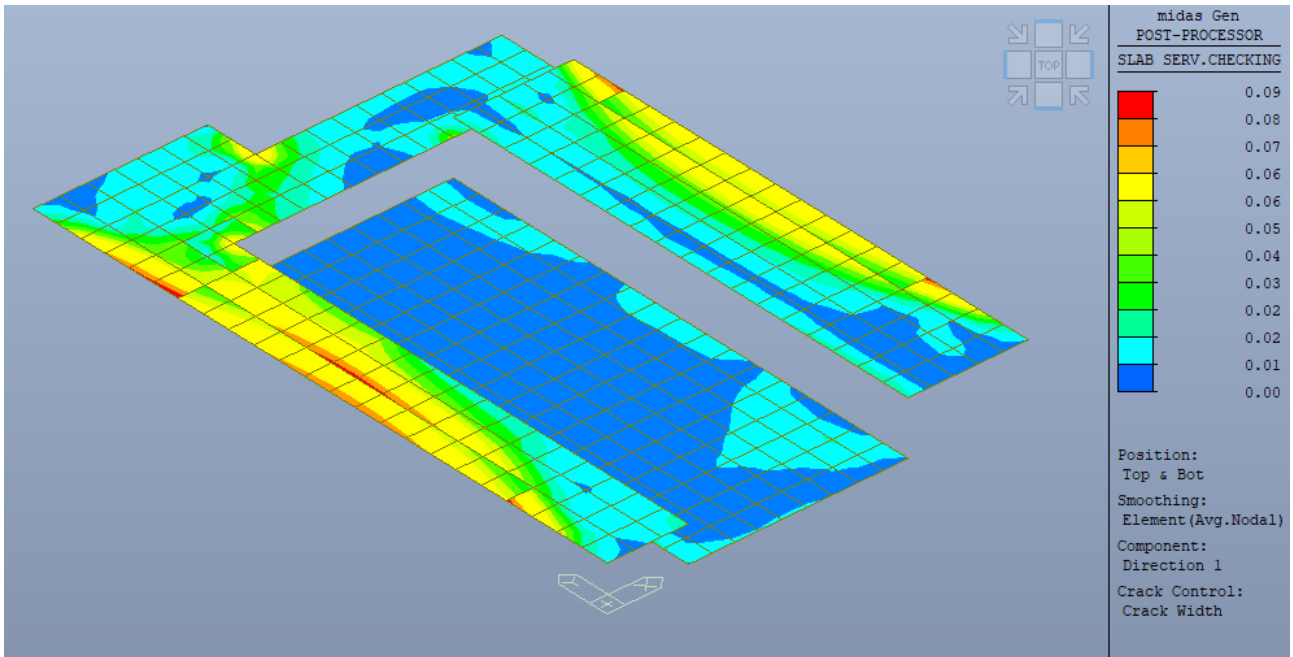
$$\text{Limit}(x/d) = 0.450 \text{ (} f_{ck} \leq 50 \text{ MPa.)}$$

$$x/d \text{ ratio} = 0.056 / 0.450 = 0.125 \text{ ---> O.K}$$

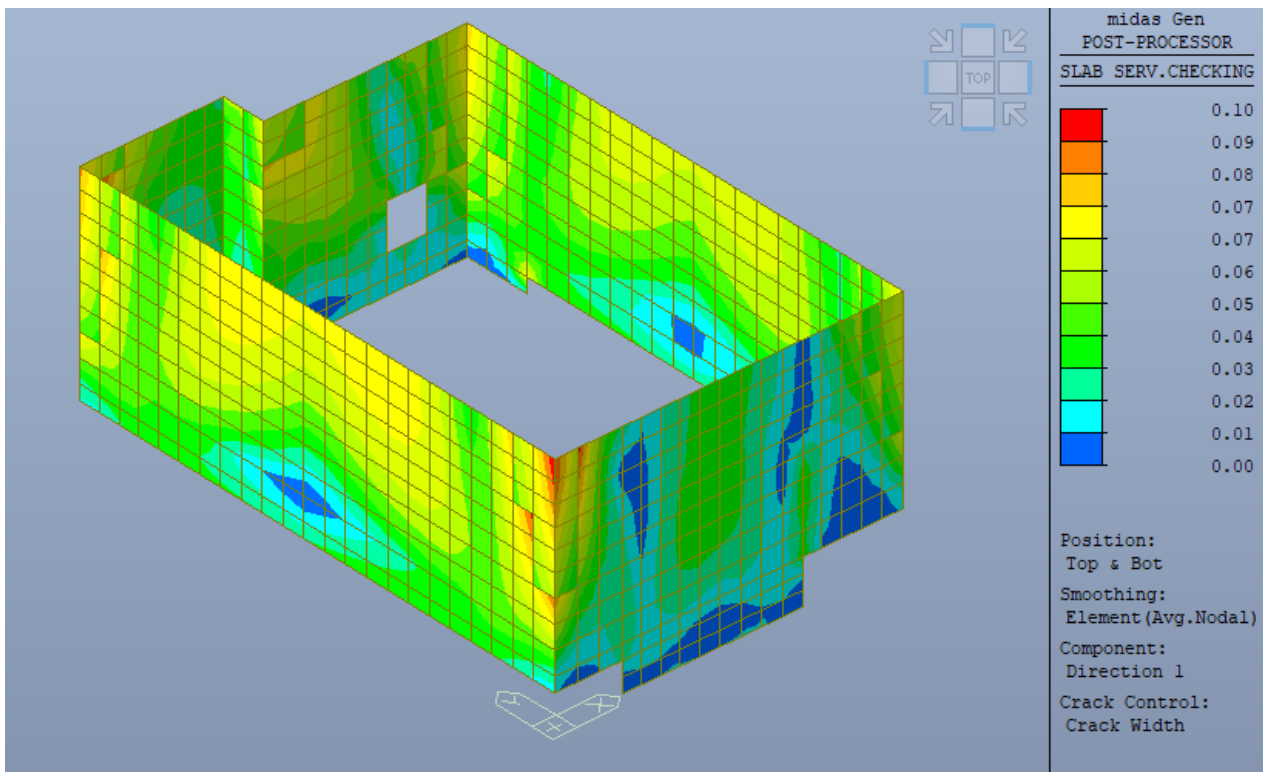
1.9 Verifiche in condizioni di esercizio SLE



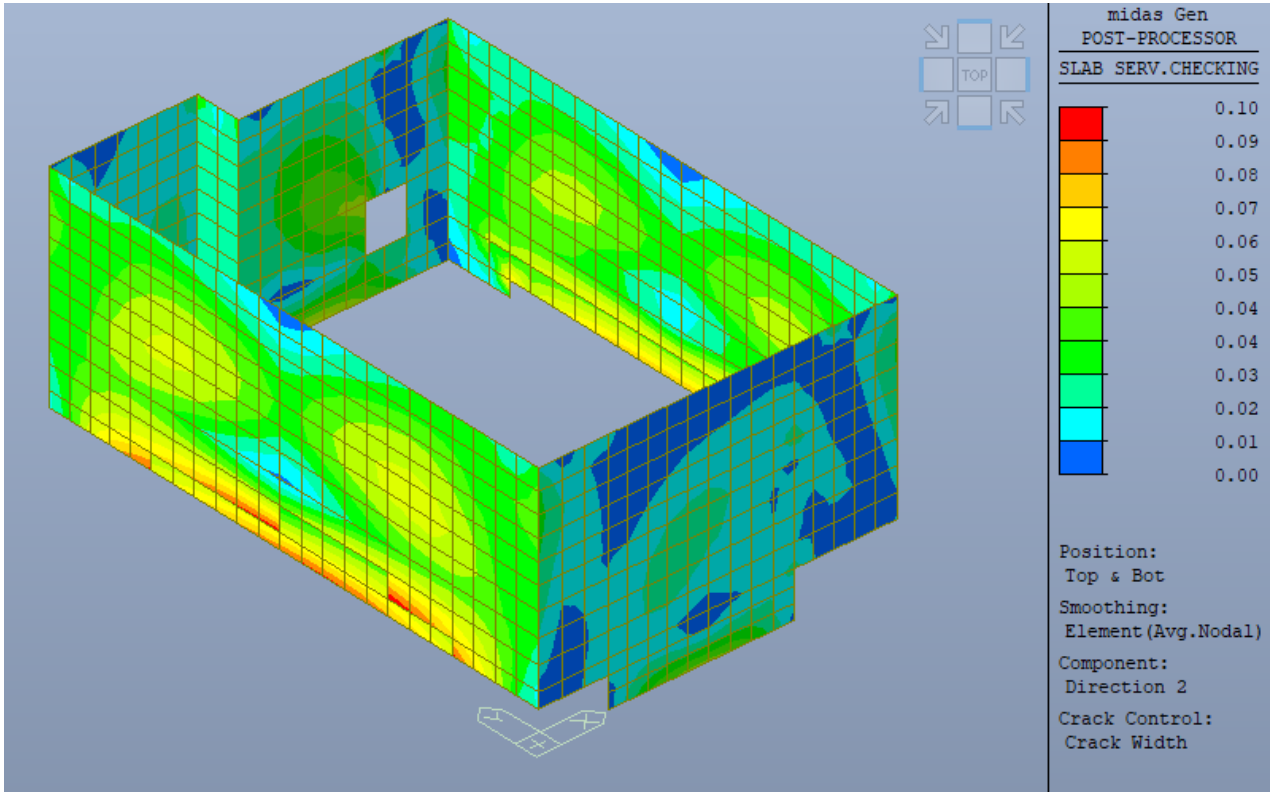
Platea – Verifica a fessurazione SLE - ratio direzione Y



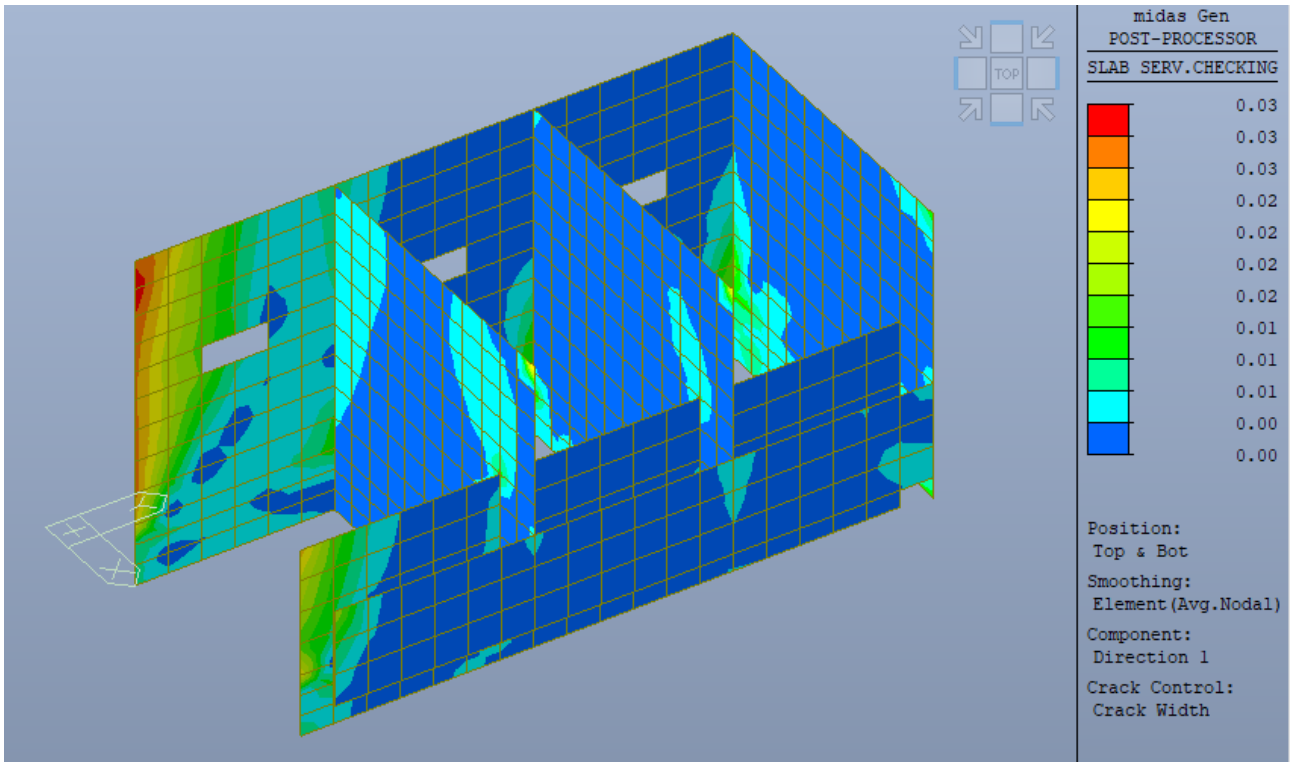
Platea – Verifica a fessurazione SLE - ratio direzione X



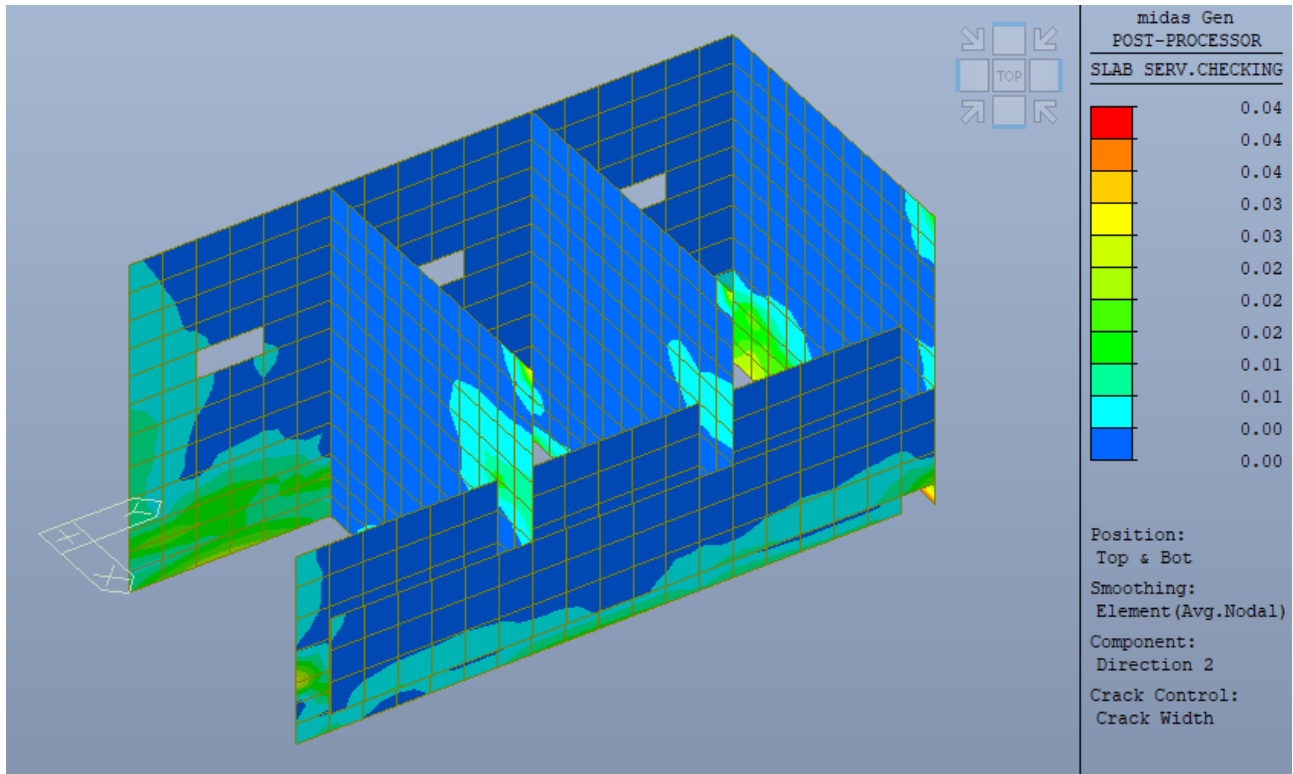
Pareti esterne – Verifica a fessurazione SLE - ratio direzione orizzontale



Pareti esterne – Verifica a fessurazione SLE - ratio direzione verticale



Pareti interne – Verifica a fessurazione SLE - ratio direzione orizzontale



Pareti interne – Verifica a fessurazione SLE - ratio direzione verticale