MANDATARIA:

ISOLA BOASSO
STUDIO DI INGEGNERIA

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

MANDANTI:

ETATEC STUDIO PAOLETTI

ETATEC STUDIO PAOLETTI

C. & S. DI GIUSEPPE INGEGNERI
ASSOCIATI SRL Socio Unico

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Vs. Rif. arch.:

Ente destinatario:

-

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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 C

Rev.	AGGIORNAMENTI	DATA

OGGETTO

FASCICOLO DEI CALCOLI – NUOVA STAZIONE SOLLEVAMENTO FANGHI

Il Responsabile Dott. Ing. Riccardo ISOLA	Visto

* Riservato all'Amministrazione

Sommario

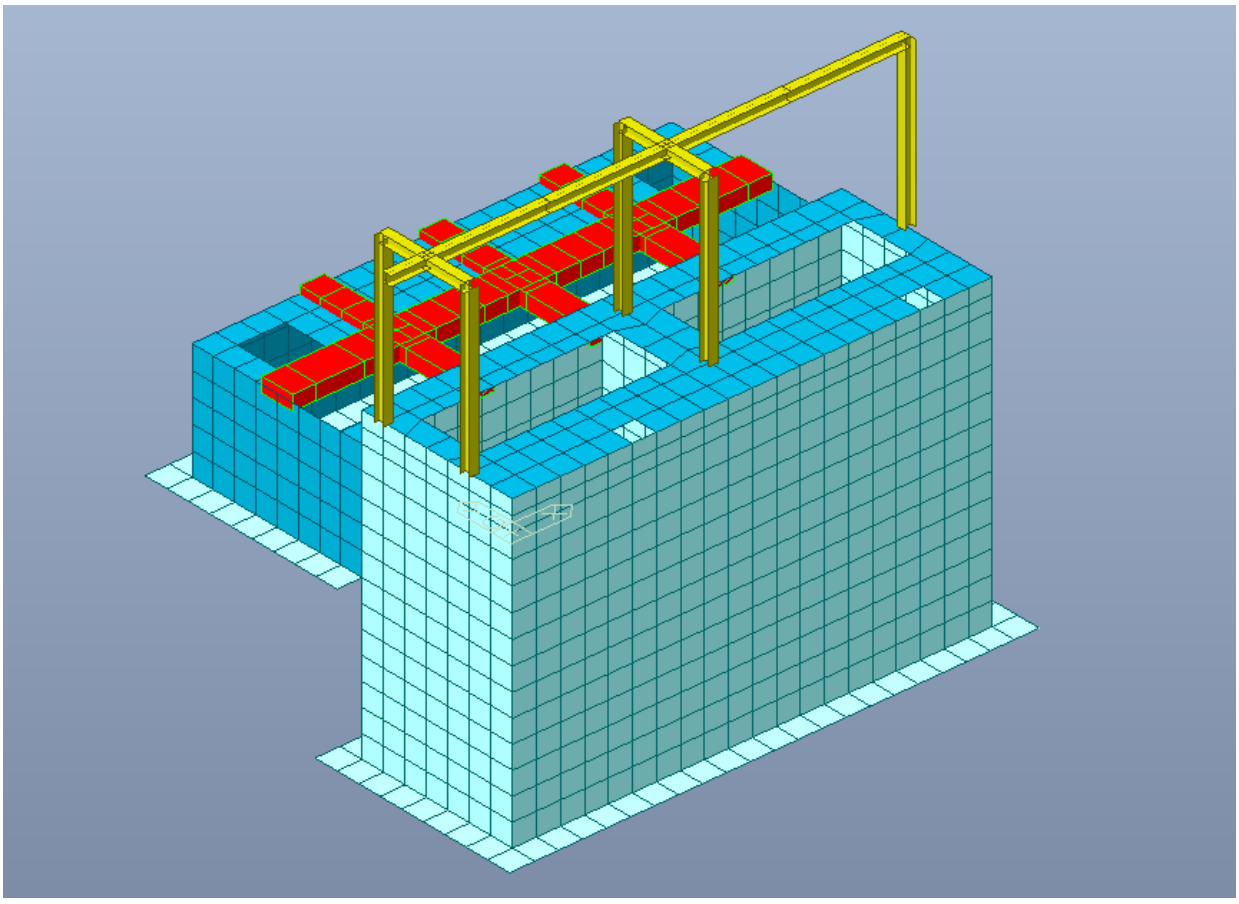
1 Fascicolo dei calcoli Nuova Stazione di Sollevamento Fanghi

1.1 Dati della modellazione

Il manufatto in oggetto è previsto interamente in calcestruzzo armato, con struttura di supporto per il paranco di estrazione delle pompe in acciaio.
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 sp.40 cm;
- Pareti vasca di pompaggio sp.40 cm;
- Pareti camera valvole sp.30 cm;
- Solette di copertura sp.30 cm.

Sono previste anche delle travi in c.a. di sezione 40x30 cm e 70x30 cm a supporto della soletta di copertura della camera valvole. La struttura di supporto del paranco è invece prevista in travi HeA180 di acciaio S235.



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 5000 kN/m^3, ricavata dalle caratteristiche geotecniche del terreno con la formula di Vesic.
L'analisi sismica è stata effettuata mediante analisi sismica statica equivalente, trattandosi di opera completamente interrata. Le azioni sismiche sono state attribuite come incrementi sismici della spinta delle terre (ET X e ET Y) ed incrementi sismici della spinta dei liquami contenuti (EL X e EL Y).

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 Pompe
3	PV	Dead Load (D)	Permanente Valvole
4	SSL1	Dead Load (D)	Spinta Statica Liquame 1
5	SSL2	Dead Load (D)	Spinta Statica Liquame 2
6	SST	Dead Load (D)	Spinta Statica Terreno
7	SSTF	Dead Load (D)	Spinta Statica Terreno Falda
8	S GAL	Dead Load (D)	Spinta Galleggiamento
9	SSS	Live Load (L)	Spinta Statica Sovraccarico
10	ET X	Earthquake (E)	Sovraspinta Sismica Terreno X
11	ET Y	Earthquake (E)	Sovraspinta Sismica Terreno Y
12	EL X	Earthquake (E)	Sovraspinta Sismica Liquame X
13	EL Y	Earthquake (E)	Sovraspinta Sismica Liquame Y
14	VP1	Live Load (L)	Variabile Paranco Pos.1
15	VP2	Live Load (L)	Variabile Paranco Pos.2
16	VP3	Live Load (L)	Variabile Paranco Pos.3
17	VP4	Live Load (L)	Variabile Paranco Pos.4
18	VP5	Live Load (L)	Variabile Paranco Pos.5
19	VM	Live Load (L)	Variabile Manutenzione
20	VC1	Live Load (L)	Variabile Soletta Carrabile 1
21	VC2	Live Load (L)	Variabile Soletta Carrabile 2
22	VC3	Live Load (L)	Variabile Soletta Carrabile 3

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

Name	DL(S	PP(	PV(S	SSL1	SSL2	SST	SSTF	S GAL	SSS	ET X	ET Y	EL X	EL Y	VP1	VP2	VP3	VP4	VP5	VM	VC1	VC2	VC3
SLU 1	1.30	1.30	1.30	1.300		1.30																
SLU 2	1.30	1.30	1.30				1.300	1.3000											1.5			
SLU 3	1.30	1.30	1.30			1.30			1.50													
SLU 4	1.30	1.30	1.30	1.300		1.30			1.05					1.0					1.5	1.50		
SLU 5	1.30	1.30	1.30	1.300		1.30			1.05						1.05				1.5	1.50		
SLU 6	1.30	1.30	1.30	1.300		1.30			1.05							1.05			1.5	1.50		
SLU 7	1.30	1.30	1.30	1.300		1.30			1.05								1.0		1.5	1.50		
SLU 8	1.30	1.30	1.30	1.300		1.30			1.05									1.05	1.5	1.50		
SLU 9	1.30	1.30	1.30	1.300		1.30			1.05					1.0					1.5		1.50	
SLU 10	1.30	1.30	1.30	1.300		1.30			1.05						1.05				1.5		1.50	
SLU 11	1.30	1.30	1.30	1.300		1.30			1.05							1.05			1.5		1.50	
SLU 12	1.30	1.30	1.30	1.300		1.30			1.05								1.0		1.5		1.50	
SLU 13	1.30	1.30	1.30	1.300		1.30			1.05									1.05	1.5		1.50	
SLU 14	1.30	1.30	1.30		1.300	1.30			1.05					1.0					1.5			1.50
SLU 15	1.30	1.30	1.30		1.300	1.30			1.05						1.05				1.5			1.50
SLU 16	1.30	1.30	1.30		1.300	1.30			1.05							1.05			1.5			1.50
SLU 17	1.30	1.30	1.30		1.300	1.30			1.05								1.0		1.5			1.50
SLU 19	1.30	1.30	1.30		1.300	1.30			1.05									1.05	1.5			1.50
SLU 20	1.30	1.30	1.30		1.300	1.30			1.05					1.5					1.5	1.05		
SLU 21	1.30	1.30	1.30		1.300	1.30			1.05						1.50				1.5	1.05		
SLU 22	1.30	1.30	1.30		1.300	1.30			1.05							1.50			1.5	1.05		
SLU 23	1.30	1.30	1.30		1.300	1.30			1.05								1.5		1.5	1.05		
SLU 24	1.30	1.30	1.30		1.300	1.30			1.05									1.50	1.5	1.05		
SLU 25	1.30	1.30	1.30		1.300	1.30			1.05					1.5					1.5		1.05	
SLU 26	1.30	1.30	1.30		1.300	1.30			1.05						1.50				1.5		1.05	
SLU 27	1.30	1.30	1.30		1.300	1.30			1.05							1.50			1.5		1.05	
SLU 28	1.30	1.30	1.30		1.300	1.30			1.05								1.5		1.5		1.05	
SLU 29	1.30	1.30	1.30		1.300	1.30			1.05									1.50	1.5		1.05	
SLU 30	1.30	1.30	1.30		1.300	1.30			1.05					1.5					1.5			1.05
SLU 31	1.30	1.30	1.30		1.300	1.30			1.05						1.50				1.5			1.05
SLU 32	1.30	1.30	1.30		1.300	1.30			1.05							1.50			1.5			1.05
SLU 33	1.30	1.30	1.30		1.300	1.30			1.05								1.5		1.5			1.05
SLU 34	1.30	1.30	1.30		1.300	1.30			1.05									1.50	1.5			1.05
SLV 1	1.00	1.00	1.00		1.000	1.00			0.30	1.00	0.30	1.00	0.30							0.30		
SLV 2	1.00	1.00	1.00		1.000	1.00			0.30	1.00	-0.30	1.00	-0.3							0.30		
SLV 3	1.00	1.00	1.00		1.000	1.00			0.30	0.30	1.00	0.30	1.00							0.30		
SLV 4	1.00	1.00	1.00		1.000	1.00			0.30	-0.30	1.00	-0.30	1.00							0.30		
SLV 5	1.00	1.00	1.00		1.000	1.00			0.30	-1.00	-0.30	-1.00	-0.3							0.30		
SLV 6	1.00	1.00	1.00		1.000	1.00			0.30	-1.00	0.30	-1.00	0.30							0.30		
SLV 7	1.00	1.00	1.00		1.000	1.00			0.30	-0.30	-1.00	-0.30	-1.0							0.30		
SLV 8	1.00	1.00	1.00		1.000	1.00			0.30	0.30	-1.00	0.30	-1.0							0.30		
SLV 9	1.00	1.00	1.00		1.000	1.00			0.30	1.00	0.30									0.30		
SLV 10	1.00	1.00	1.00		1.000	1.00			0.30	1.00	-0.30									0.30		
SLV 11	1.00	1.00	1.00		1.000	1.00			0.30	0.30	1.00									0.30		
SLV 12	1.00	1.00	1.00		1.000	1.00			0.30	-0.30	1.00									0.30		
SLV 13	1.00	1.00	1.00		1.000	1.00			0.30	-1.00	-0.30									0.30		
SLV 14	1.00	1.00	1.00		1.000	1.00			0.30	-1.00	0.30									0.30		
SLV 15	1.00	1.00	1.00		1.000	1.00			0.30	-0.30	-1.00									0.30		
SLV 16	1.00	1.00	1.00		1.000	1.00			0.30	0.30	-1.00									0.30		
SLE R1	1.00	1.00	1.00			1.00								1.0					0.7	0.70		
SLE R2	1.00	1.00	1.00			1.00									1.00				0.7	0.70		

Name	DL(S	PP(	PV(S	SSL1	SSL2	SST	SSTF	S GAL	SSS	ET X	ET Y	EL X	EL Y	VP1	VP2	VP3	VP4	VP5	VM	VC1	VC2	VC3
SLE R3	1.00	1.00	1.00			1.00										1.00			0.7	0.70		
SLE R4	1.00	1.00	1.00			1.00											1.0		0.7	0.70		
SLE R5	1.00	1.00	1.00			1.00												1.00	0.7	0.70		
SLE R6	1.00	1.00	1.00			1.00								1.0					0.7		0.70	
SLE R7	1.00	1.00	1.00			1.00									1.00				0.7		0.70	
SLE R8	1.00	1.00	1.00			1.00										1.00			0.7		0.70	
SLE R9	1.00	1.00	1.00			1.00											1.0		0.7		0.70	
SLE R10	1.00	1.00	1.00			1.00												1.00	0.7		0.70	
SLE R11	1.00	1.00	1.00			1.00								1.0					0.7			0.70
SLE R12	1.00	1.00	1.00			1.00									1.00				0.7			0.70
SLE R13	1.00	1.00	1.00			1.00										1.00			0.7			0.70
SLE R14	1.00	1.00	1.00			1.00											1.0		0.7			0.70
SLE R15	1.00	1.00	1.00			1.00												1.00	0.7			0.70
SLE R16	1.00	1.00	1.00			1.00								1.0					0.7	1.00		
SLE R17	1.00	1.00	1.00			1.00								1.0					0.7		1.00	
SLE R18	1.00	1.00	1.00			1.00								1.0					0.7			1.00
SLE R19	1.00	1.00	1.00			1.00								0.7					1.0	1.00		
SLE R20	1.00	1.00	1.00			1.00								0.7					1.0		1.00	
SLE R21	1.00	1.00	1.00			1.00								0.7					1.0			1.00
SLE R22	1.00	1.00	1.00		1.000	1.00								1.0					0.7	0.70		
SLE R23	1.00	1.00	1.00		1.000	1.00									1.00				0.7	0.70		
SLE R24	1.00	1.00	1.00		1.000	1.00										1.00			0.7	0.70		
SLE R25	1.00	1.00	1.00		1.000	1.00											1.0		0.7	0.70		
SLE R26	1.00	1.00	1.00		1.000	1.00												1.00	0.7	0.70		
SLE R27	1.00	1.00	1.00	1.000		1.00								1.0					0.7	0.70		
SLE R28	1.00	1.00	1.00	1.000		1.00									1.00				0.7	0.70		
SLE R29	1.00	1.00	1.00	1.000		1.00										1.00			0.7	0.70		
SLE R30	1.00	1.00	1.00	1.000		1.00											1.0		0.7	0.70		
SLE R31	1.00	1.00	1.00	1.000		1.00												1.00	0.7	0.70		
SLE R32	1.00	1.00	1.00				1.000	1.0000											1.0			
SLE F1	1.00	1.00	1.00		1.000	1.00			0.50					0.3					0.3	0.30		
SLE F2	1.00	1.00	1.00		1.000	1.00			0.50					0.3					0.3		0.30	
SLE F3	1.00	1.00	1.00		1.000	1.00			0.50					0.3					0.3			0.30
SLE F4	1.00	1.00	1.00		1.000	1.00			0.50						0.30				0.3	0.30		
SLE F5	1.00	1.00	1.00		1.000	1.00			0.50						0.30				0.3		0.30	
SLE F6	1.00	1.00	1.00		1.000	1.00			0.50						0.30				0.3			0.30
SLE F7	1.00	1.00	1.00		1.000	1.00			0.30							0.30			0.3	0.50		
SLE F8	1.00	1.00	1.00		1.000	1.00			0.30							0.30			0.3		0.50	
SLE F9	1.00	1.00	1.00		1.000	1.00			0.30							0.30			0.3			0.50
SLE F10	1.00	1.00	1.00	1.000		1.00			0.30							0.30			0.3	0.50		
SLE F11	1.00	1.00	1.00	1.000		1.00			0.30							0.30			0.3		0.50	
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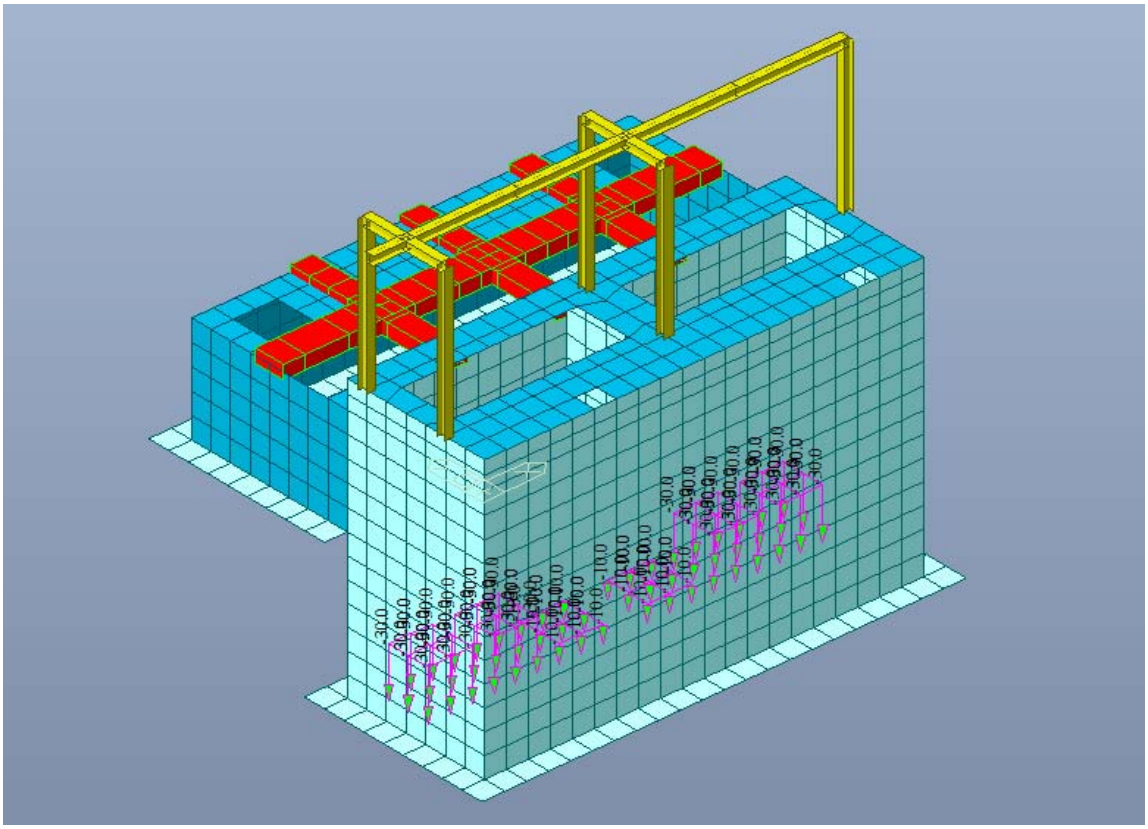
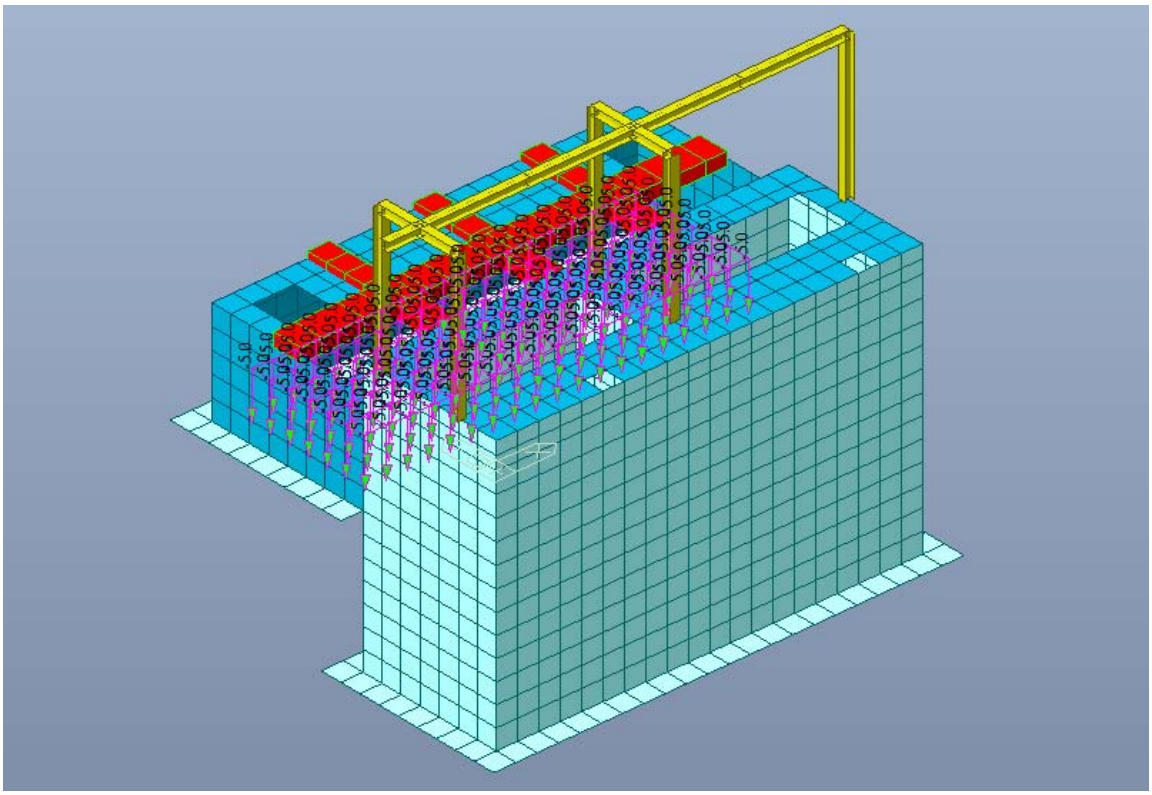
SLE QP	1.00	1.00	1.00		1.000	1.00																

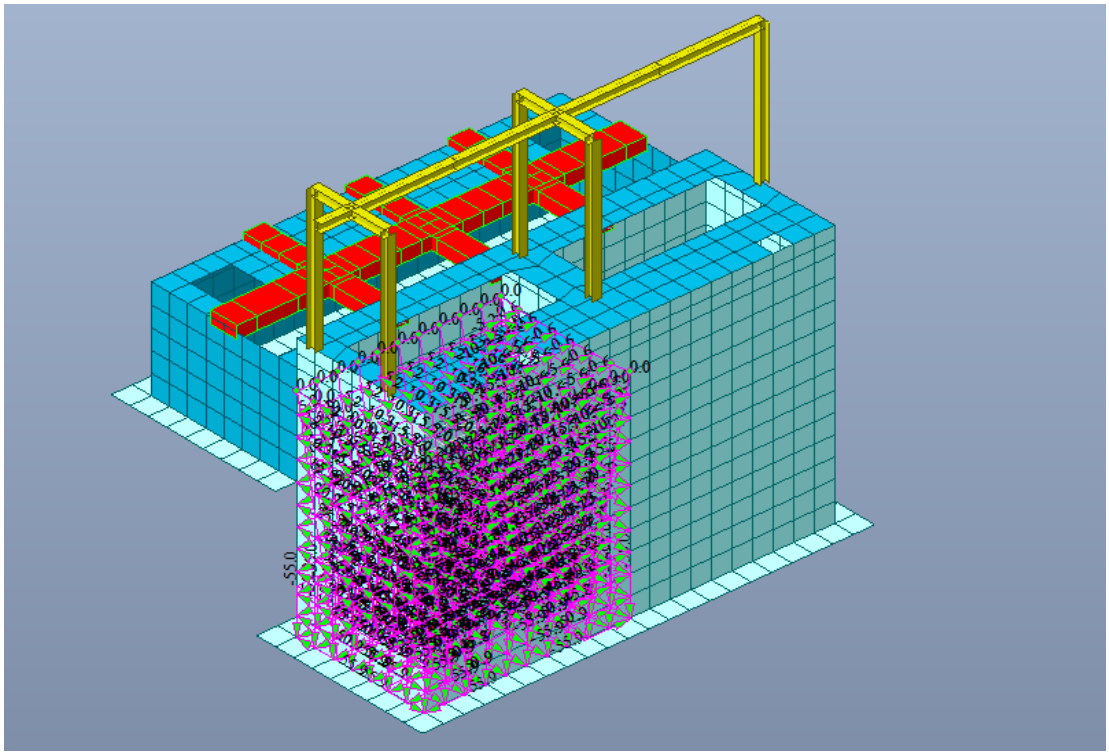
Nelle immagini seguenti si riportano le assegnazioni dei carichi:



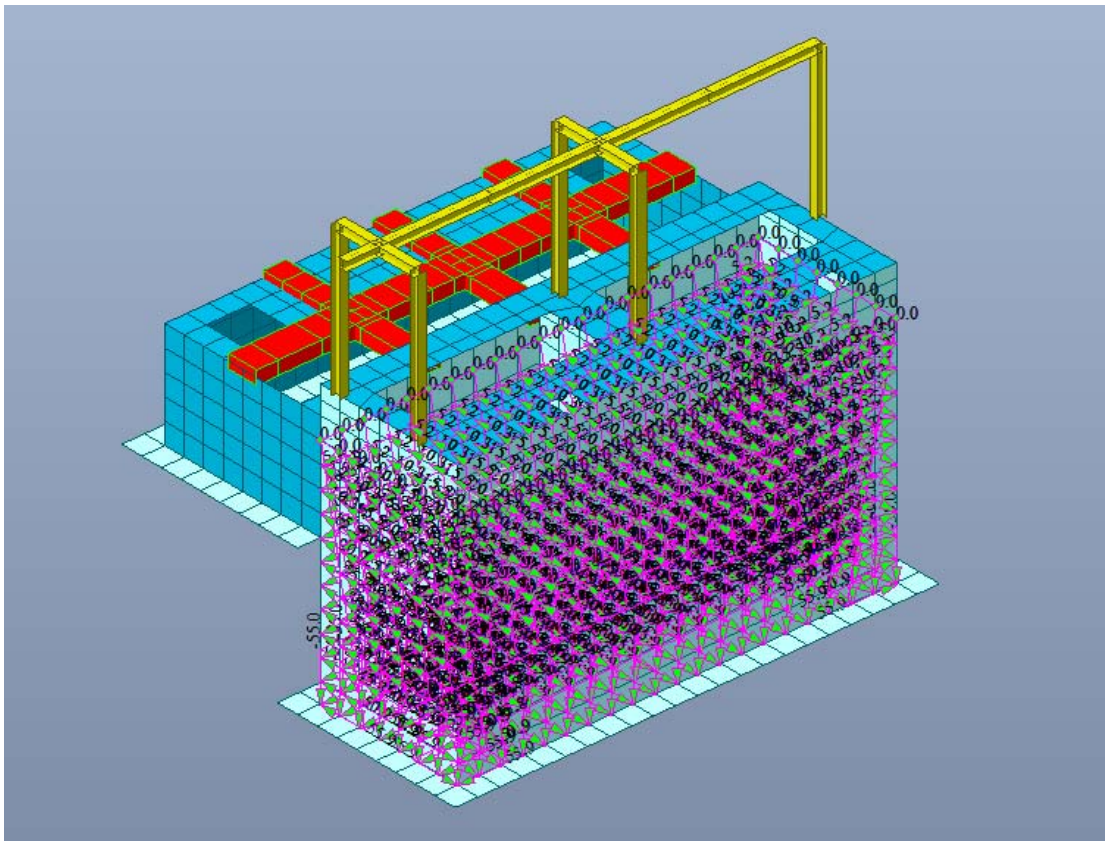
Assegnazione permanente pompe (PP) - [kN/mq]



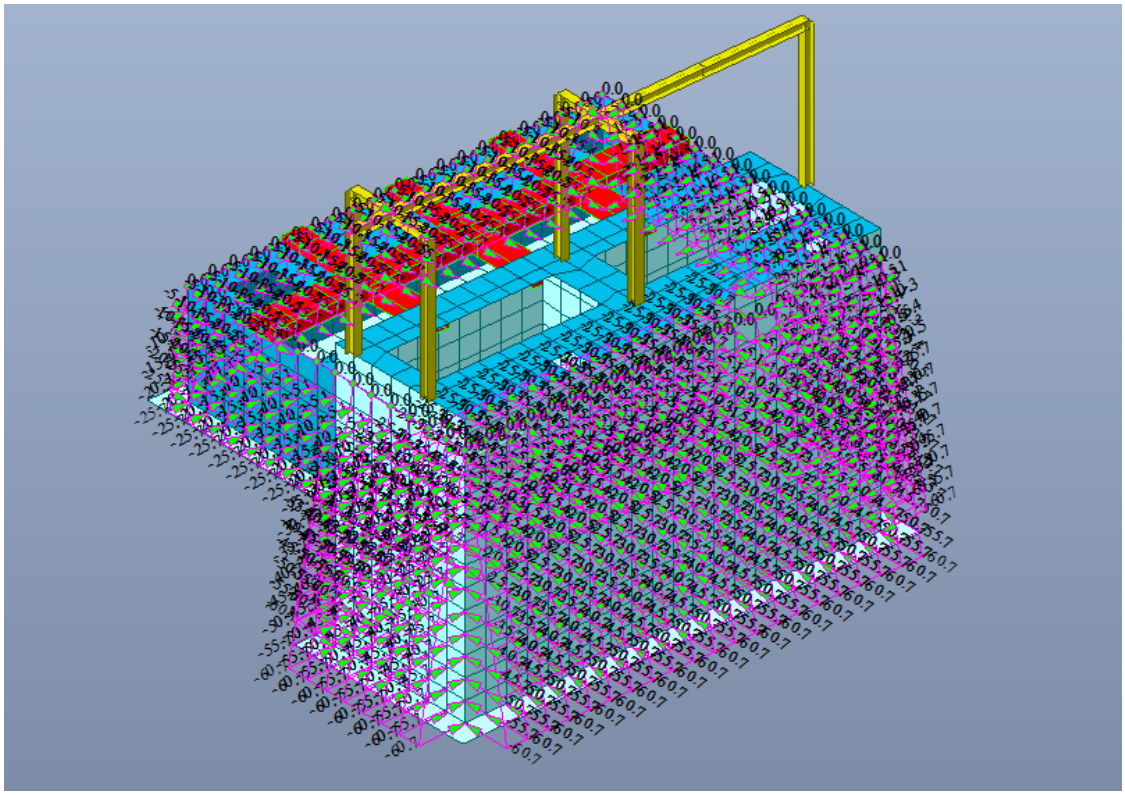
Assegnazione permanente valvole (PV) - [kN/mq]



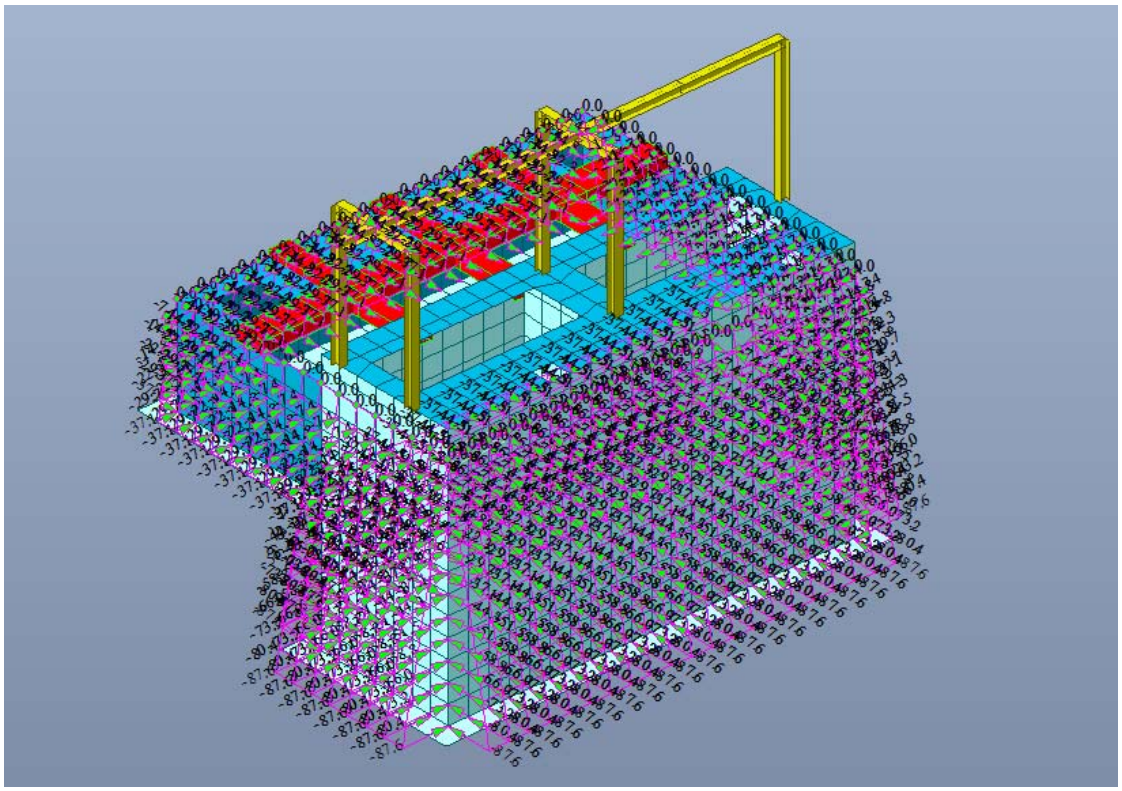
Assegnazione spinta statica liquame (SSL 1) - [kN/mq]



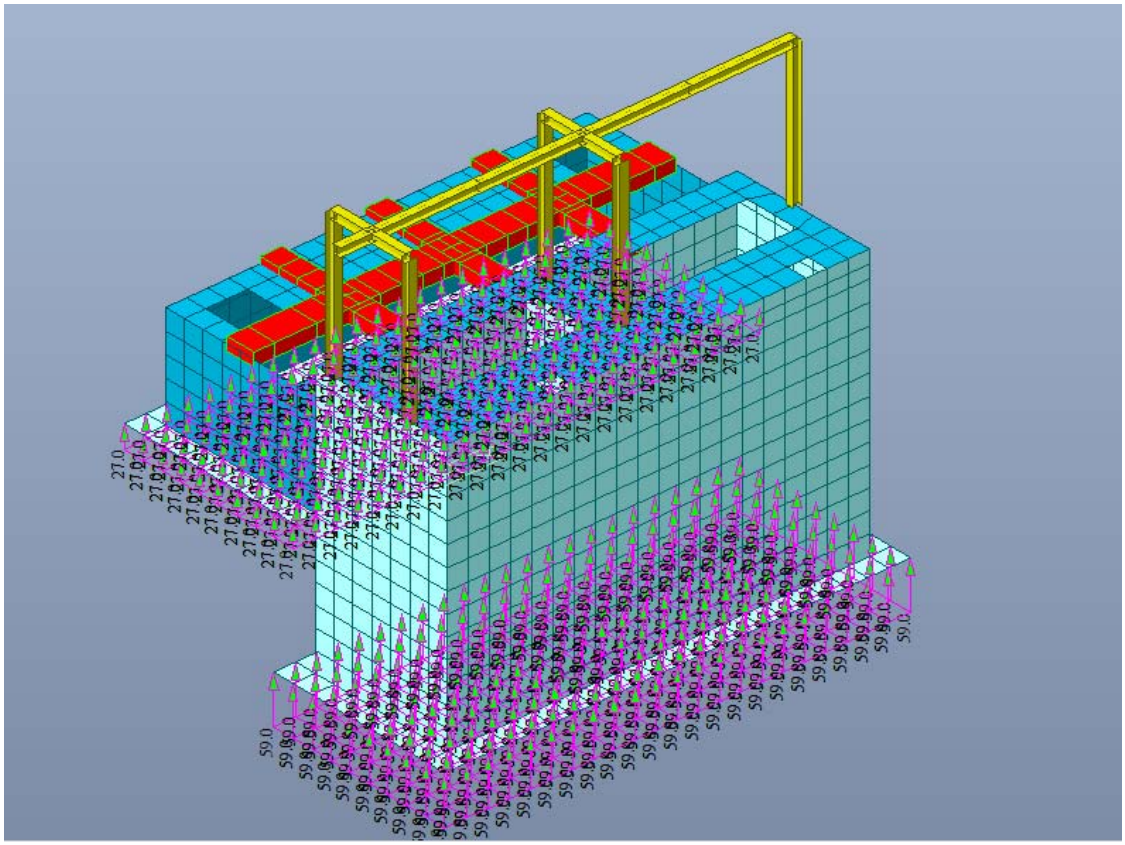
Assegnazione spinta statica liquame (SSL 2) - [kN/mq]



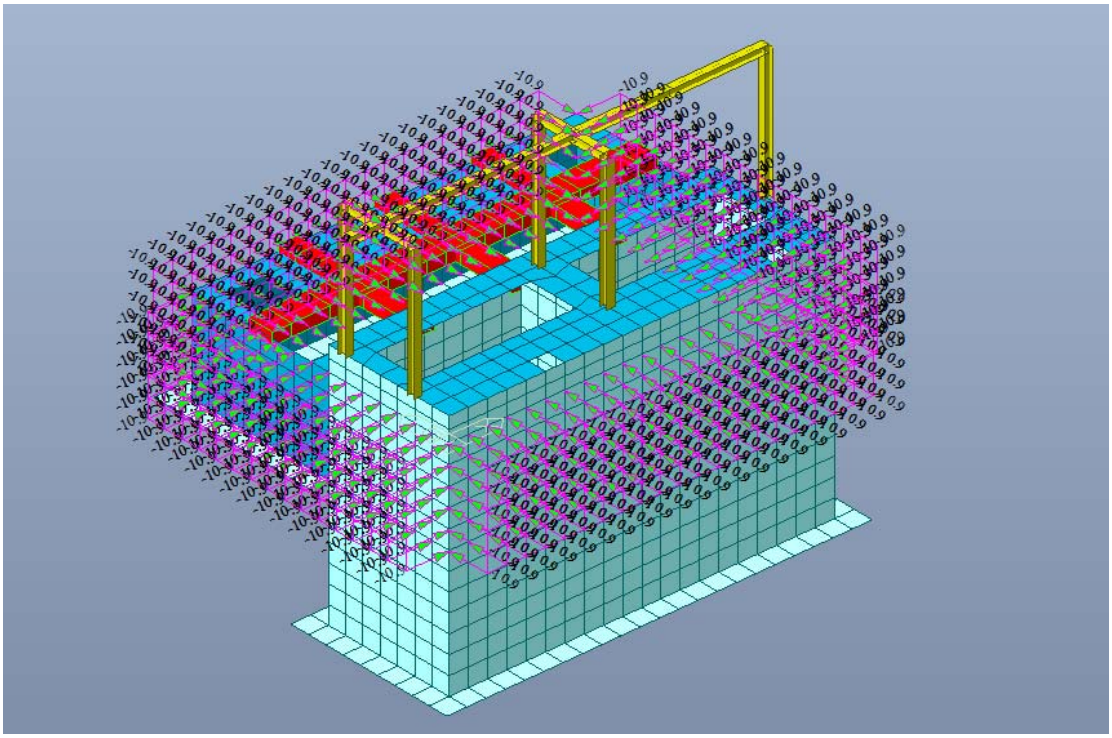
Assegnazione spinta statica del terreno (SST) - [kN/mq]



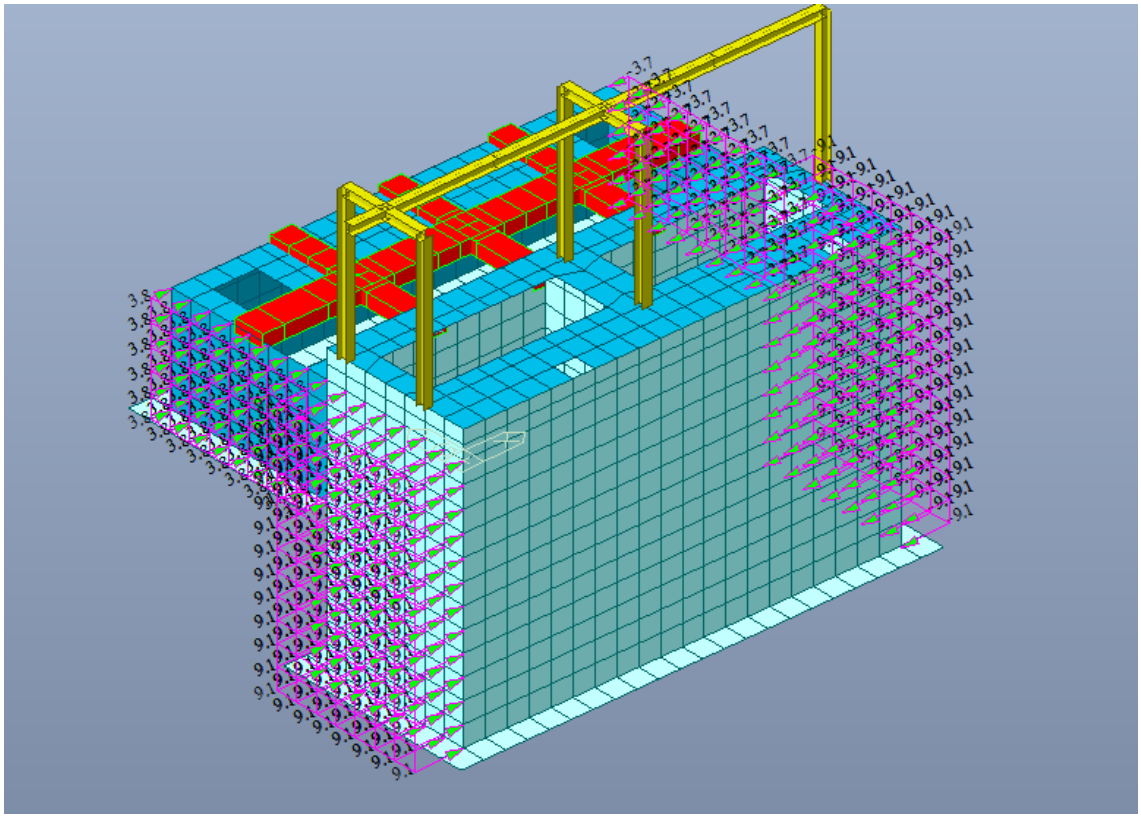
Assegnazione spinta statica del terreno con falda (SSTF) - [kN/mq]



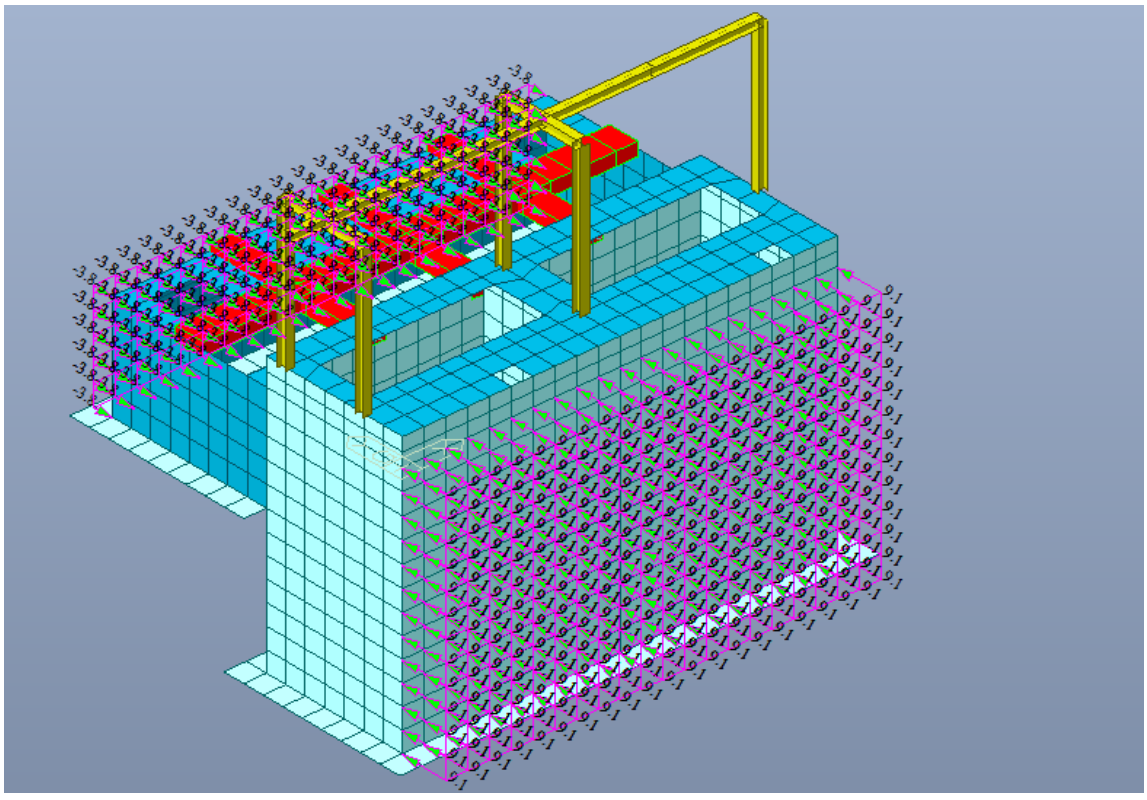
Assegnazione spinta galleggiamento (S GAL) - [kN/mq]



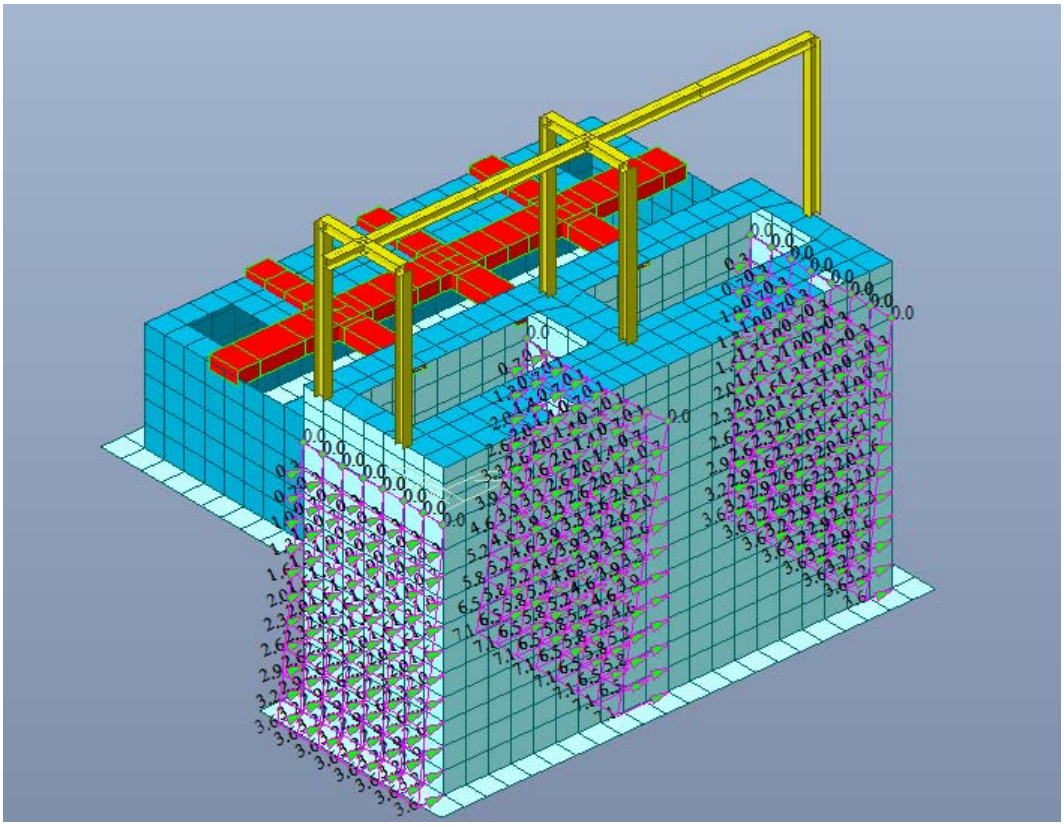
Assegnazione spinta statica sovraccarico (SSS) - [kN/mq]



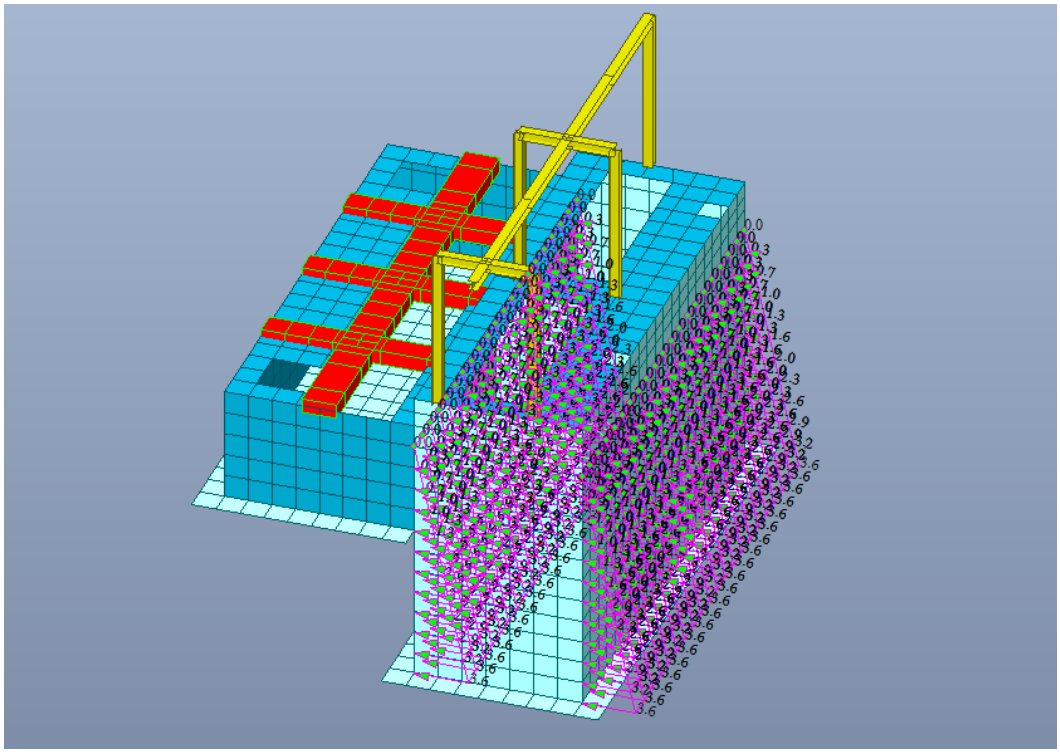
Assegnazione sovra spinta sismica terreno X (ET X) - [kN/mq]



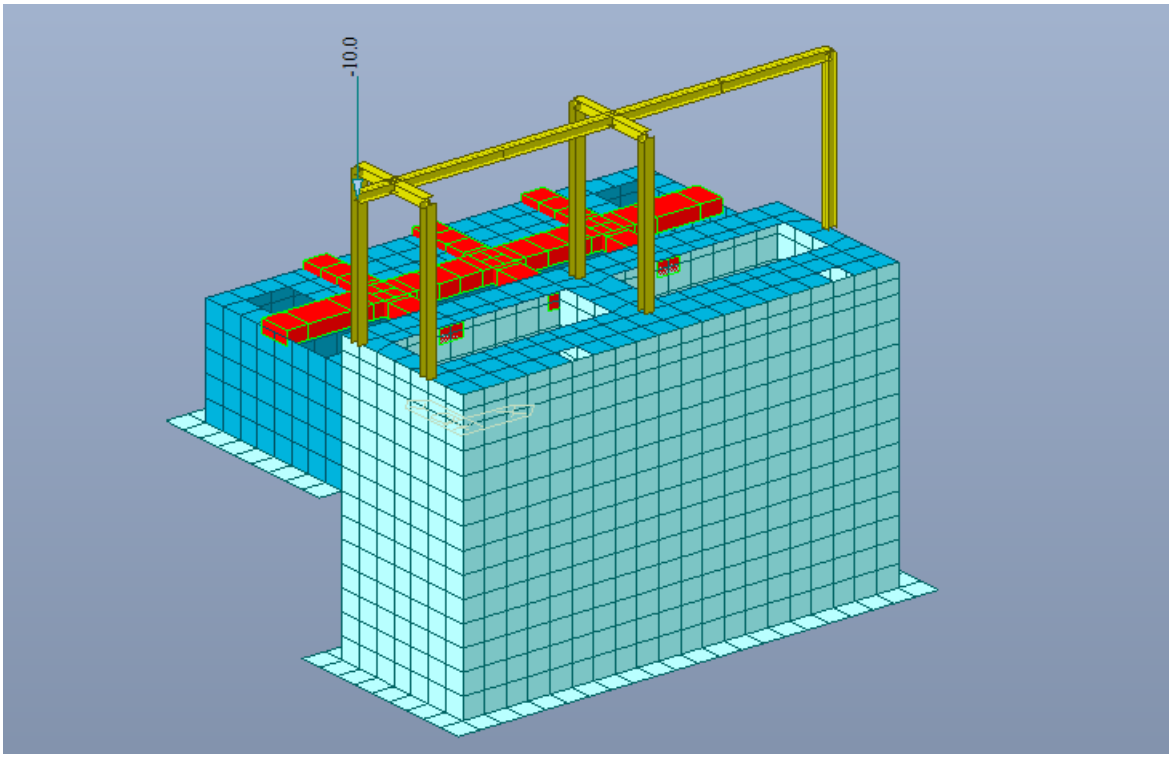
Assegnazione sovra spinta sismica terreno Y (ET Y) - [kN/mq]



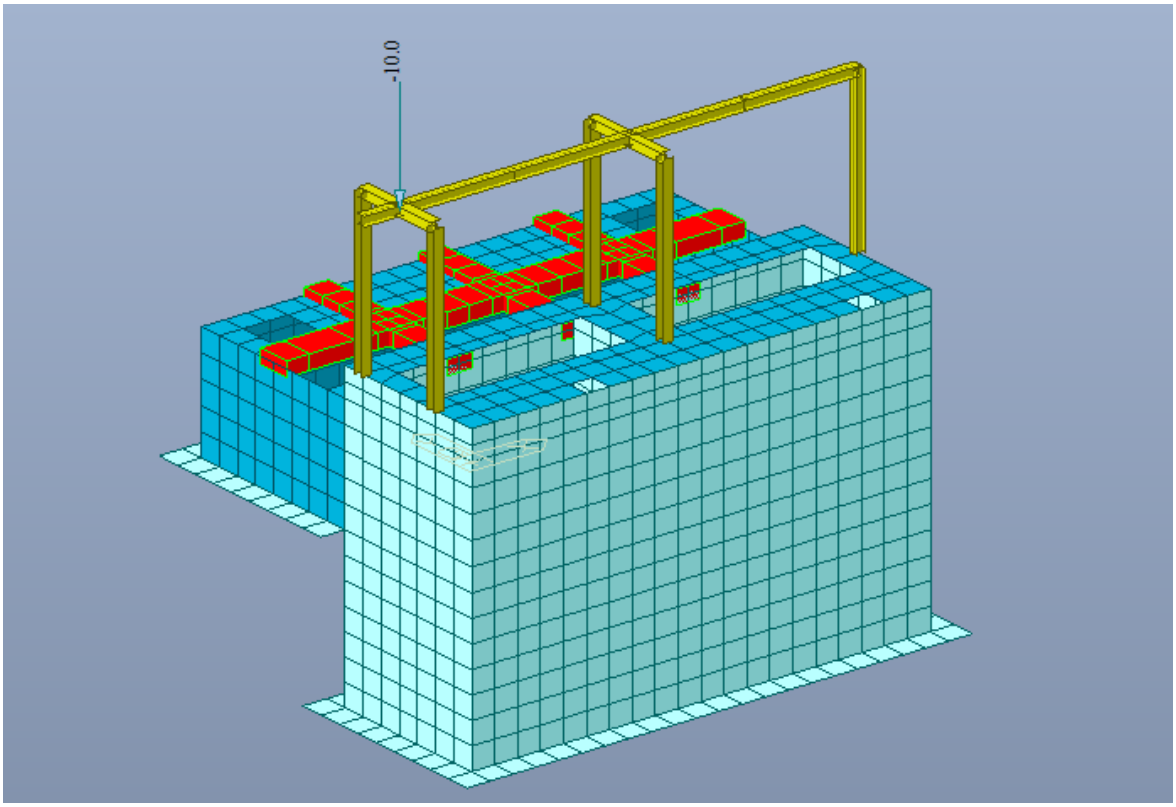
Assegnazione sovra spinta sismica liquame X (EL X) - [kN/mq]



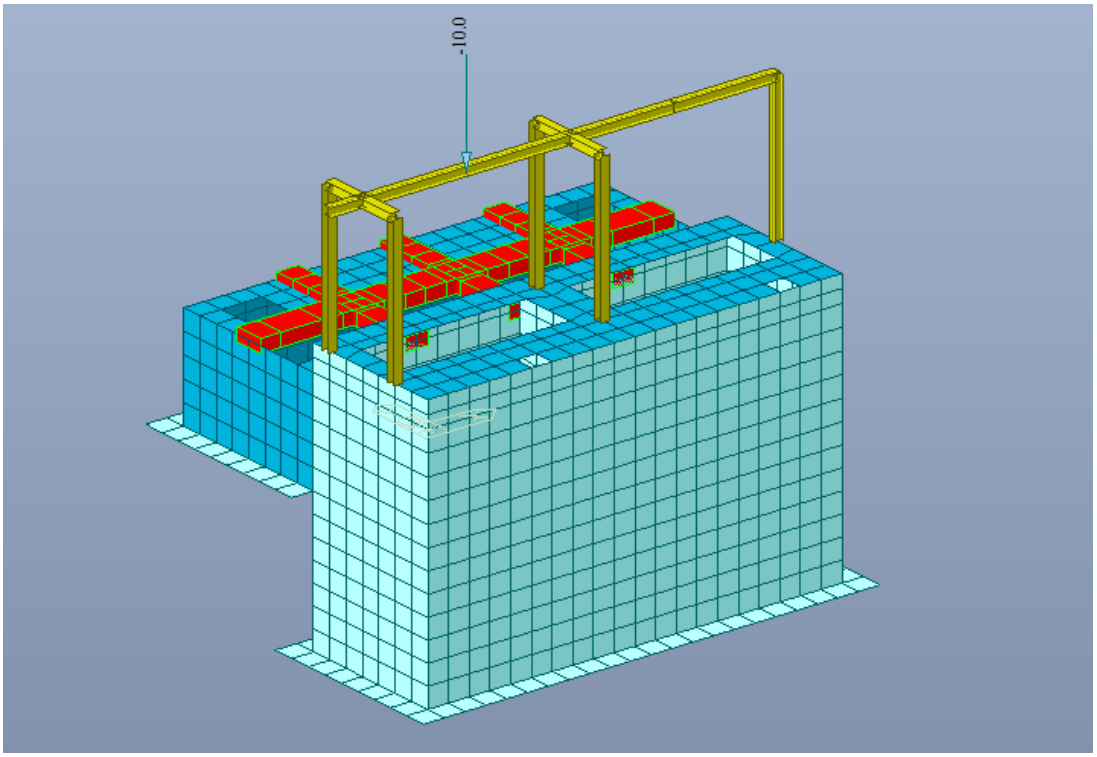
Assegnazione sovra spinta sismica liquame Y (EL Y) - [kN/mq]



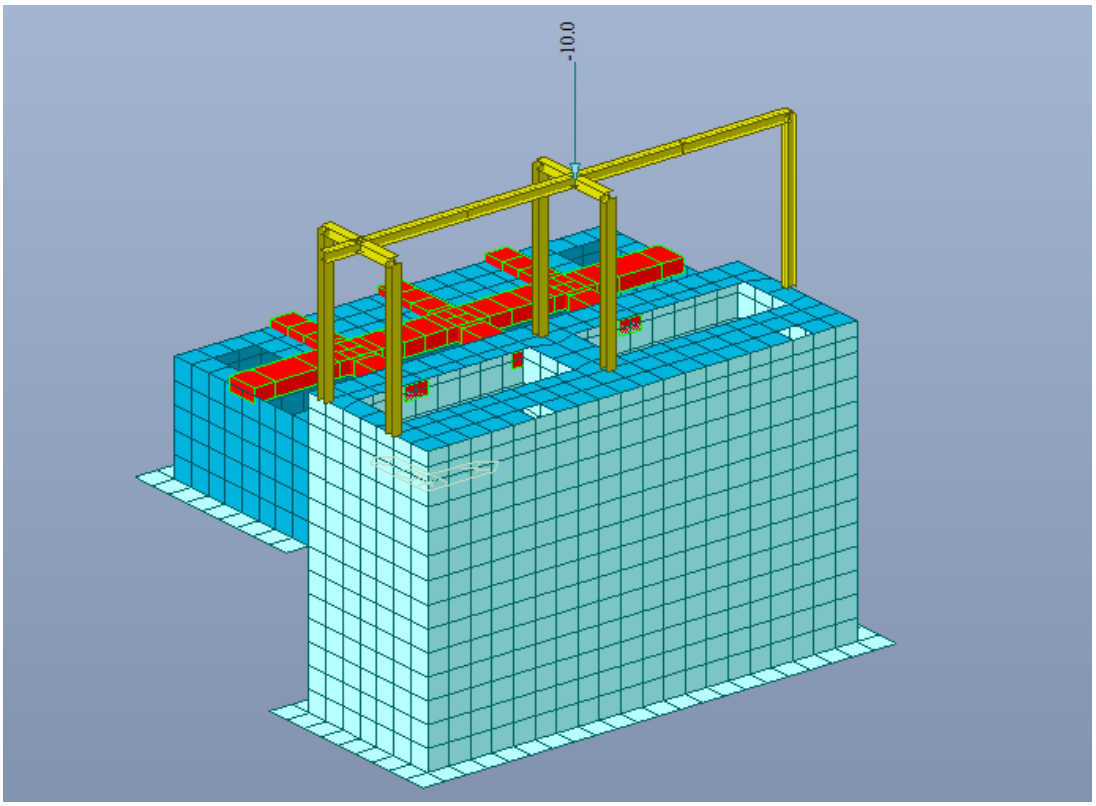
Assegnazione variabile paranco pos.1 (VP1) - [kN]



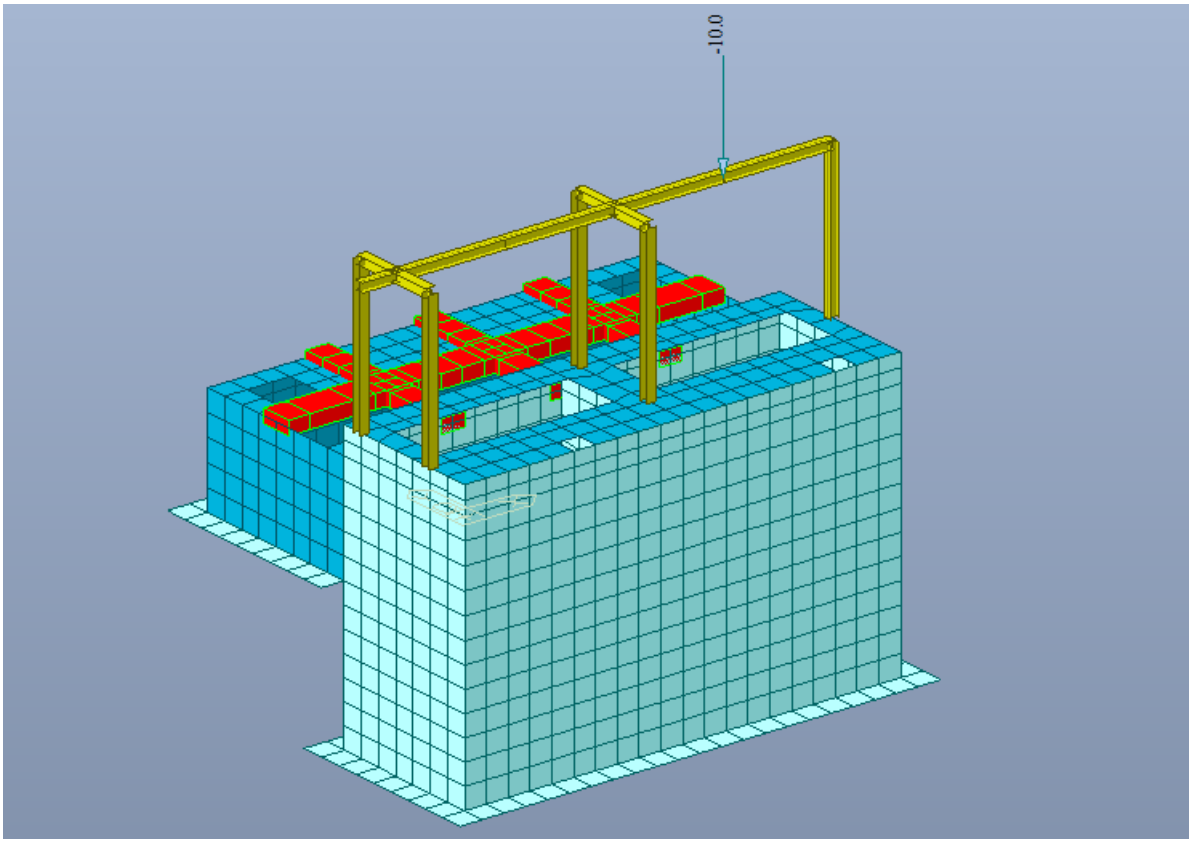
Assegnazione variabile paranco pos.2 (VP2) - [kN]



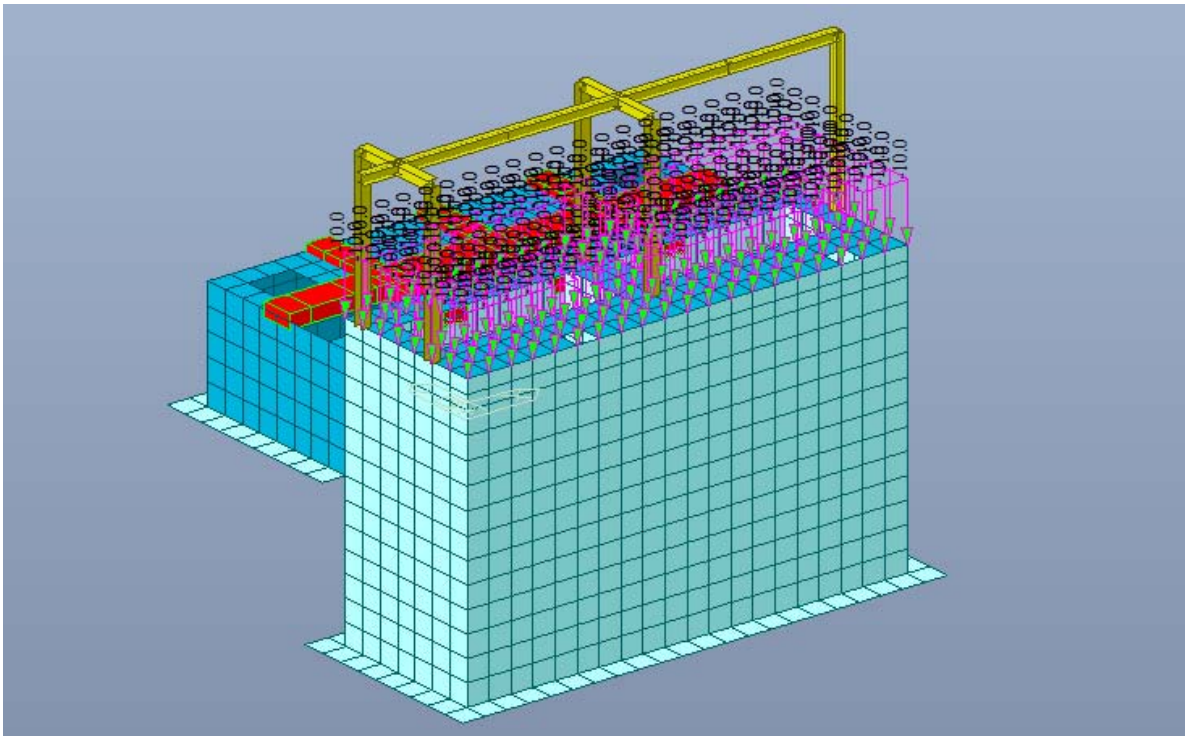
Assegnazione variabile paranco pos.3 (VP3) - [kN]



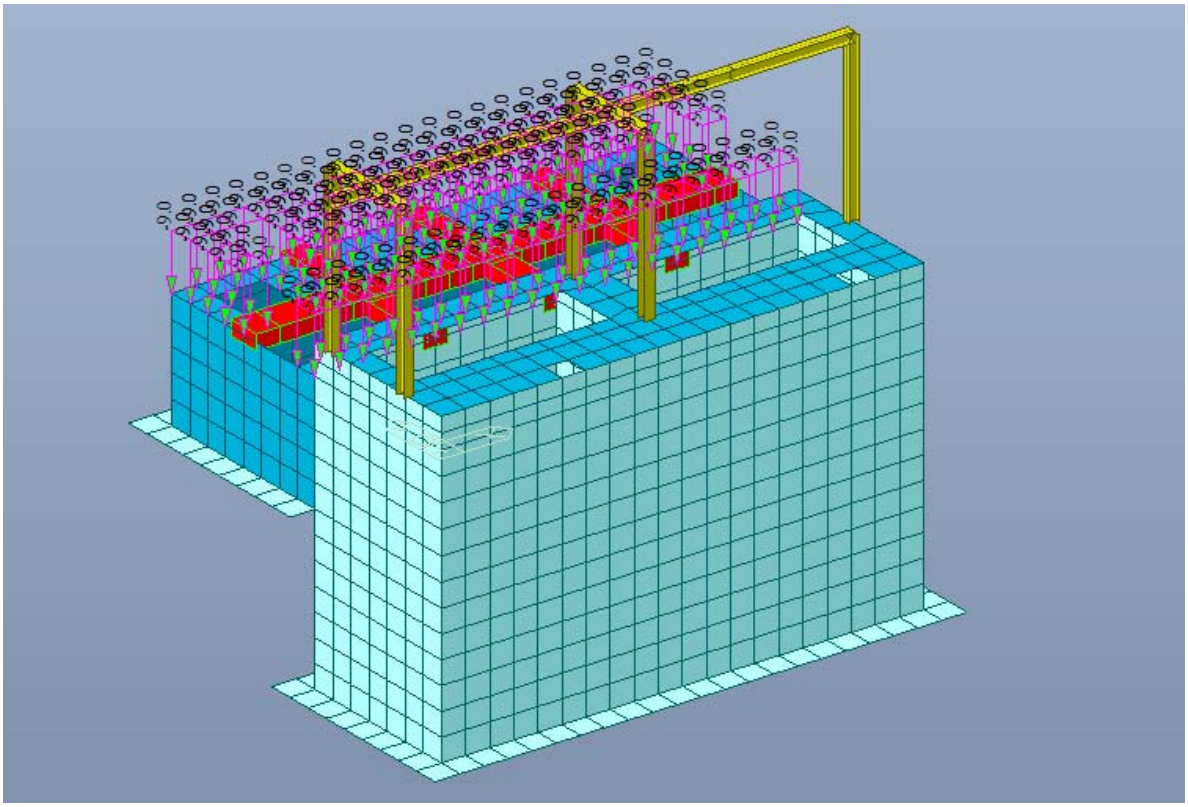
Assegnazione variabile paranco pos.4 (VP4) - [kN]



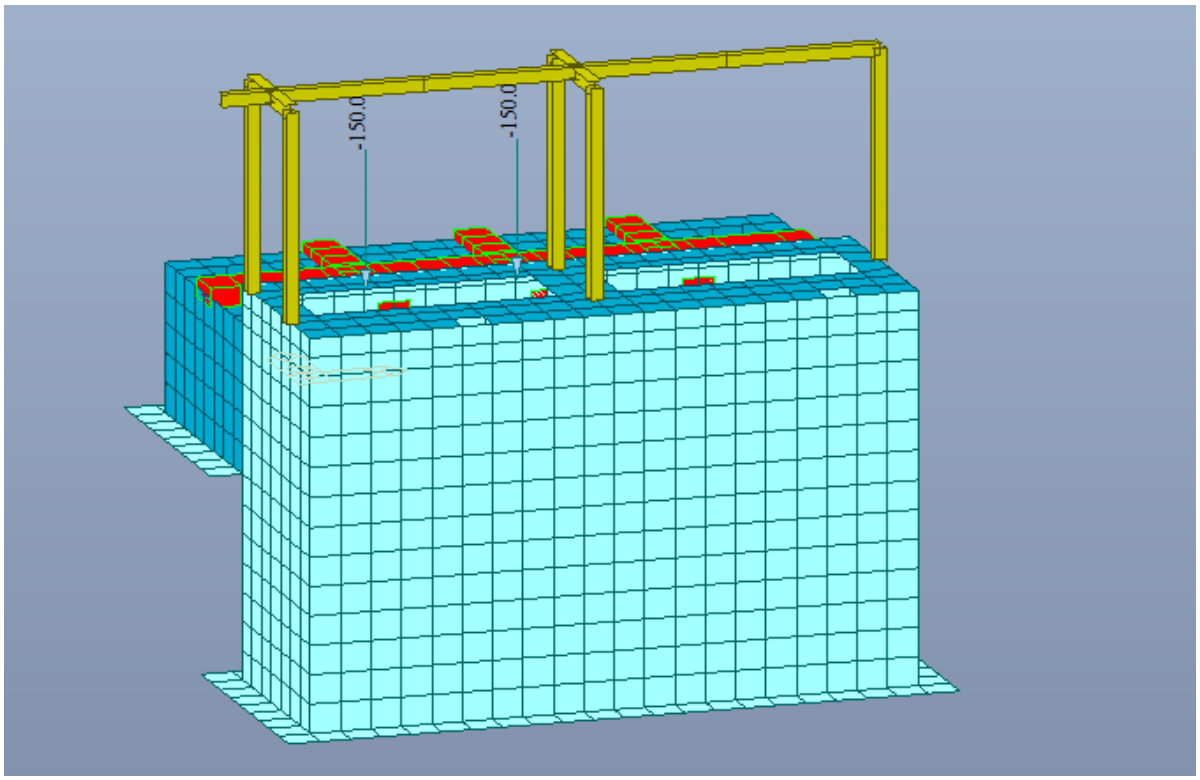
Assegnazione variabile paranco pos.5 (VP5) - [kN]



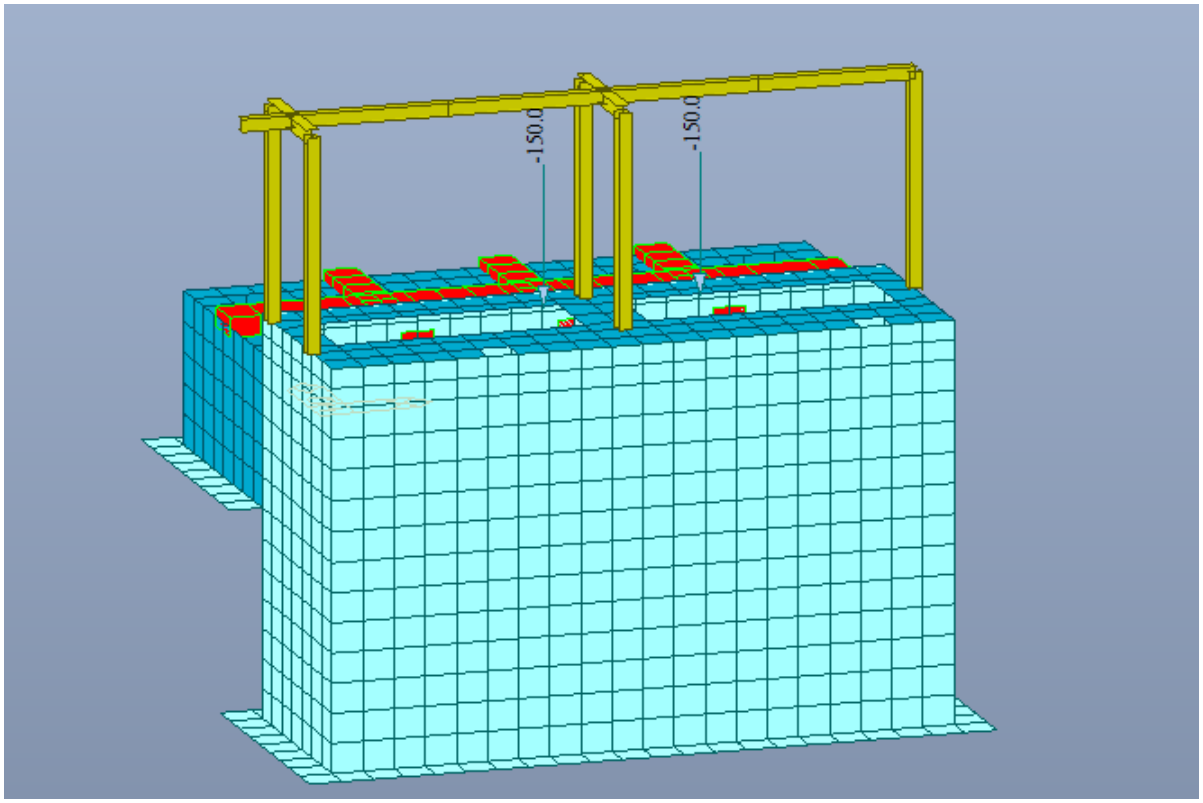
Assegnazione variabile manutenzione (VM) - [kN/mq]



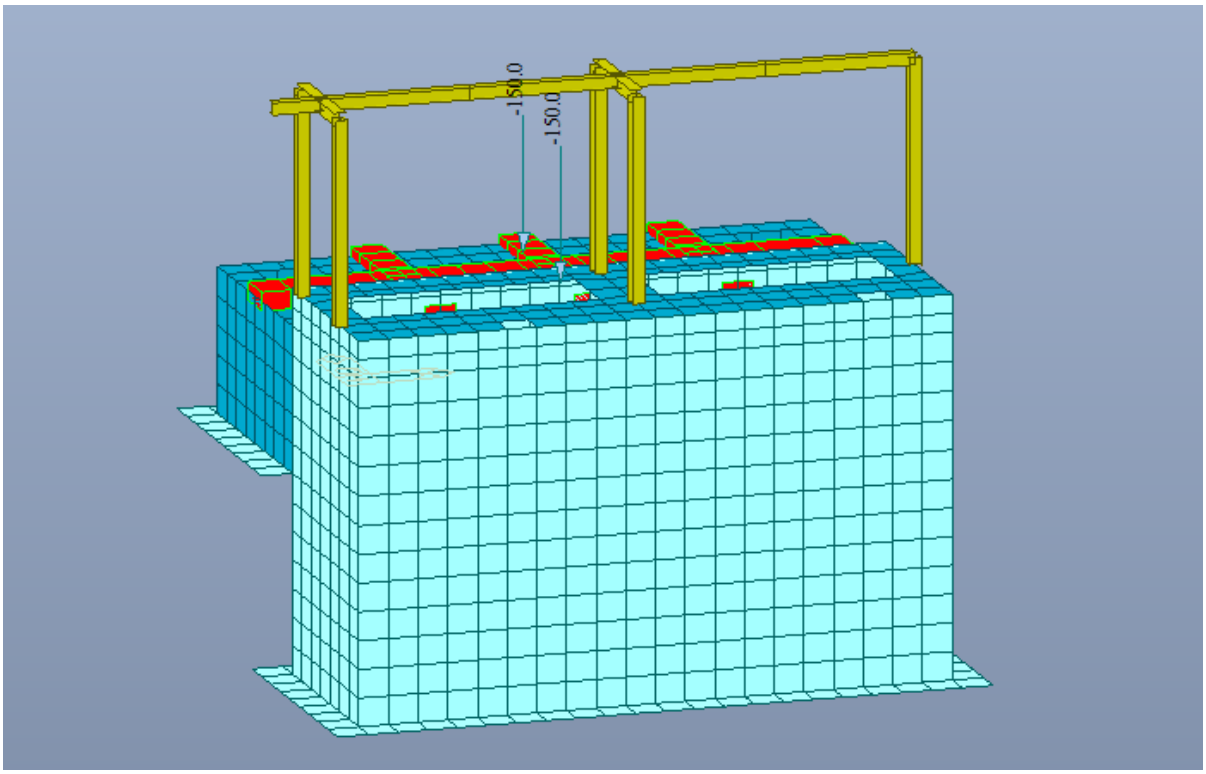
Assegnazione variabile copertura distribuito pos.1-2-3 (VC1-2-3) - [kN/mq]



Assegnazione variabile copertura concentrati pos.1 (VC1) - [kN/mq]



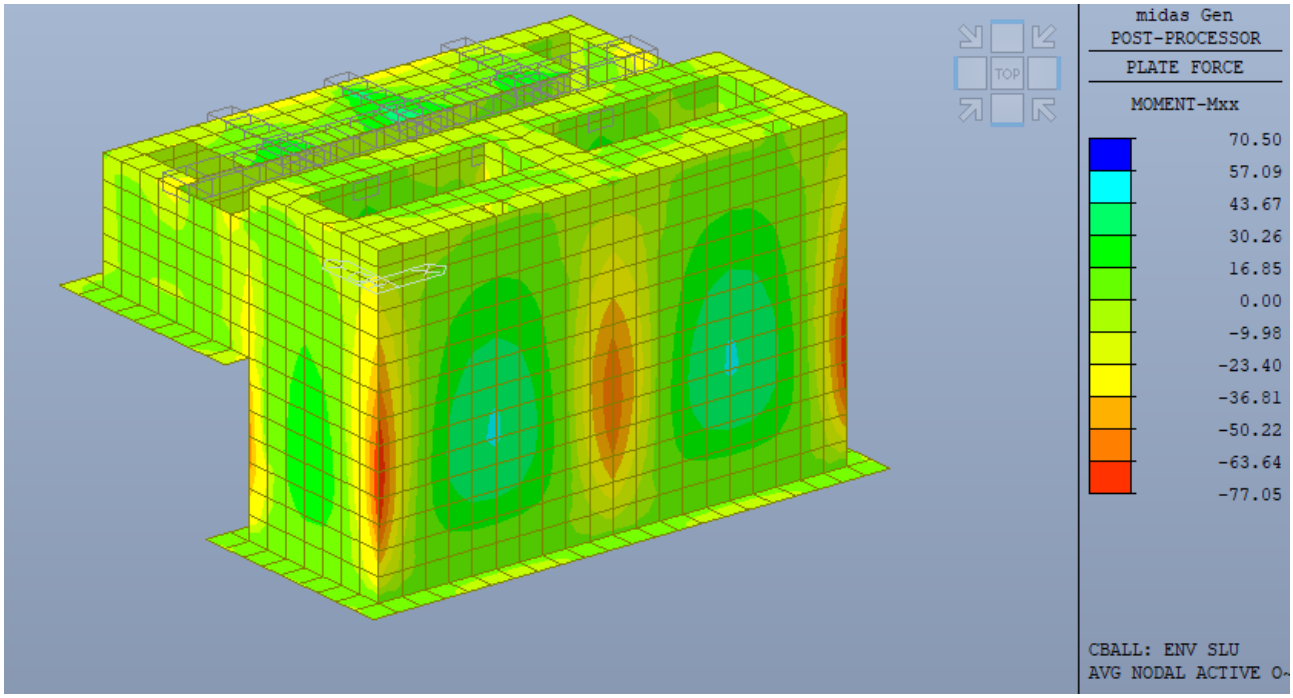
Assegnazione variabile copertura concentrati pos.2 (VC2) - [kN/mq]



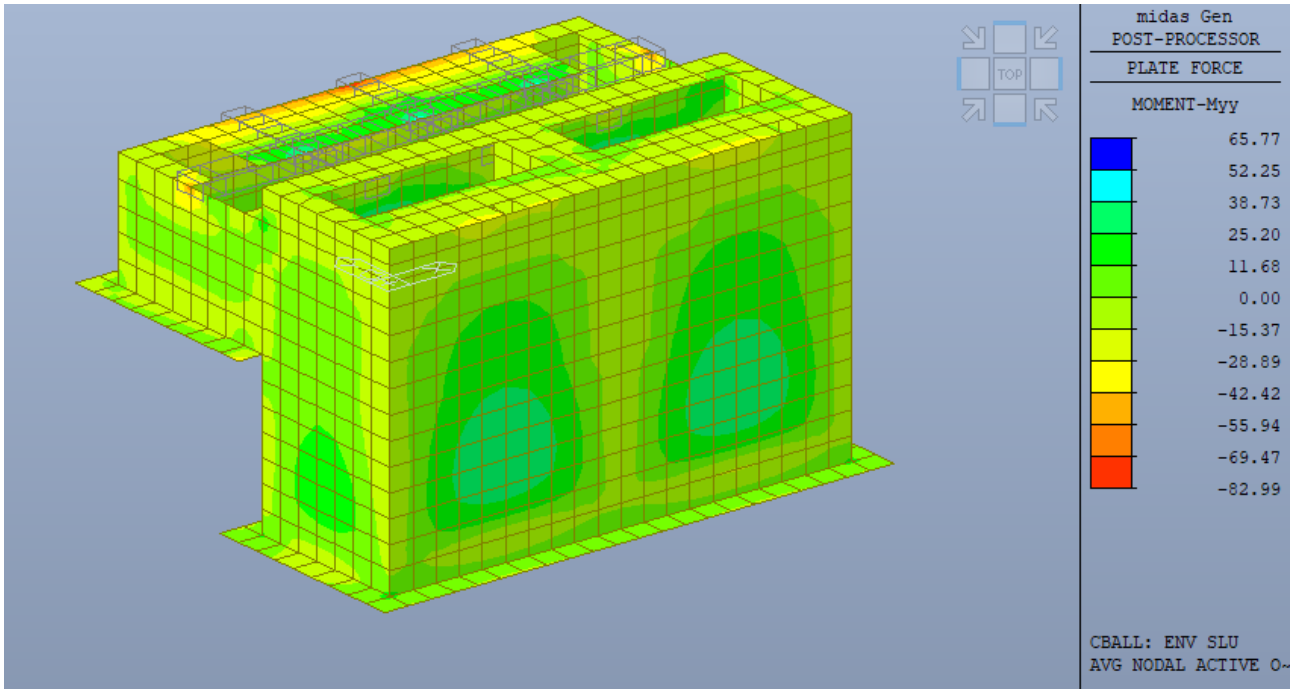
Assegnazione variabile copertura concentrati pos.3 (VC3) - [kN/mq]

1.3 Sollecitazioni

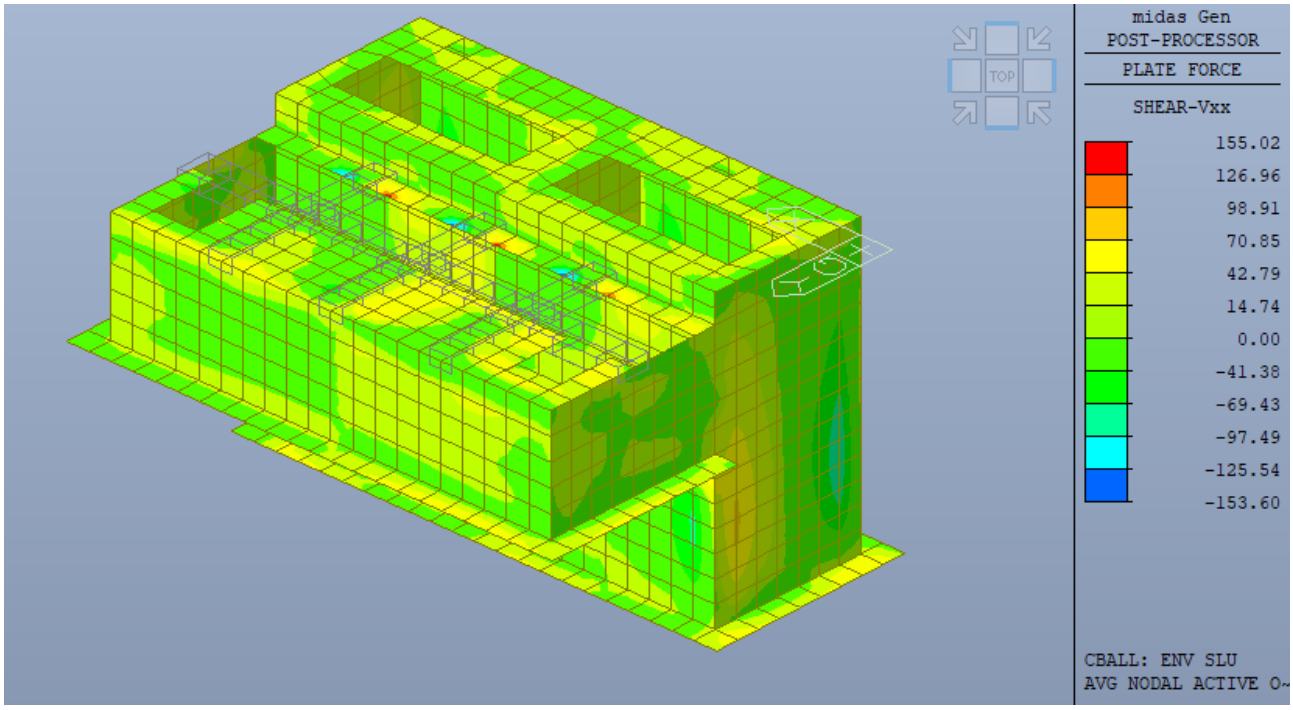
Nel presente paragrafo vengono riportate per via grafica le sollecitazioni sulla struttura indotte dai carichi applicati, per le varie combinazioni di carico statiche e sismiche.



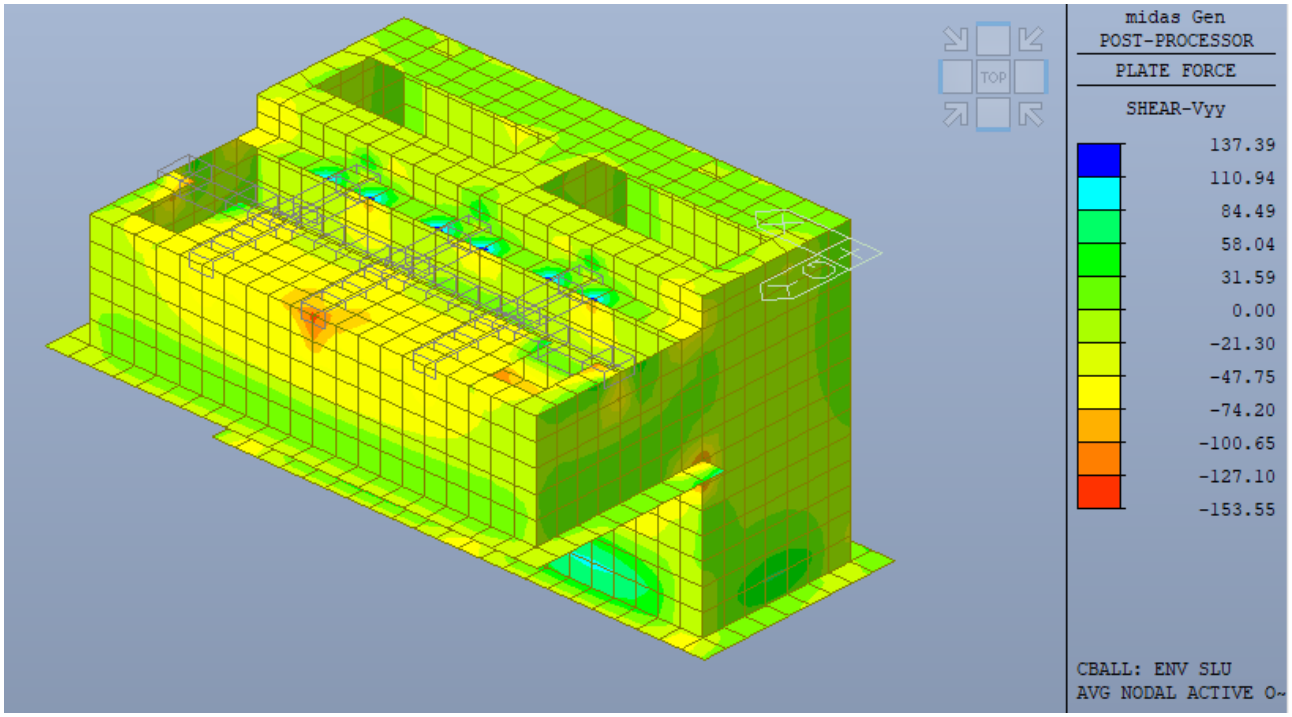
Momento flettente membranale Mxx – inviluppo SLU [kN*m/m]



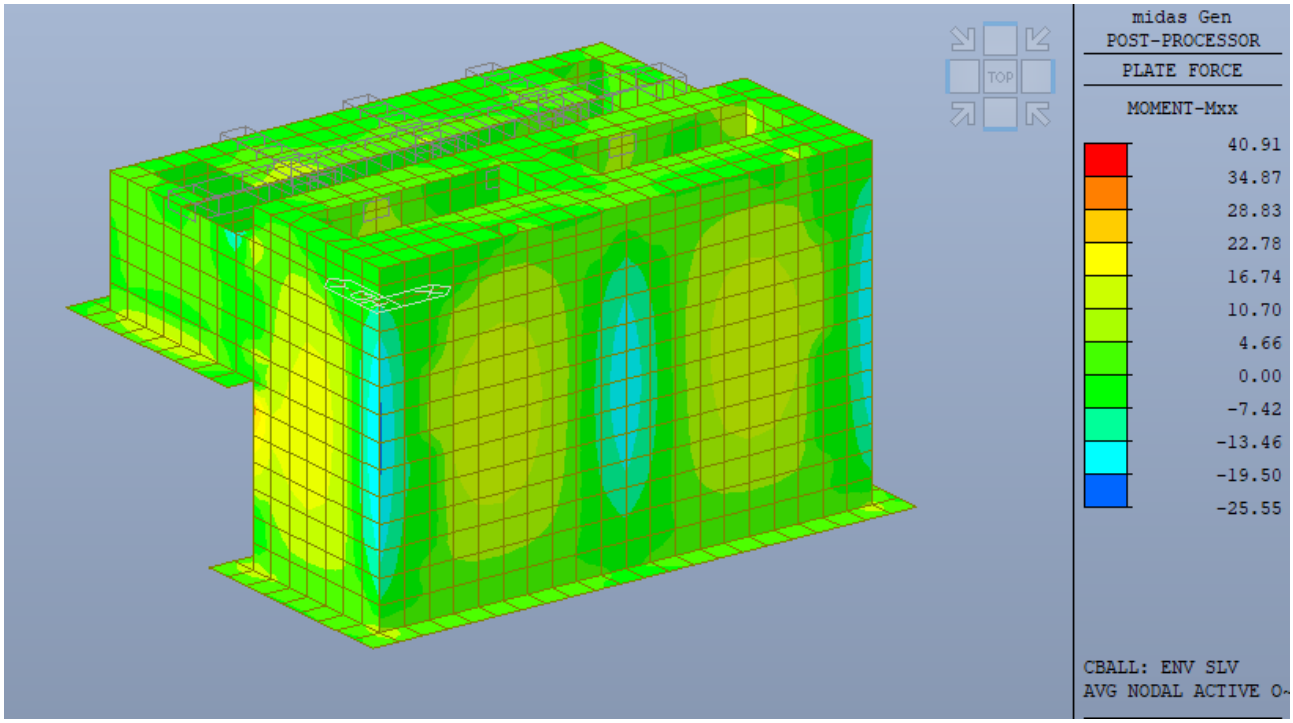
Momento flettente membranale Myy – inviluppo SLU [kN*m/m]



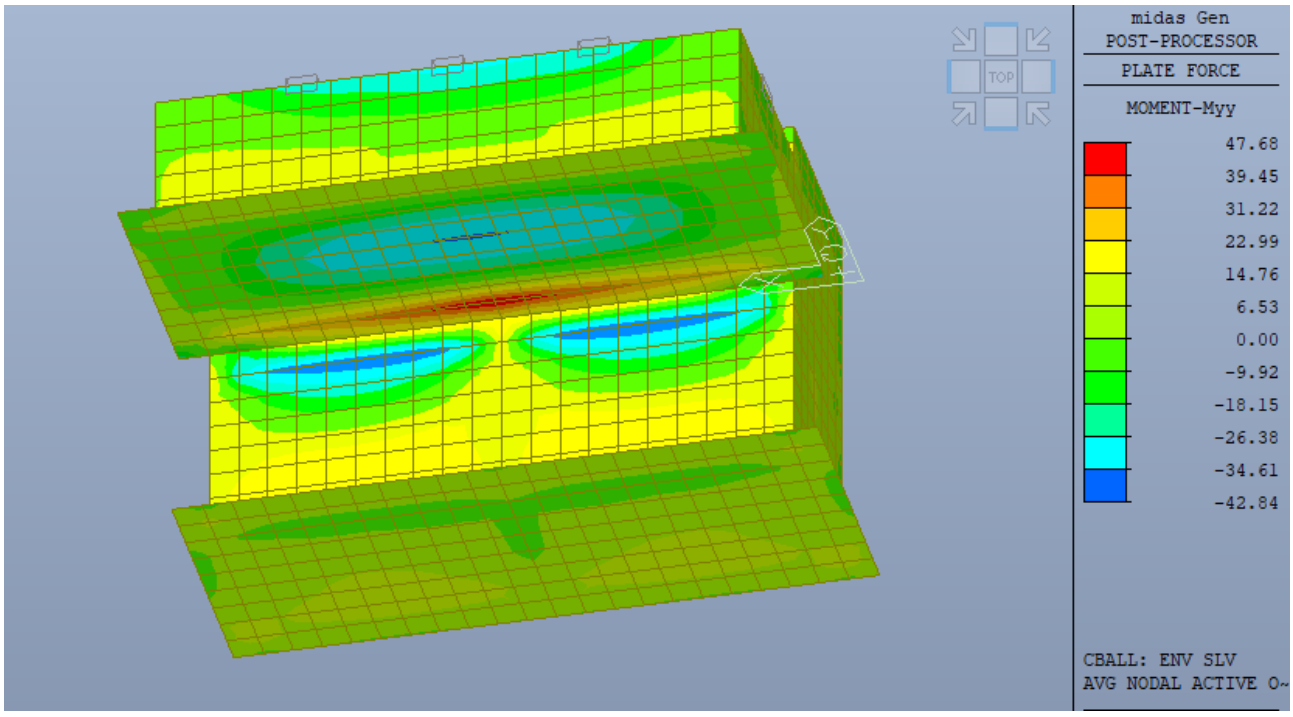
Sollecitazione tagliante Vxx – inviluppo SLU [kN/m]



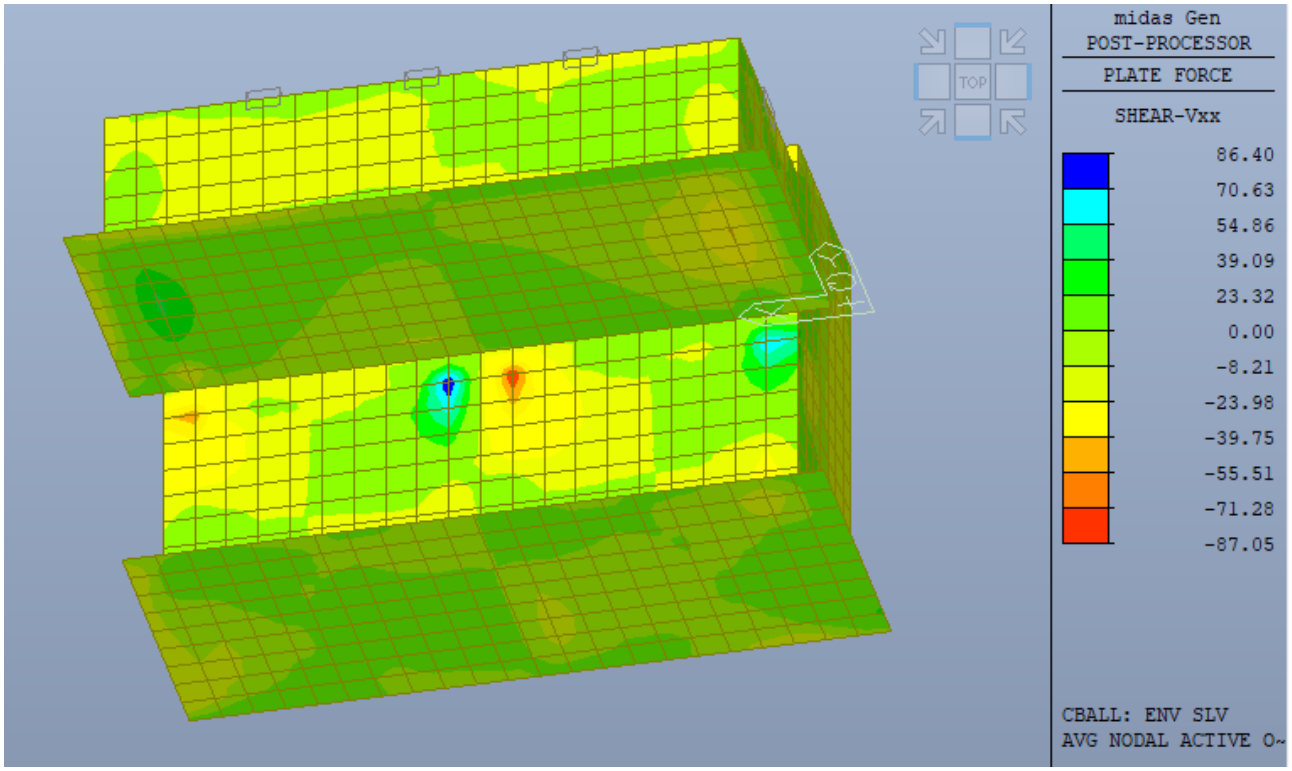
Sollecitazione tagliante Vyy – inviluppo SLU [kN/m]



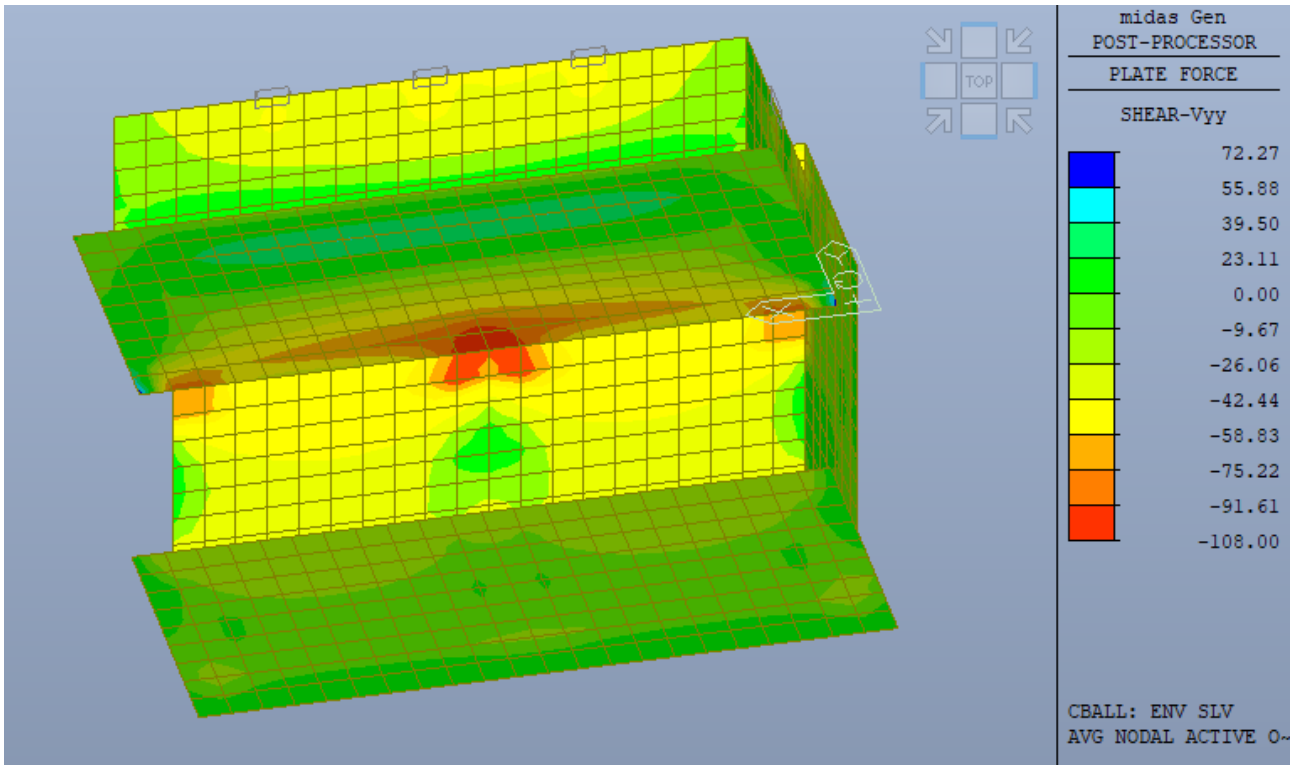
Momento flettente membranale Mxx – inviluppo SLV [kN*m/m]



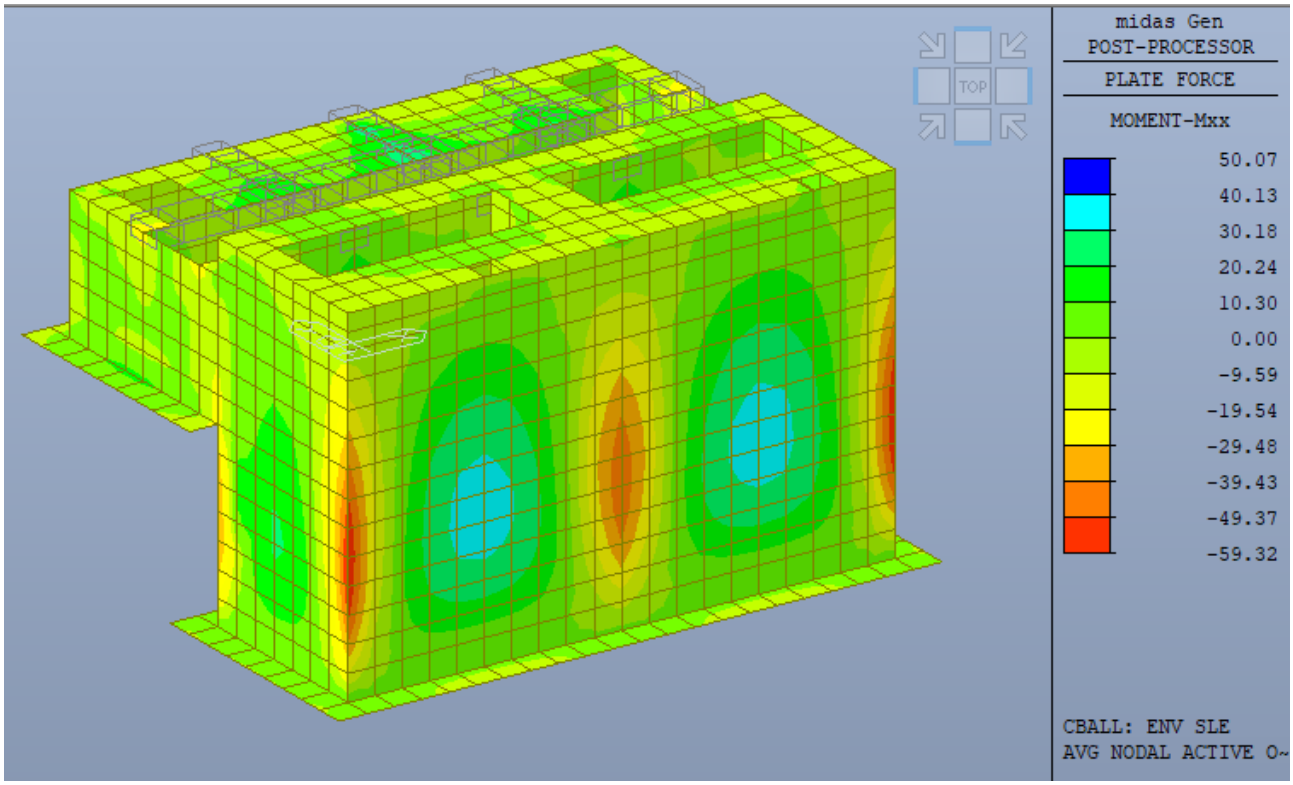
Momento flettente membranale Myy – inviluppo SLV [kN*m/m]



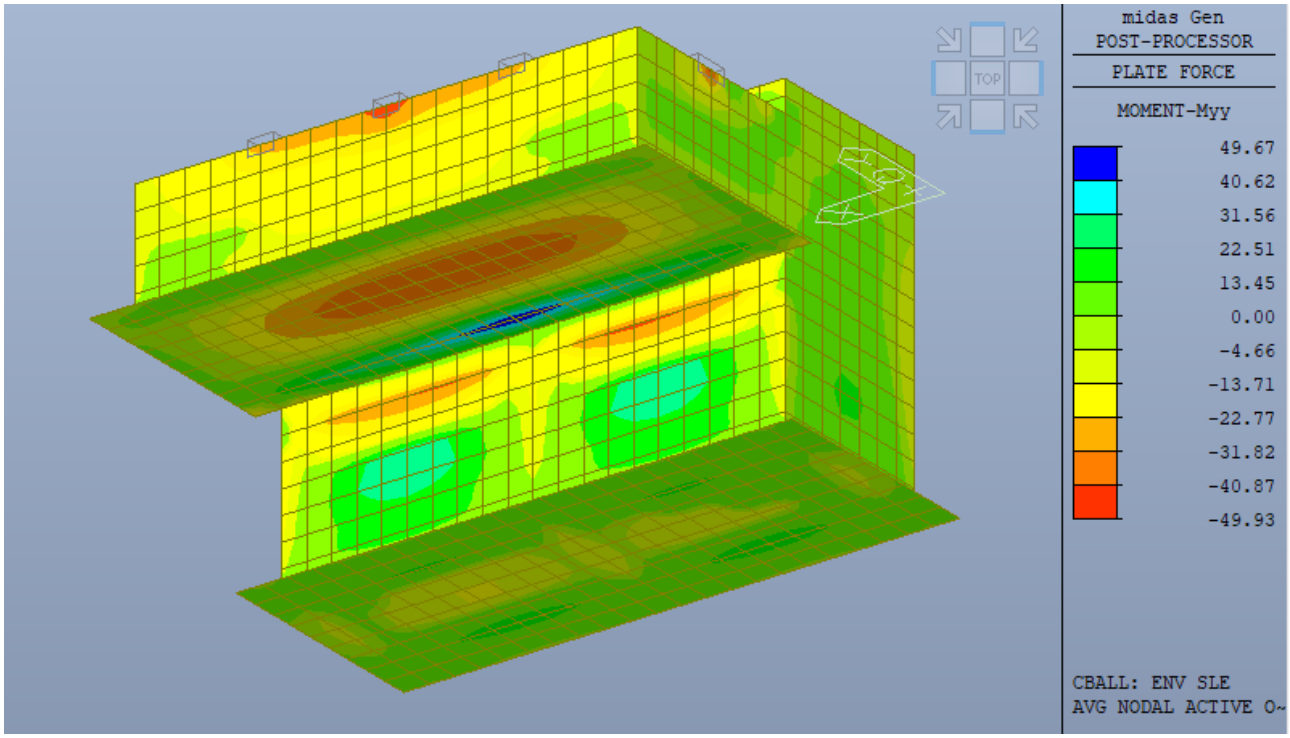
Sollecitazione tagliante Vxx – inviluppo SLV [kN/m]



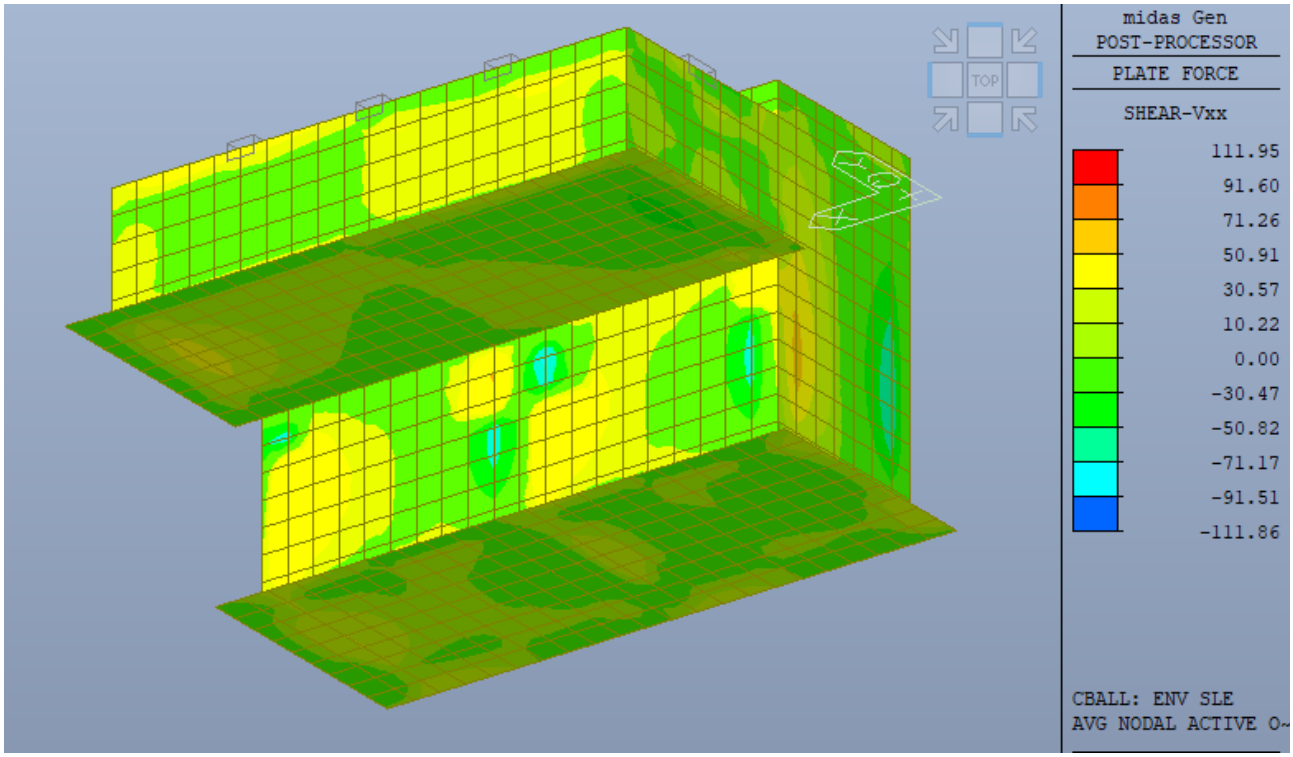
Sollecitazione tagliante Vyy – inviluppo SLV [kN/m]



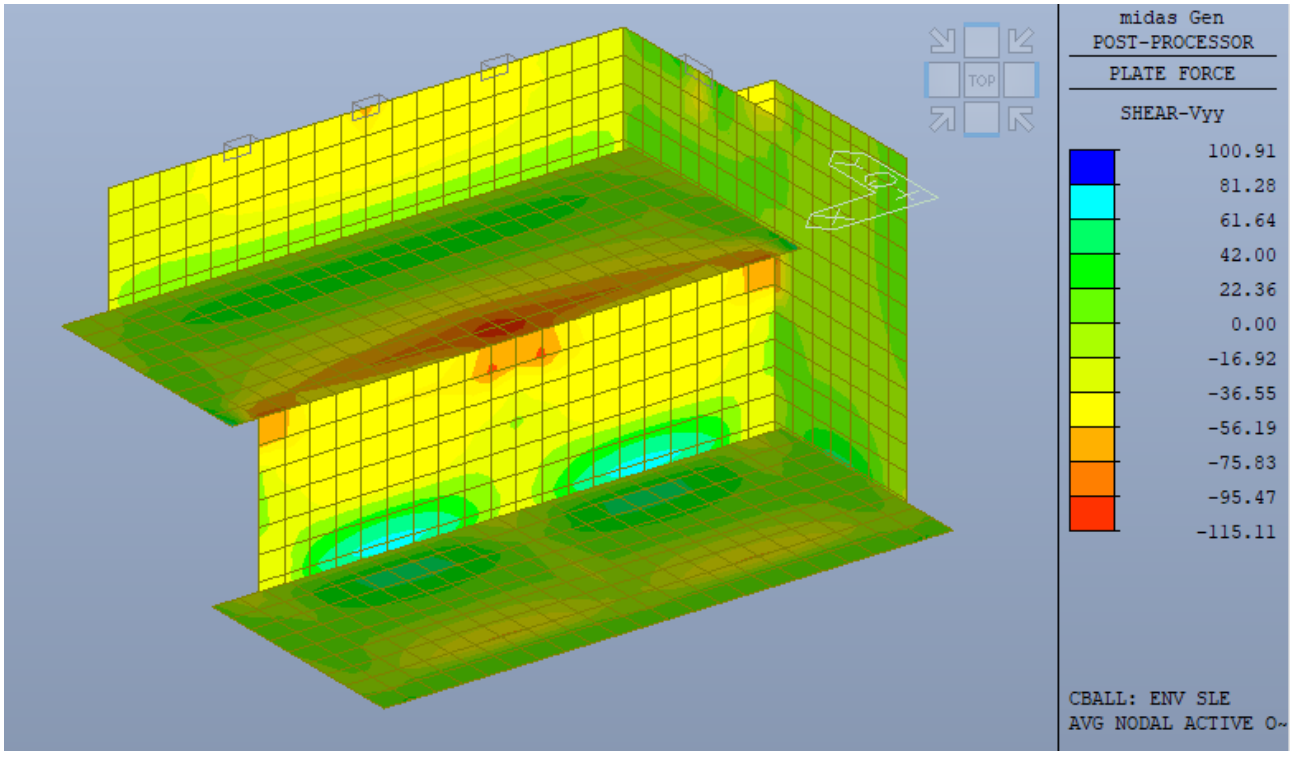
Momento flettente membranale Mxx – inviluppo SLE [kN*m/m]



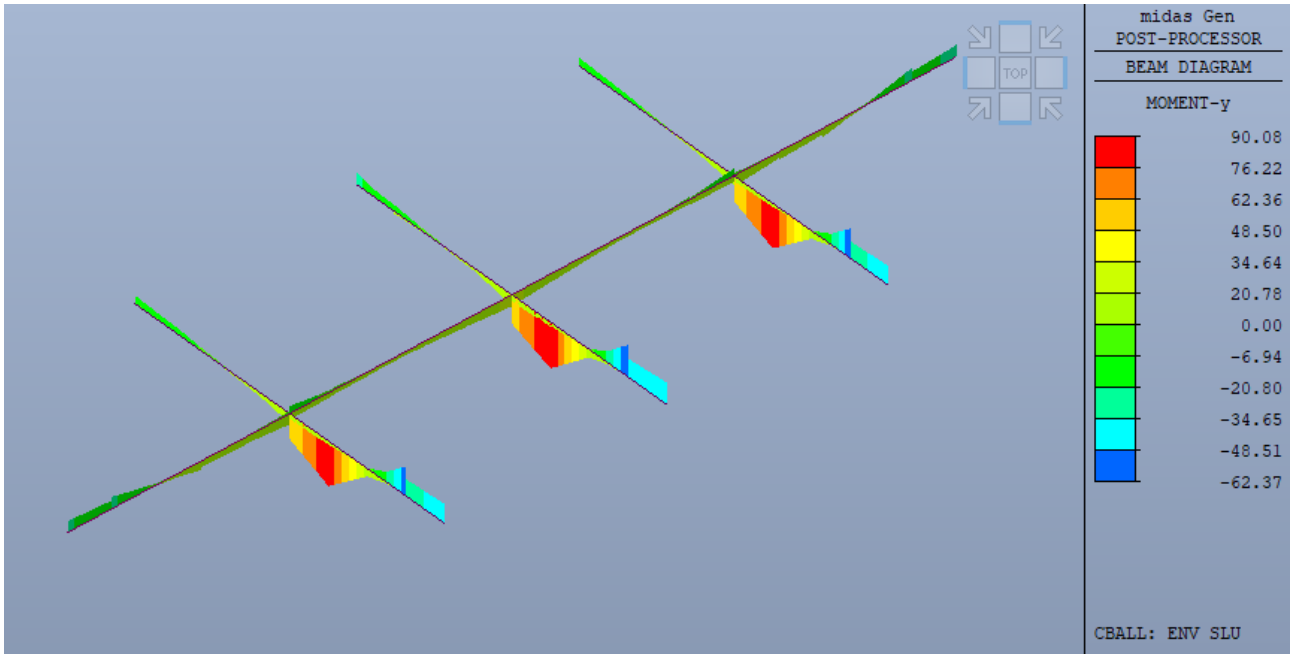
Momento flettente membranale Myy – inviluppo SLE [kN*m/m]



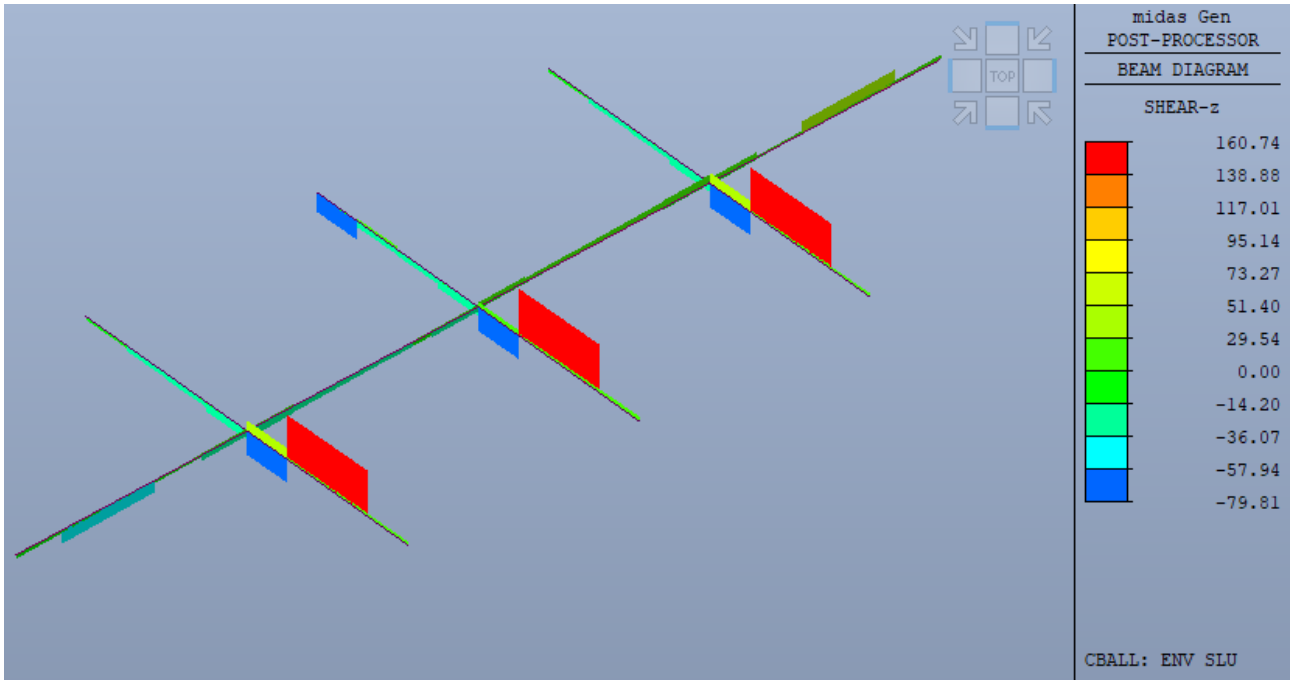
Sollecitazione tagliante Vxx – inviluppo SLE [kN/m]



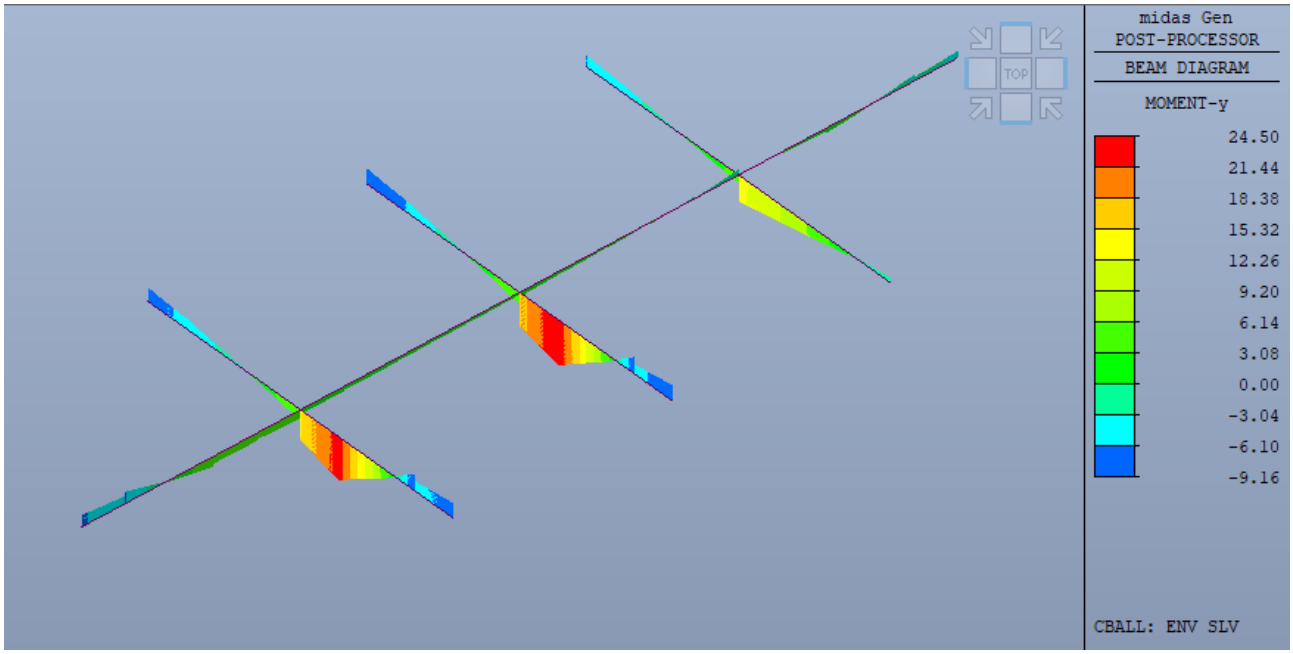
Sollecitazione tagliante Vyy – inviluppo SLE [kN/m]



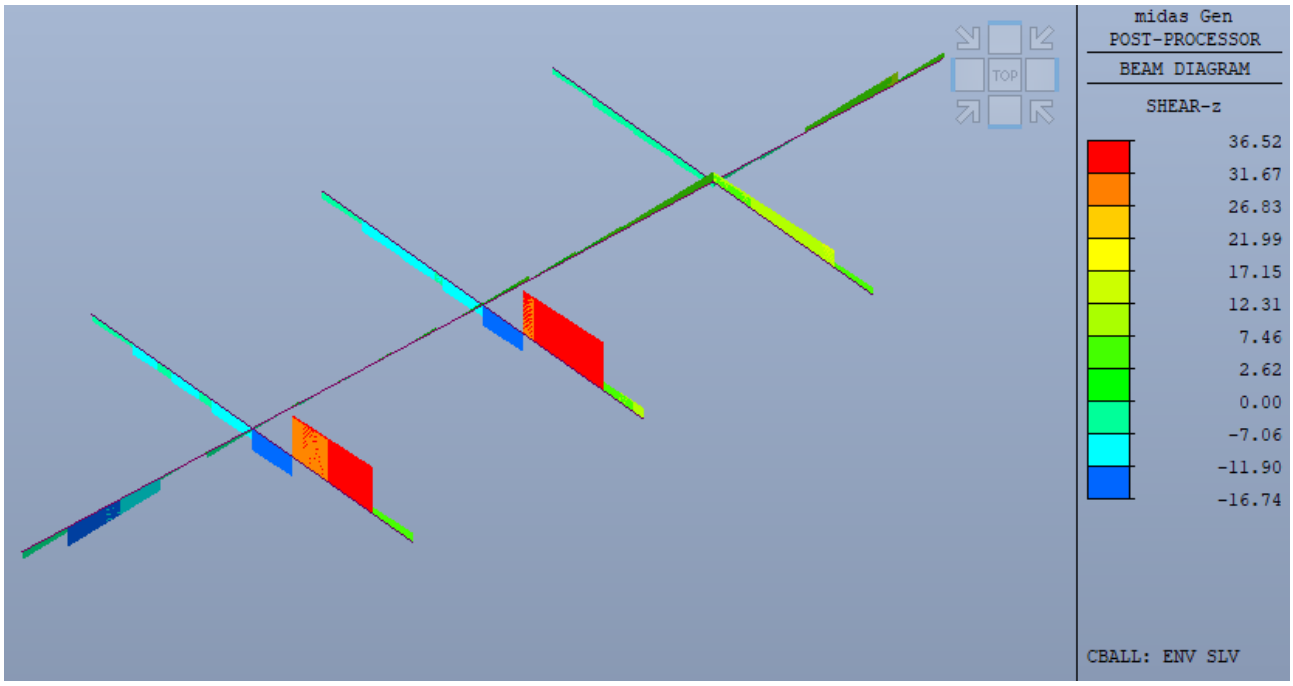
*Momento flettente Travi di copertura in c.a. – My inviluppo SLU [kN*m]*



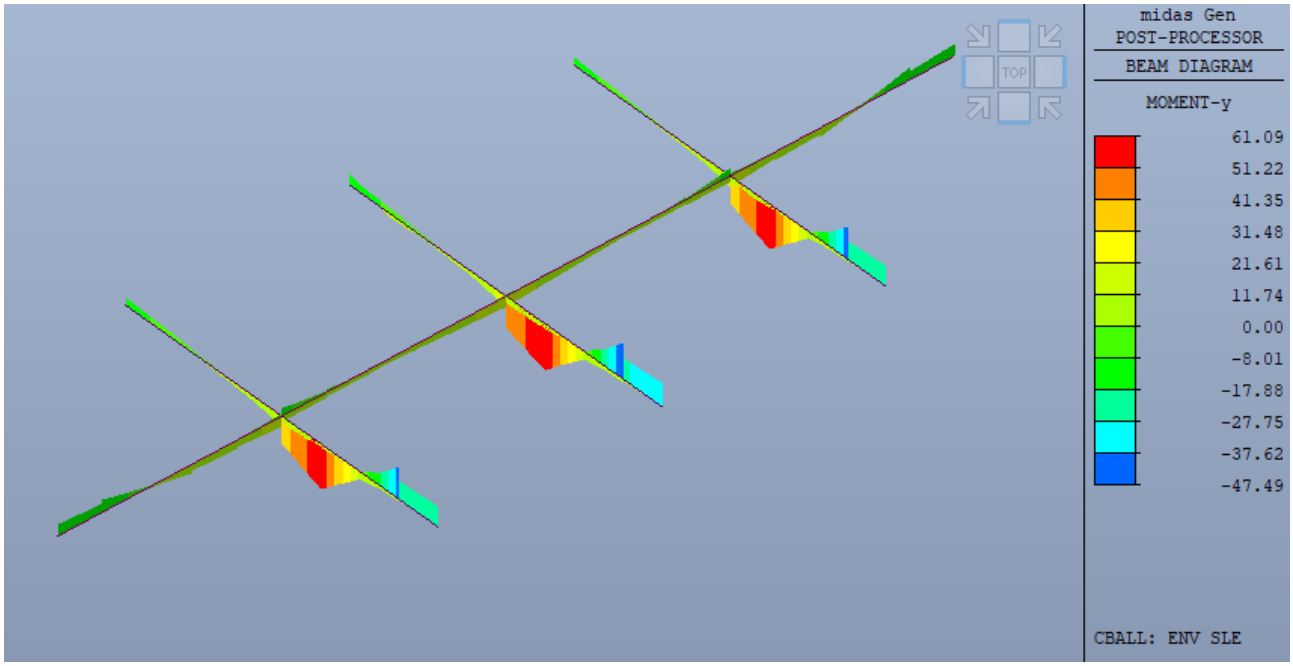
Taglio Fz Travi di copertura in c.a. – inviluppo SLU [kN]



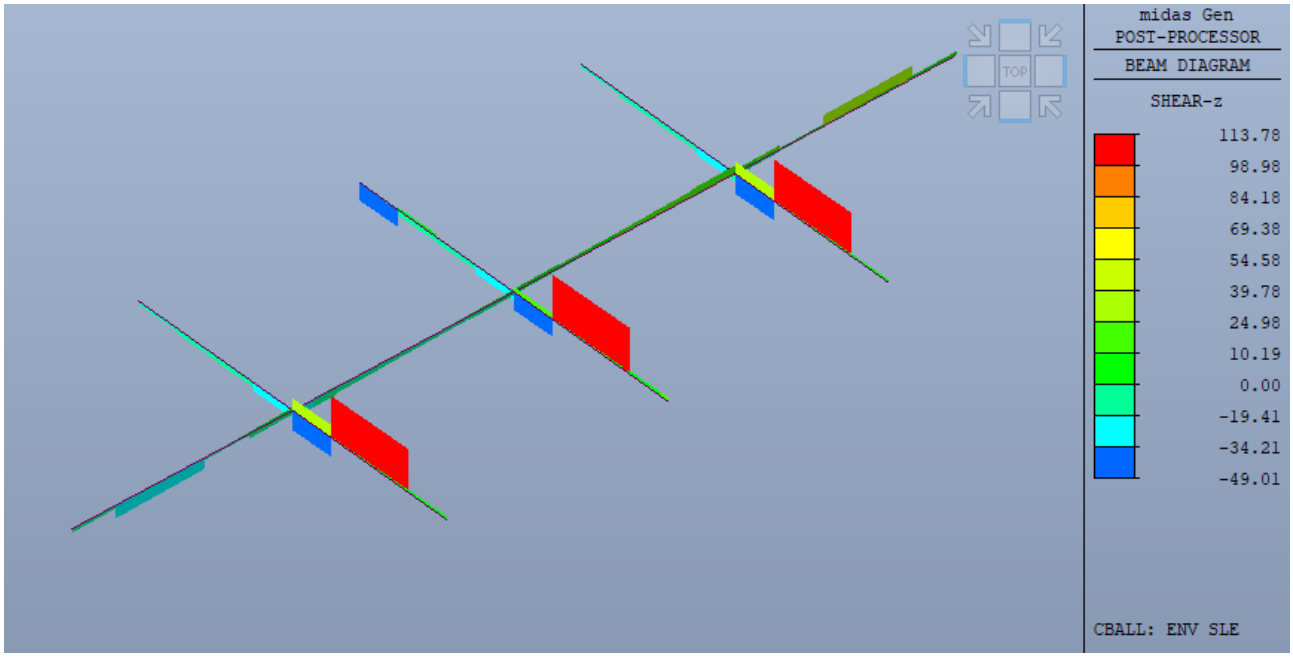
*Momento flettente Travi di copertura in c.a. – My inviluppo SLV [kN*m]*



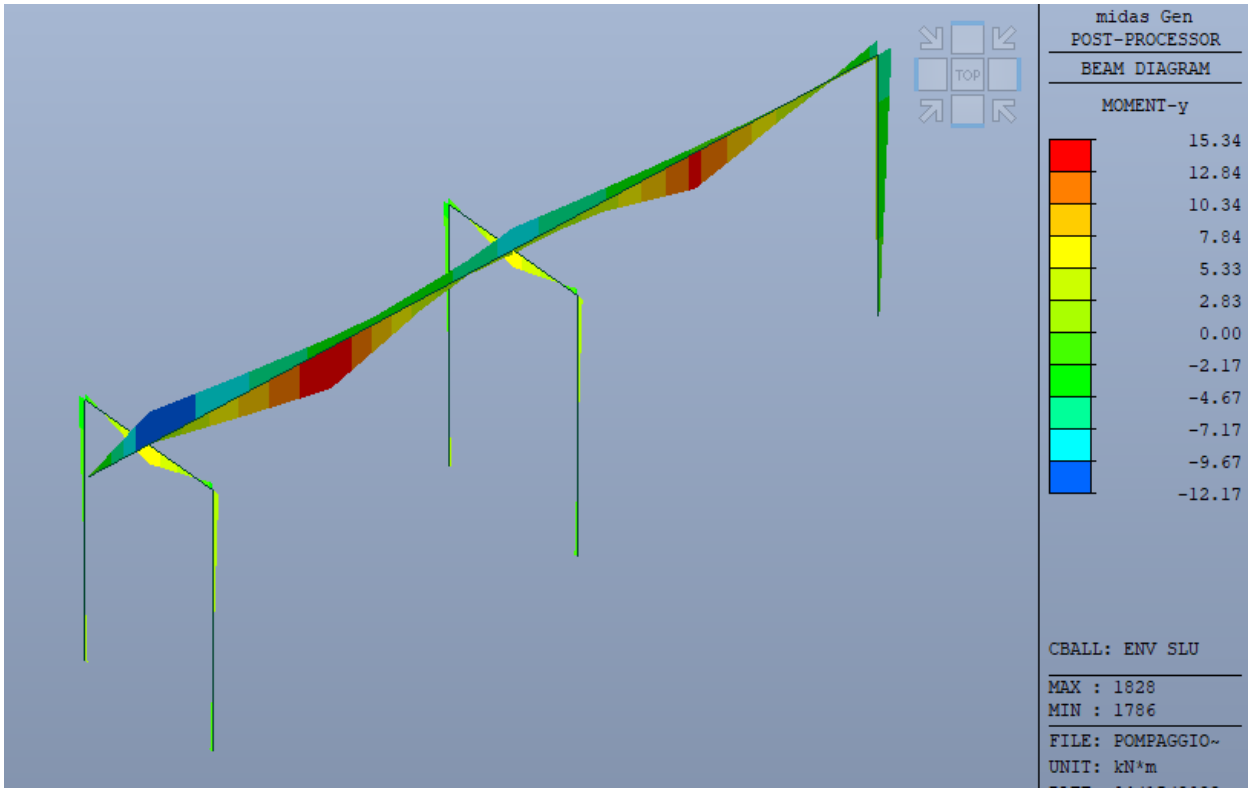
Taglio Fz Travi di copertura in c.a. – inviluppo SLV [kN]



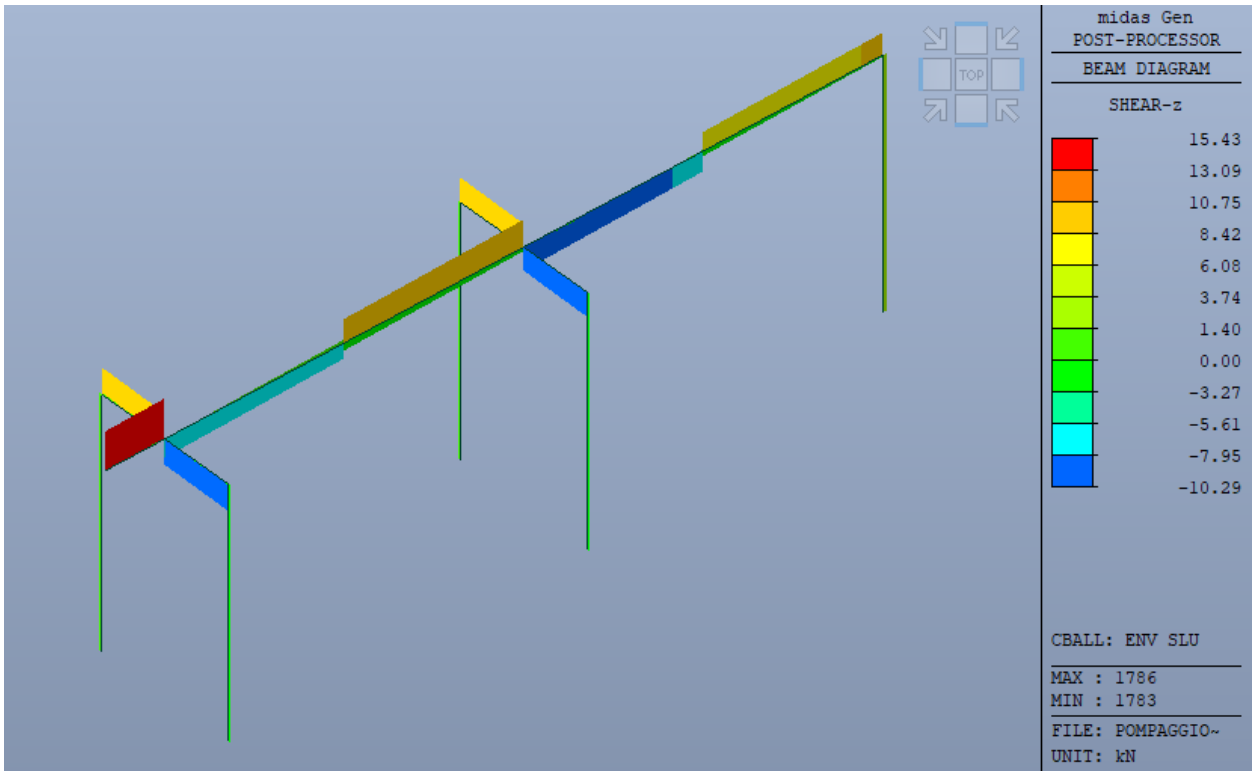
*Momento flettente Travi di copertura in c.a. – My inviluppo SLE [kN*m]*



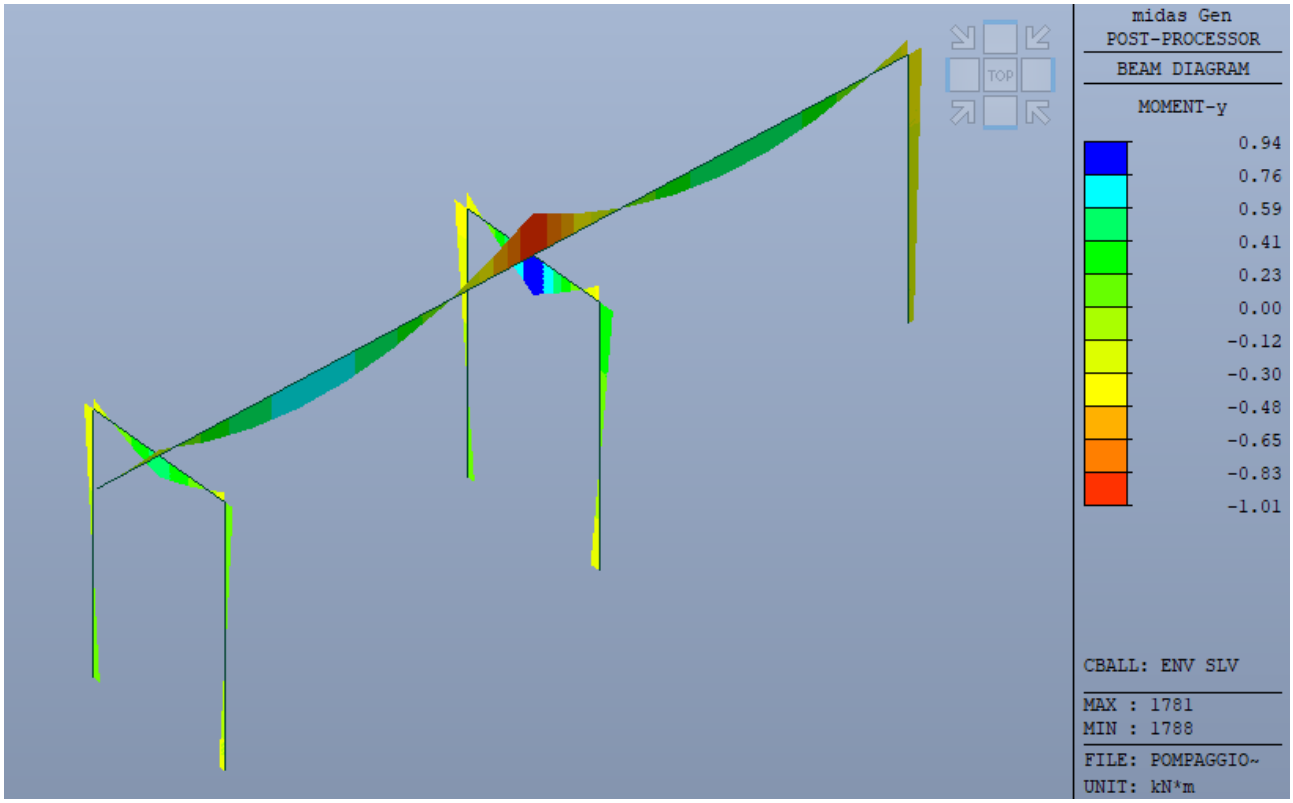
Taglio Fz Travi di copertura in c.a. – inviluppo SLE [kN]



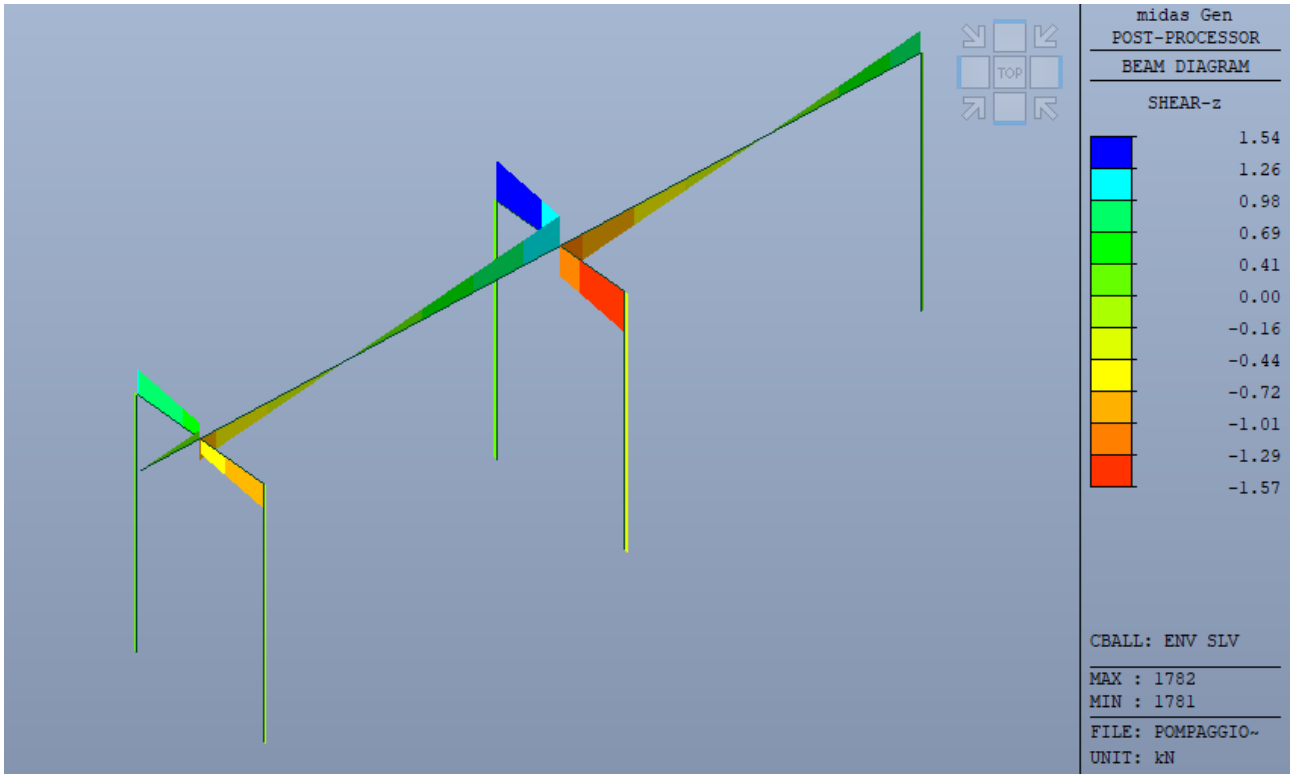
Momento flettente Struttura in acciaio per sostegno paranco – My inviluppo SLU [kN*m]



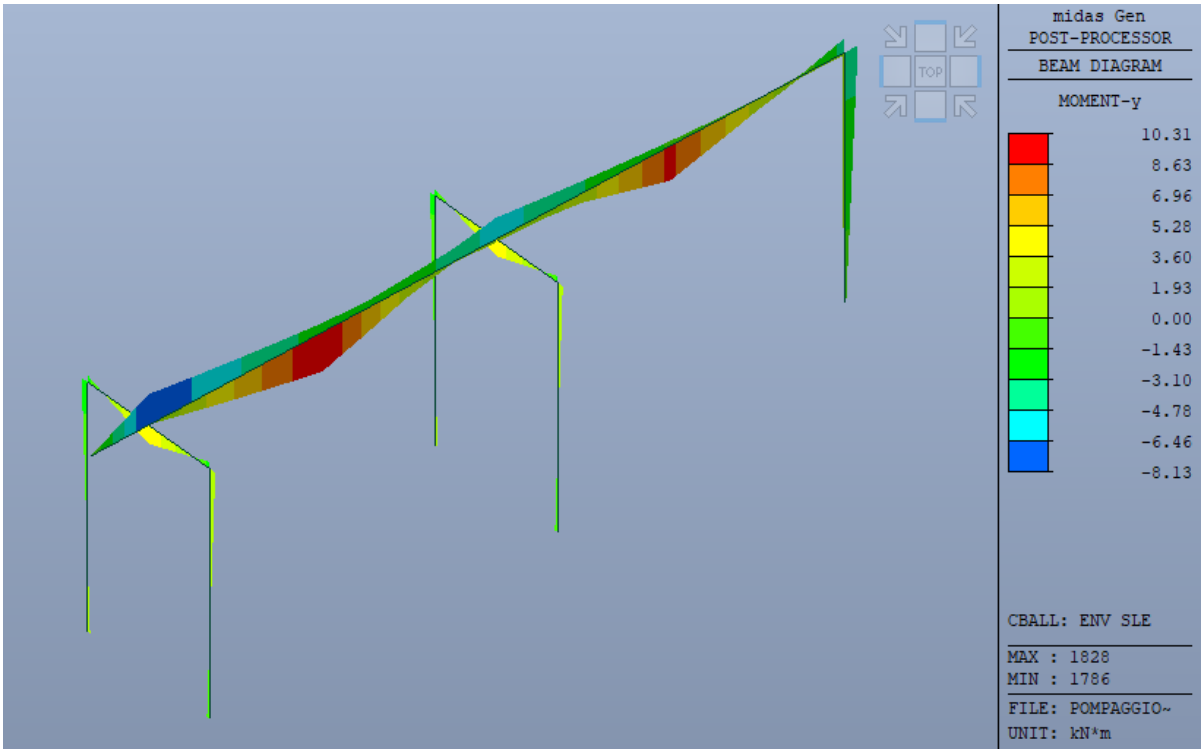
Taglio Fz Struttura in acciaio per sostegno paranco – inviluppo SLU [kN]



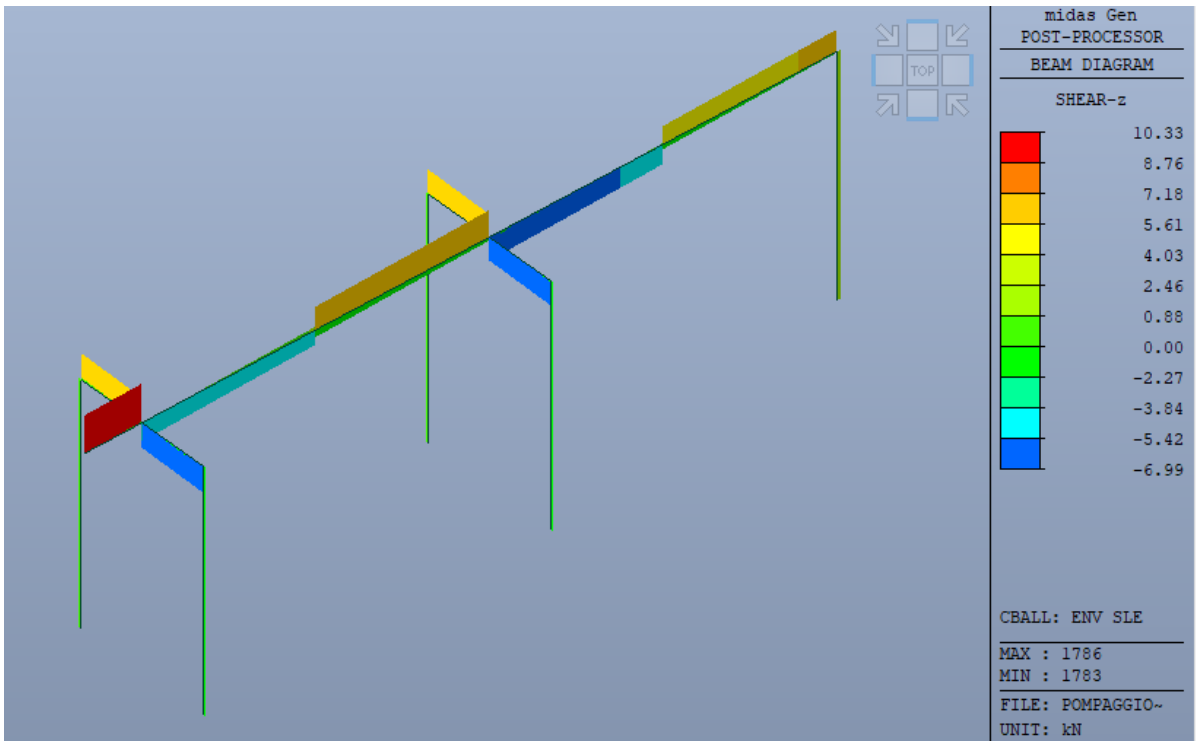
*Momento flettente Struttura in acciaio per sostegno paranco – My inviluppo SLV [kN*m]*



Taglio Fz Struttura in acciaio per sostegno paranco – inviluppo SLV [kN]



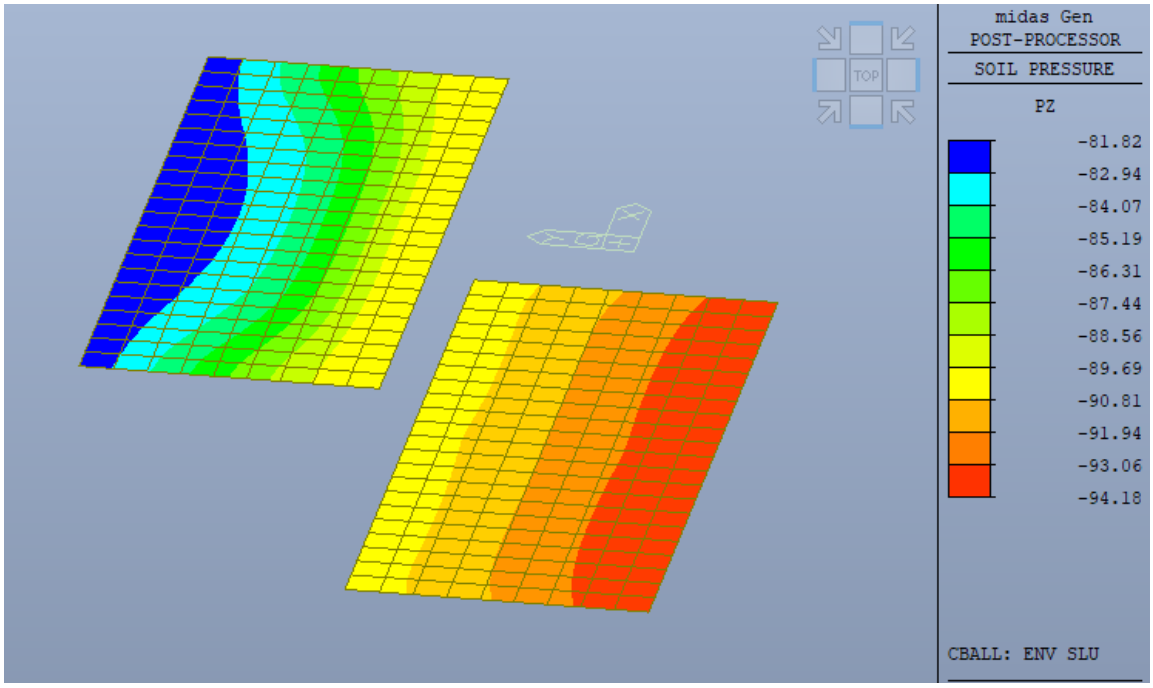
Momento flettente Struttura in acciaio per sostegno paranco – My inviluppo SLE [kN*m]



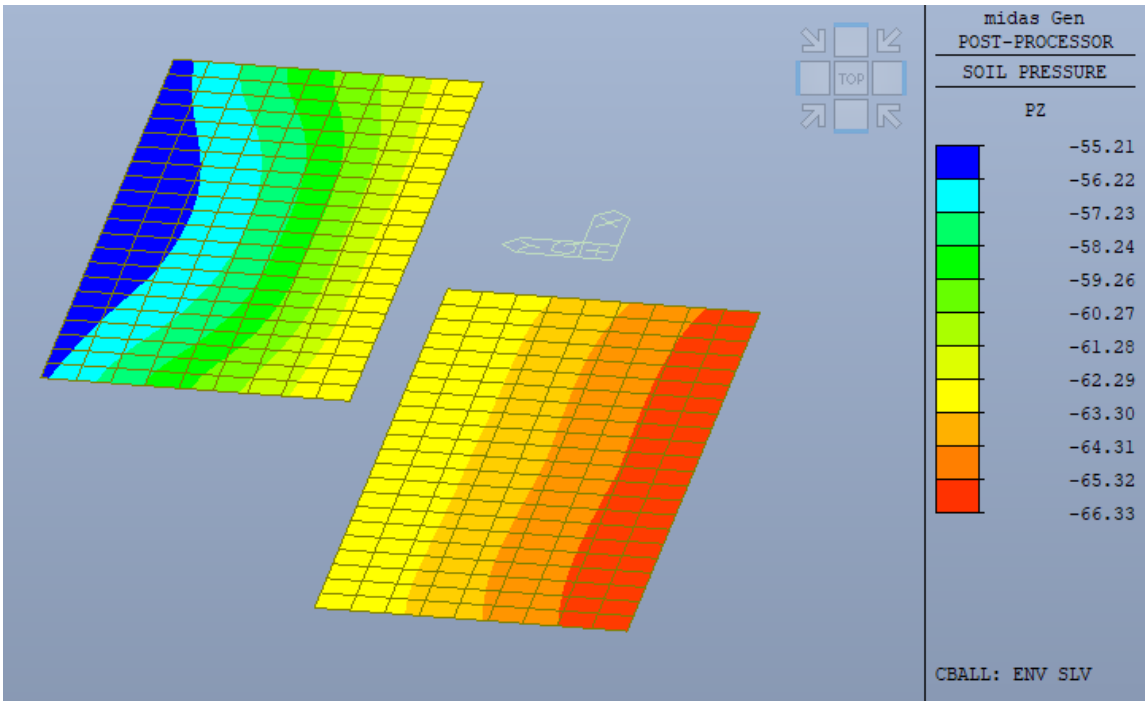
Taglio Fz Struttura in acciaio per sostegno paranco – inviluppo SLE [kN]

1.4 Reazioni vincolari e pressioni sul terreno

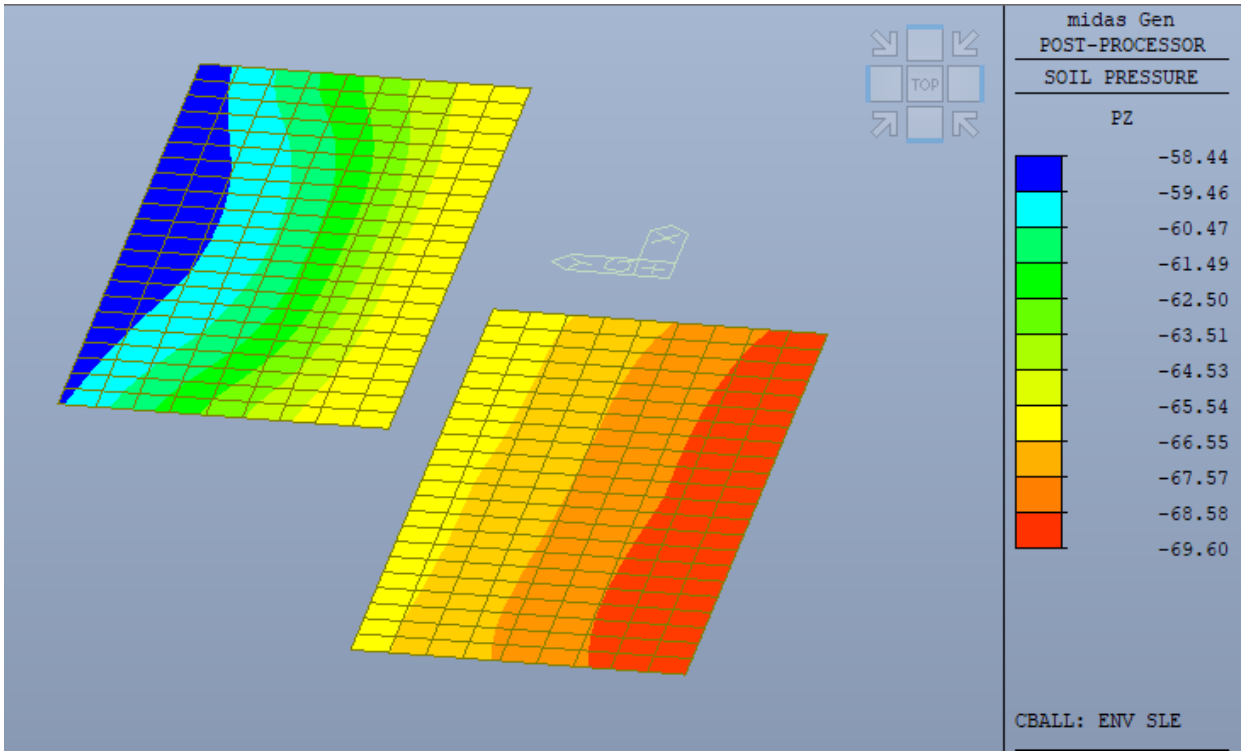
Nel presente paragrafo vengono riportate le reazioni vincolari e le pressioni sul terreno.



Pressioni sul terreno ENV SLU



Pressioni sul terreno ENV SLV



Pressioni sul terreno ENV SLE

Load	FX (kN)	FY (kN)	FZ (kN)
SLU 1	0.052049	0.000000	6005.027014
SLU 2	0.000000	-0.000000	-23.768844
SLU 3	-0.000000	0.000000	4838.147014
SLU 4	0.052049	0.000000	7070.669656
SLU 5	0.052049	0.000000	7070.669656
SLU 6	0.052049	0.000000	7070.669656
SLU 7	0.052049	0.000000	7070.669656
SLU 8	0.052049	0.000000	7070.669656
SLU 9	0.052049	0.000000	7070.669656
SLU 10	0.052049	0.000000	7070.669656
SLU 11	0.052049	0.000000	7070.669656
SLU 12	0.052049	0.000000	7070.669656
SLU 13	0.052049	0.000000	7070.669656
SLU 14	-0.000000	0.000000	8237.549656
SLU 15	-0.000000	0.000000	8237.549656
SLU 16	-0.000000	0.000000	8237.549656
SLU 17	-0.000000	0.000000	8237.549656
SLU 19	-0.000000	0.000000	8237.549656
SLU 20	-0.000000	0.000000	8025.656806
SLU 21	-0.000000	0.000000	8025.656806
SLU 22	-0.000000	0.000000	8025.656806
SLU 23	-0.000000	0.000000	8025.656806
SLU 24	-0.000000	0.000000	8025.656806
SLU 25	-0.000000	0.000000	8025.656806

Load	FX (kN)	FY (kN)	FZ (kN)
SLU 26	-0.000000	0.000000	8025.656806
SLU 27	-0.000000	0.000000	8025.656806
SLU 28	-0.000000	0.000000	8025.656806
SLU 29	-0.000000	0.000000	8025.656806
SLU 30	-0.000000	0.000000	8025.656806
SLU 31	-0.000000	0.000000	8025.656806
SLU 32	-0.000000	0.000000	8025.656806
SLU 33	-0.000000	0.000000	8025.656806
SLU 34	-0.000000	0.000000	8025.656806
SLV 1	-123.738118	-171.761702	5661.113449
SLV 2	-123.738118	171.761702	5661.113449
SLV 3	-37.121435	-572.539008	5661.113449
SLV 4	37.121435	-572.539008	5661.113449
SLV 5	123.738118	171.761702	5661.113449
SLV 6	123.738118	-171.761702	5661.113449
SLV 7	37.121435	572.539008	5661.113449
SLV 8	-37.121435	572.539008	5661.113449
SLV 9	-0.904750	-119.736000	5661.113449
SLV 10	-0.904750	119.736000	5661.113449
SLV 11	-0.271425	-399.120000	5661.113449
SLV 12	0.271425	-399.120000	5661.113449
SLV 13	0.904750	119.736000	5661.113449
SLV 14	0.904750	-119.736000	5661.113449
SLV 15	0.271425	399.120000	5661.113449
SLV 16	-0.271425	399.120000	5661.113449

Load	FX (kN)	FY (kN)	FZ (kN)
SLE R1	-0.000000	0.000000	4224.051449
SLE R2	-0.000000	0.000000	4224.051449
SLE R3	-0.000000	0.000000	4224.051449
SLE R4	-0.000000	0.000000	4224.051449
SLE R5	-0.000000	0.000000	4224.051449
SLE R6	-0.000000	0.000000	4224.051449
SLE R7	-0.000000	0.000000	4224.051449
SLE R8	-0.000000	0.000000	4224.051449
SLE R9	-0.000000	0.000000	4224.051449
SLE R10	-0.000000	0.000000	4224.051449
SLE R11	-0.000000	0.000000	4224.051449
SLE R12	-0.000000	0.000000	4224.051449
SLE R13	-0.000000	0.000000	4224.051449
SLE R14	-0.000000	0.000000	4224.051449
SLE R15	-0.000000	0.000000	4224.051449
SLE R16	-0.000000	0.000000	4368.313349
SLE R17	-0.000000	0.000000	4368.313349
SLE R18	-0.000000	0.000000	4368.313349
SLE R19	-0.000000	0.000000	4432.079977
SLE R20	-0.000000	0.000000	4432.079977
SLE R21	-0.000000	0.000000	4432.079977
SLE R22	-0.000000	0.000000	6019.251449
SLE R23	-0.000000	0.000000	6019.251449
SLE R24	-0.000000	0.000000	6019.251449
SLE R25	-0.000000	0.000000	6019.251449
SLE R26	-0.000000	0.000000	6019.251449
SLE R27	0.040038	0.000000	5121.651449
SLE R28	0.040038	0.000000	5121.651449
SLE R29	0.040038	0.000000	5121.651449
SLE R30	0.040038	0.000000	5121.651449
SLE R31	0.040038	0.000000	5121.651449
SLE R32	0.000000	0.000000	-52.523023
SLE F1	-0.000000	0.000000	5730.880077
SLE F2	-0.000000	0.000000	5730.880077
SLE F3	-0.000000	0.000000	5730.880077
SLE F4	-0.000000	0.000000	5730.880077
SLE F5	-0.000000	0.000000	5730.880077
SLE F6	-0.000000	0.000000	5730.880077
SLE F7	-0.000000	0.000000	5827.054677
SLE F8	-0.000000	0.000000	5827.054677
SLE F9	-0.000000	0.000000	5827.054677
SLE F10	0.040038	0.000000	4929.454677
SLE F11	0.040038	0.000000	4929.454677
SLE F12	0.040038	0.000000	4929.454677
SLE QP	-0.000000	0.000000	5516.851549

Reazioni vincolari

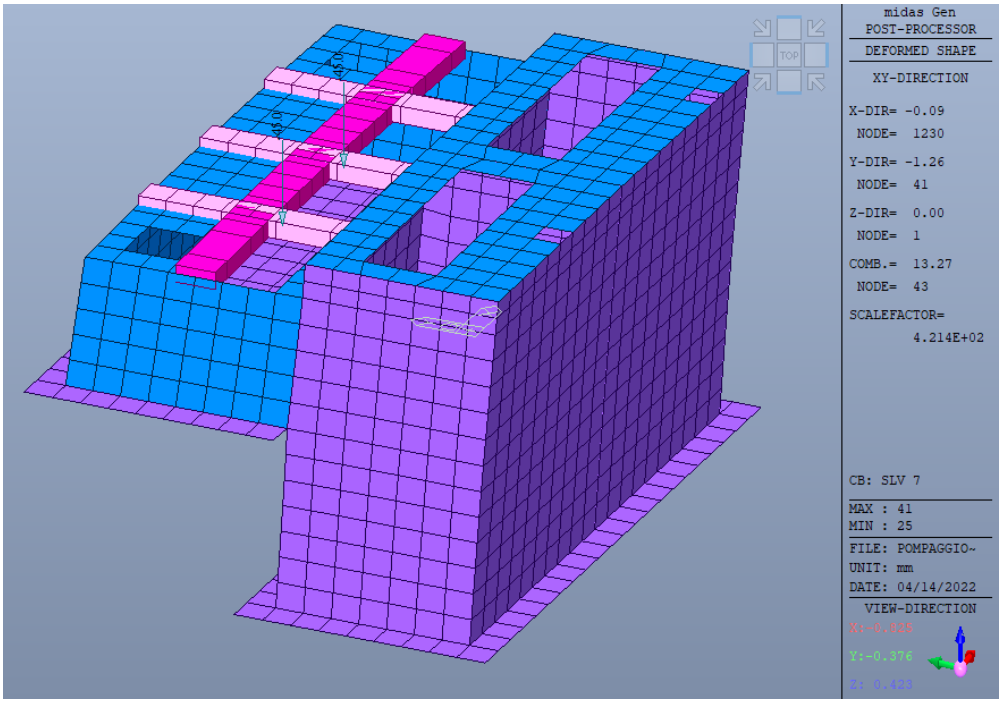
1.5 Deformazioni

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:

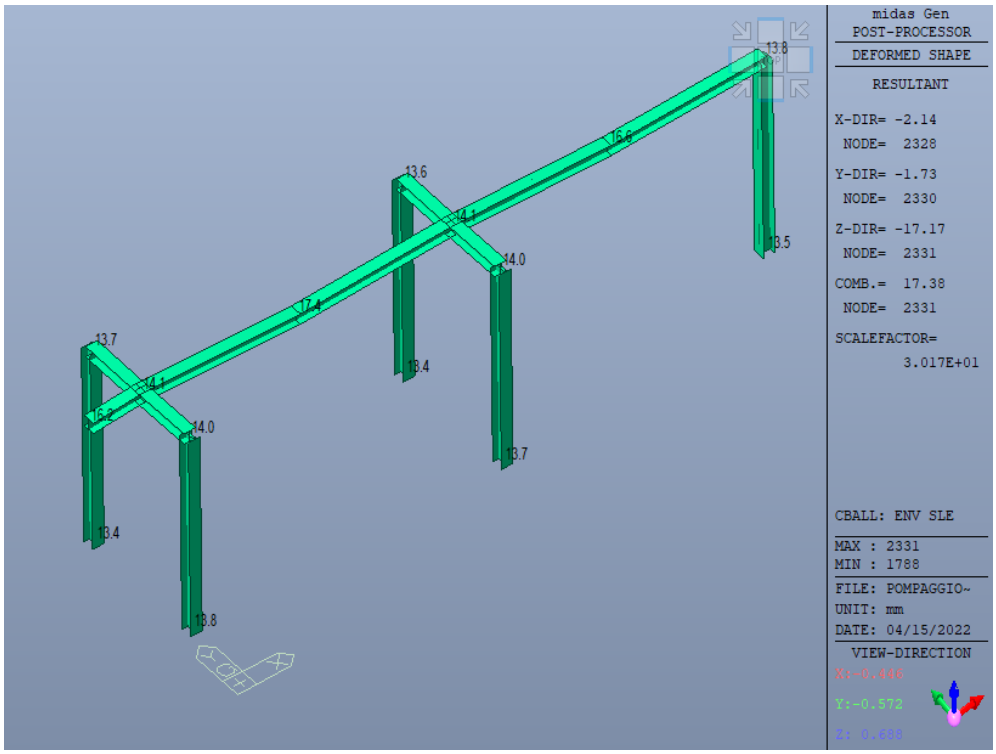
- per tamponamenti collegati rigidamente alla struttura che interferiscono con la deformabilità della stessa: dr < 0,005 h
- per tamponamenti progettati in modo da non subire danni a seguito di spostamenti di interpiano drp, per effetto della loro deformabilità intrinseca ovvero dei collegamenti alla 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 SLV è pari a 1.3 mm, quindi trascurabile.



Massime deformazioni SLV combinata XY [cm]

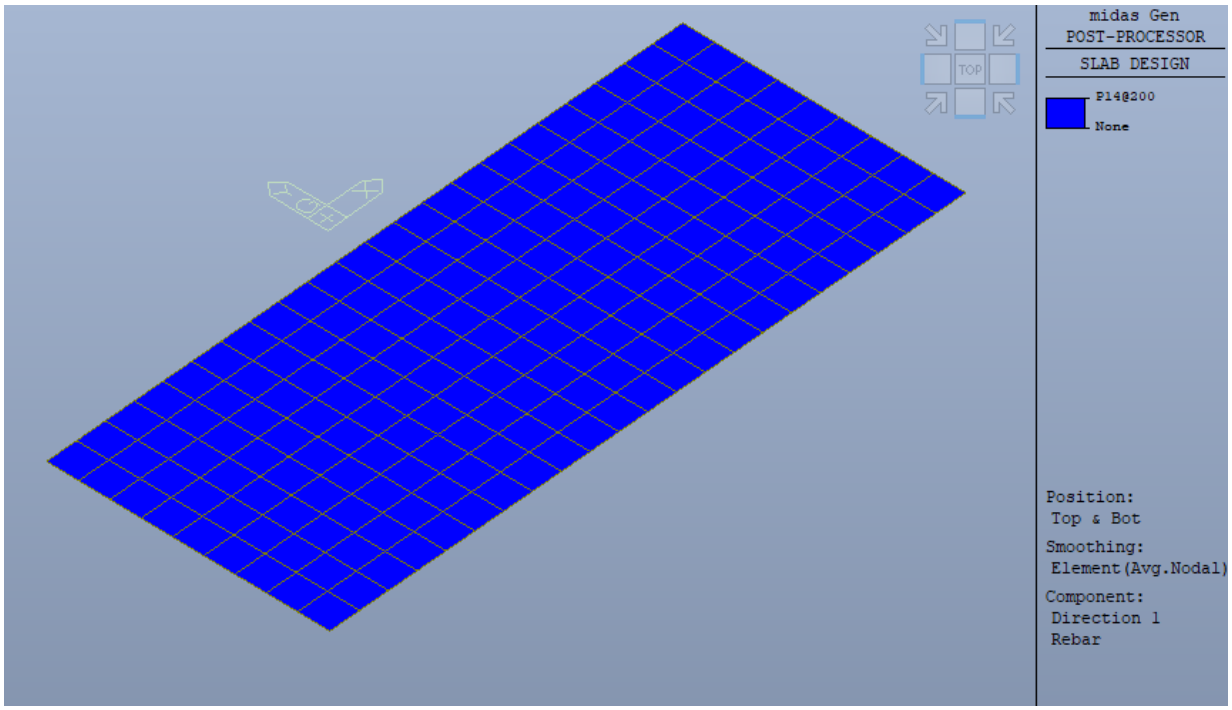
È stata inoltre verificata la deformazione in condizioni di esercizio della struttura in acciaio di supporto del paranco per la movimentazione delle pompe. Il differenziale è pari a circa 3,3 mm, che sulla luce di 4,8 m corrisponde a circa L/1450 quindi accettabile.



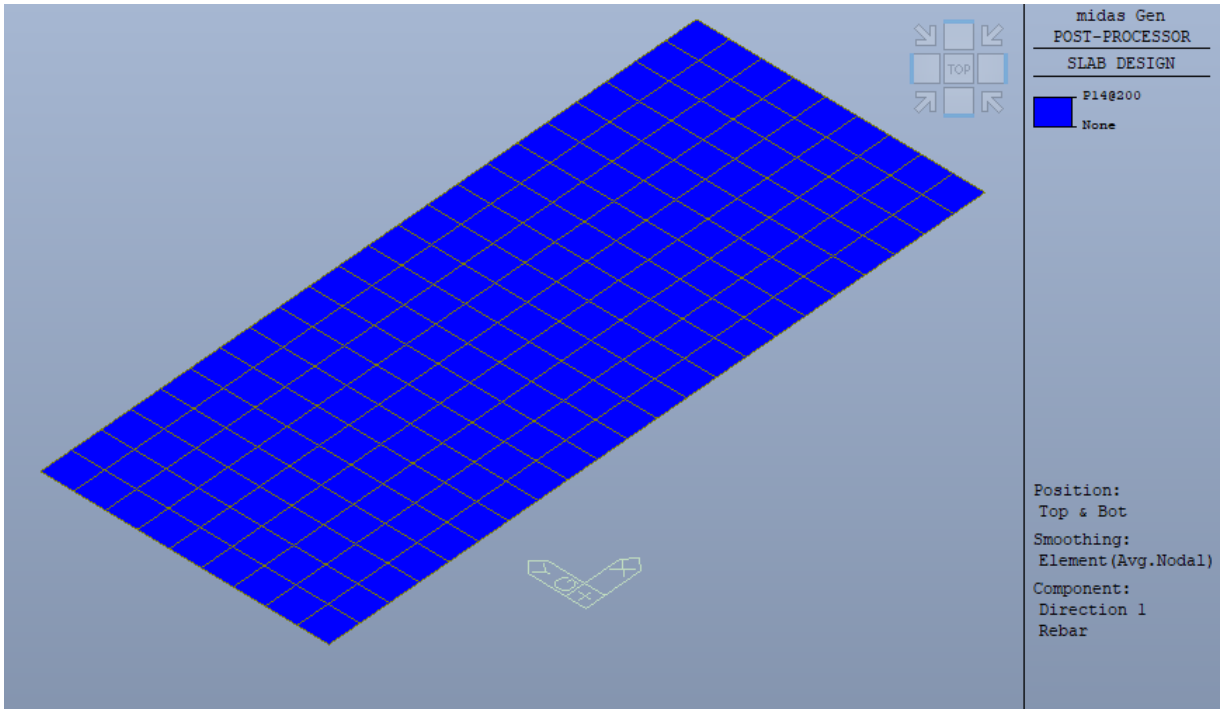
Deformata statica SLE [mm]

1.6 Armature previste

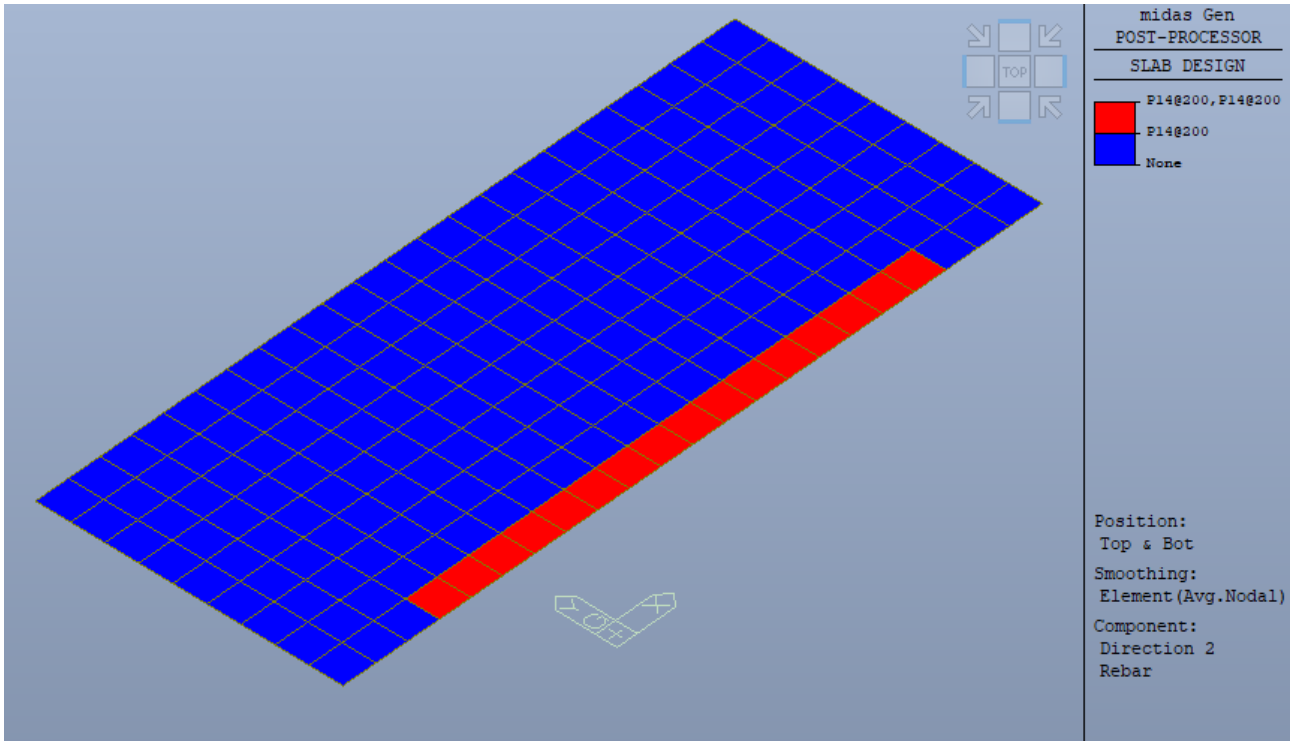
Nelle immagini seguenti vengono riportate le armature previste per i vari elementi strutturali.



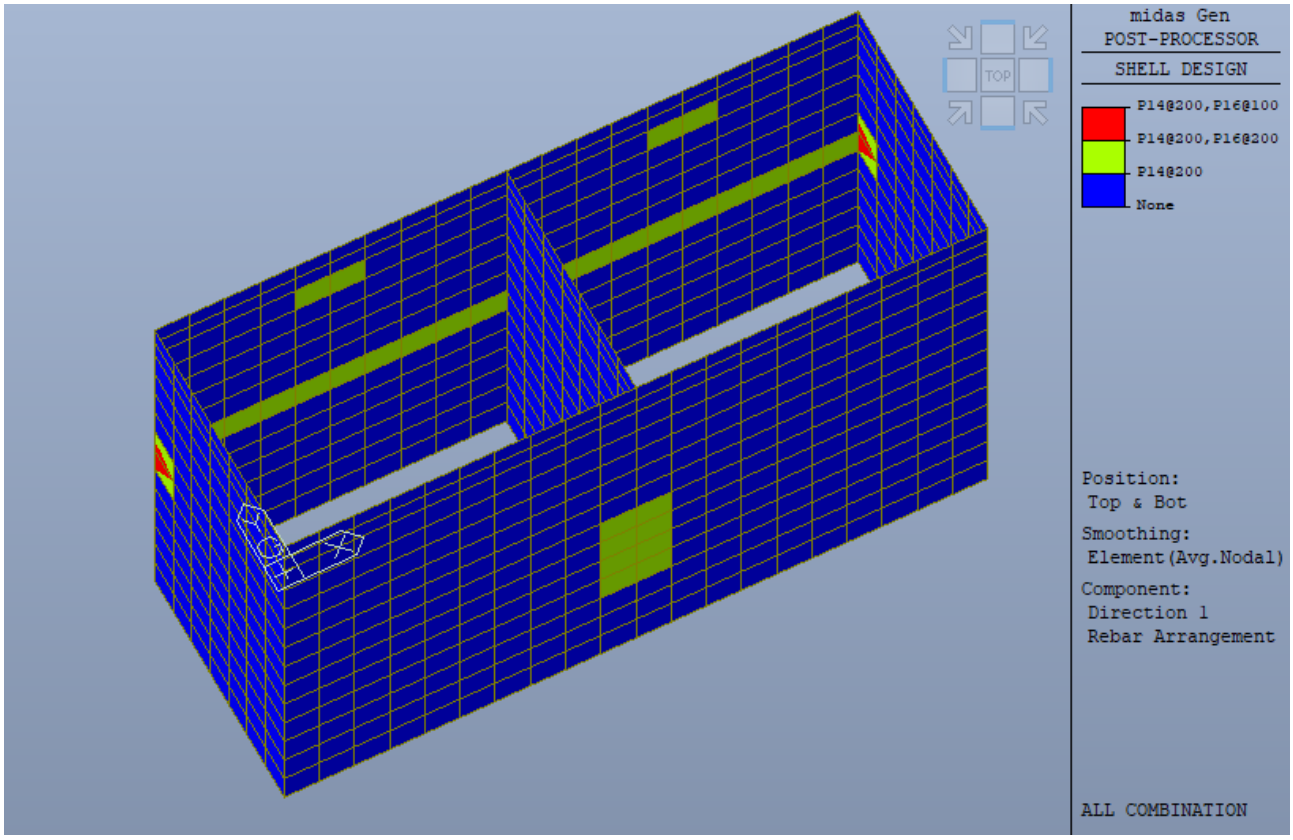
Platea pompaggio sp.40 – armature in direzione X e Y – ambo i lati



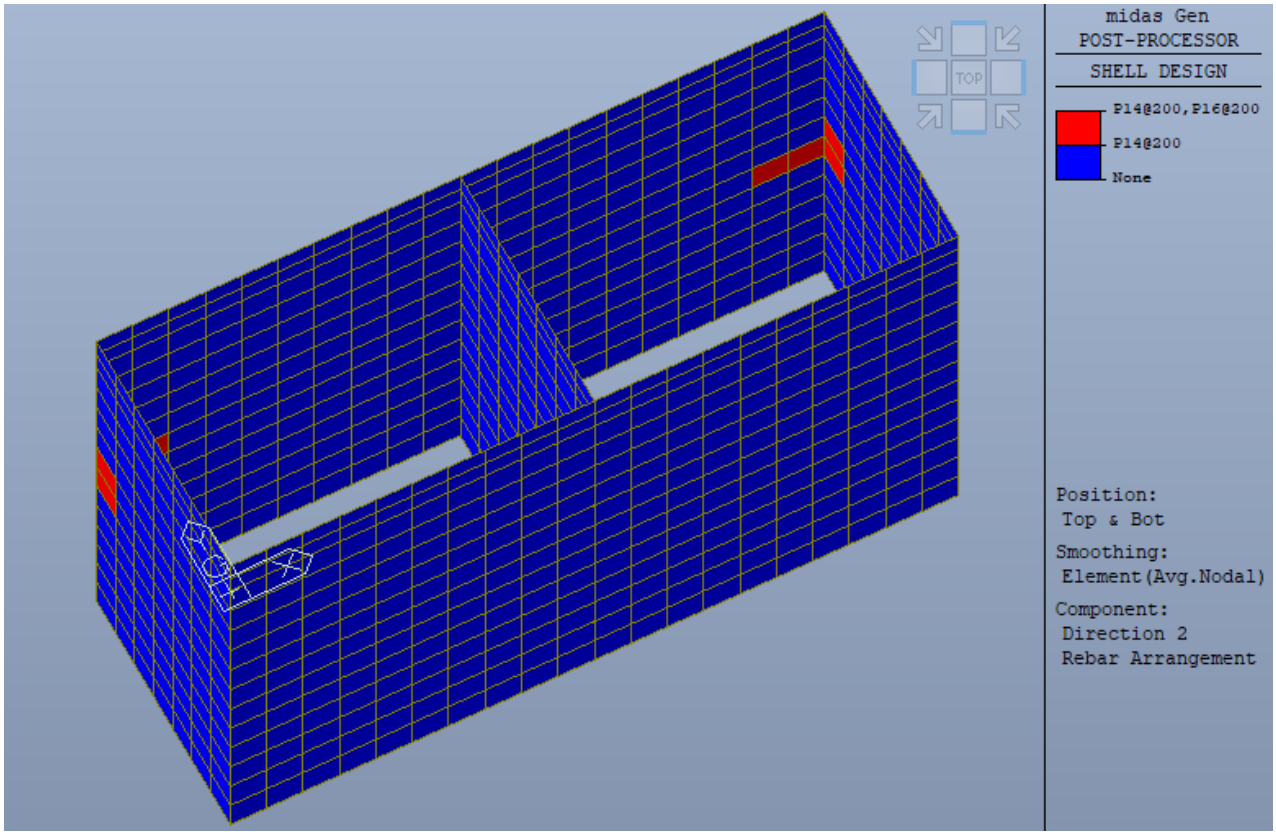
Platea camera valvole sp.40 – armature in direzione X – ambo i lati



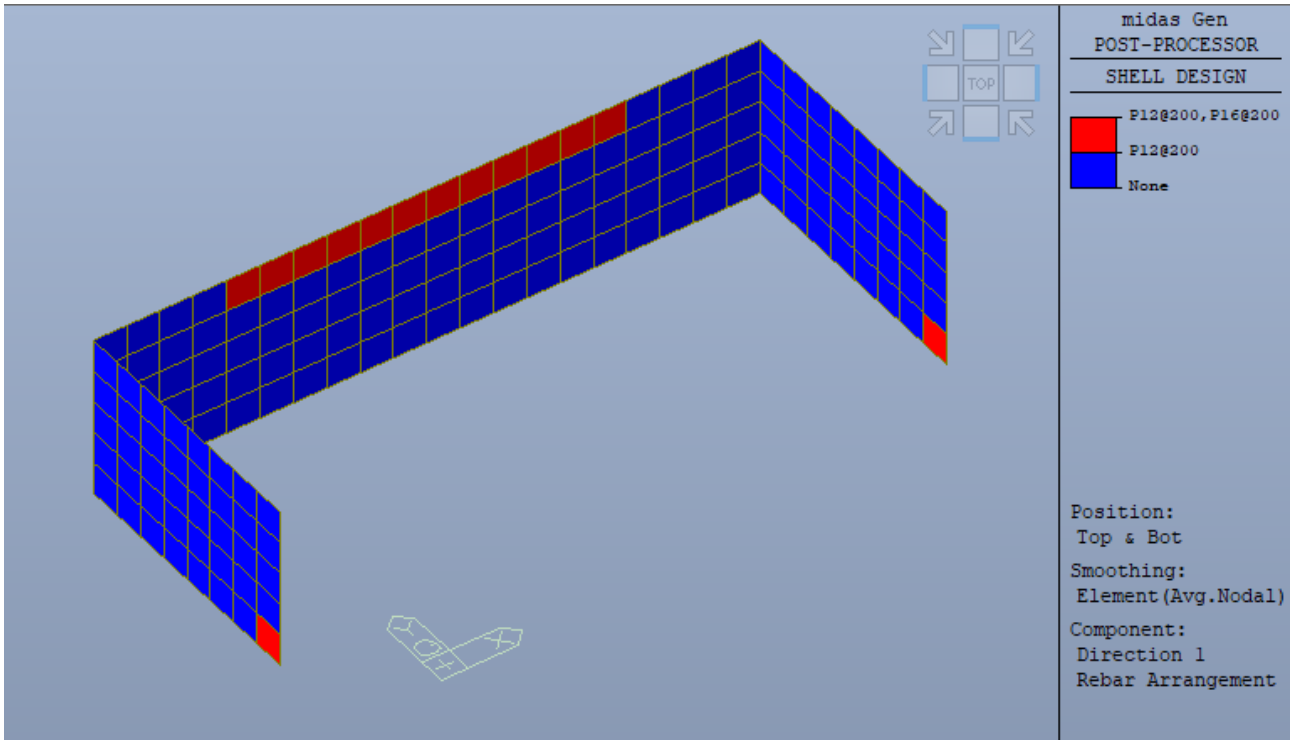
Platea camera valvole sp.40 – armature in direzione Y – ambo i lati



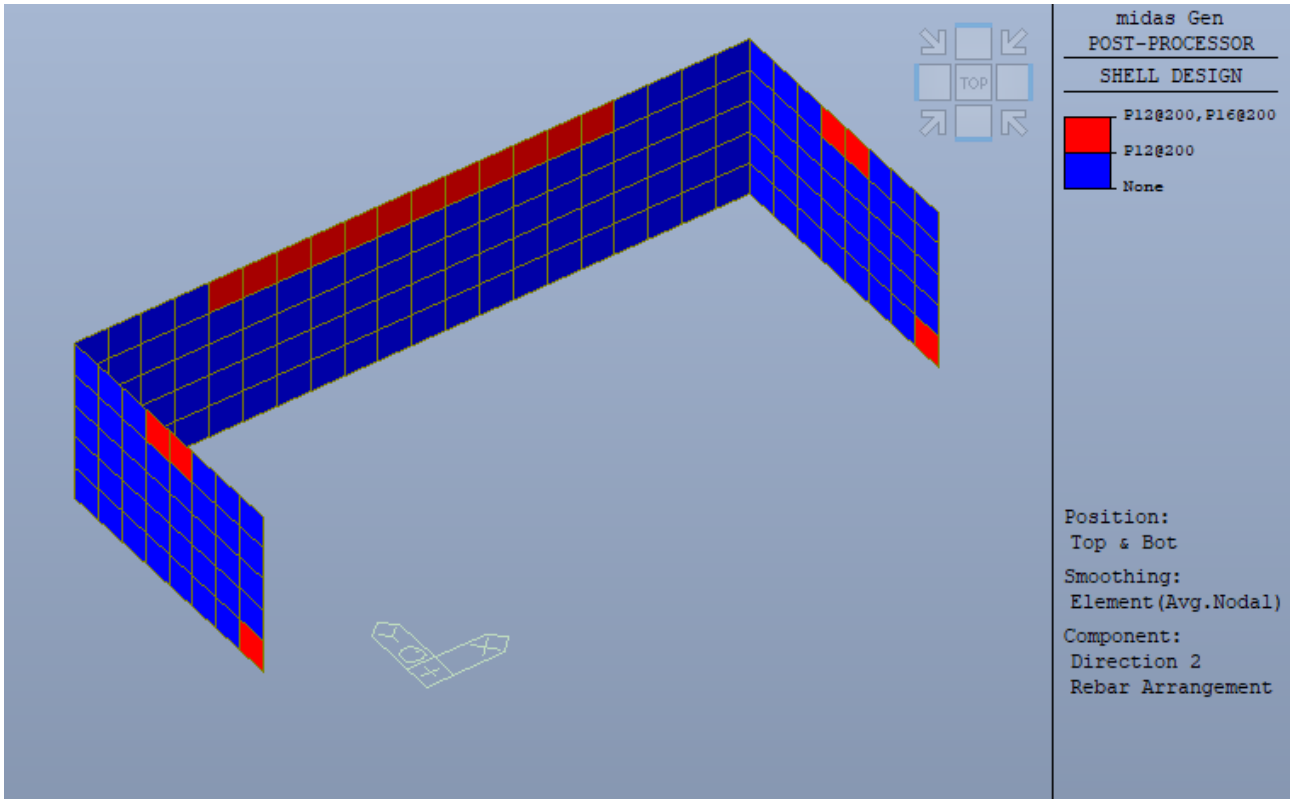
Pareti pompaggio sp.40 – armature in direzione orizzontale – ambo i lati



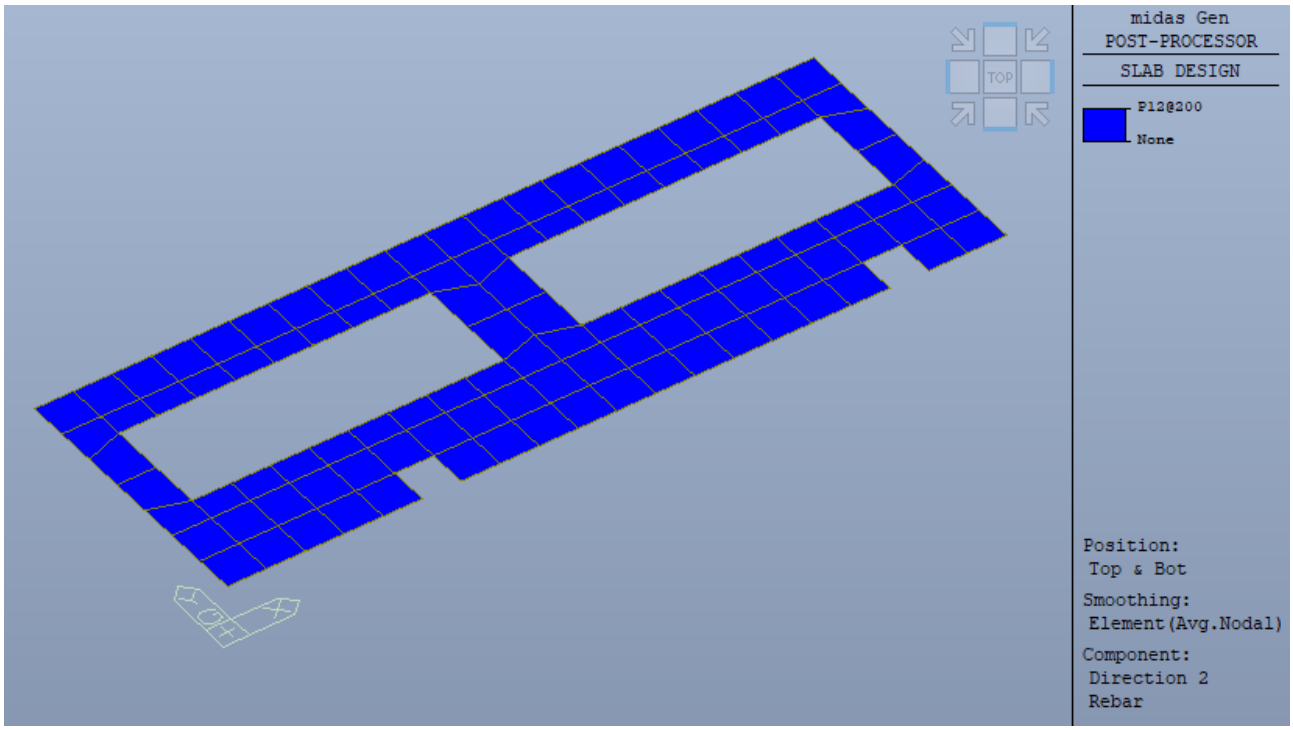
Pareti pompaggio sp.40 – armature in direzione verticale – ambo i lati



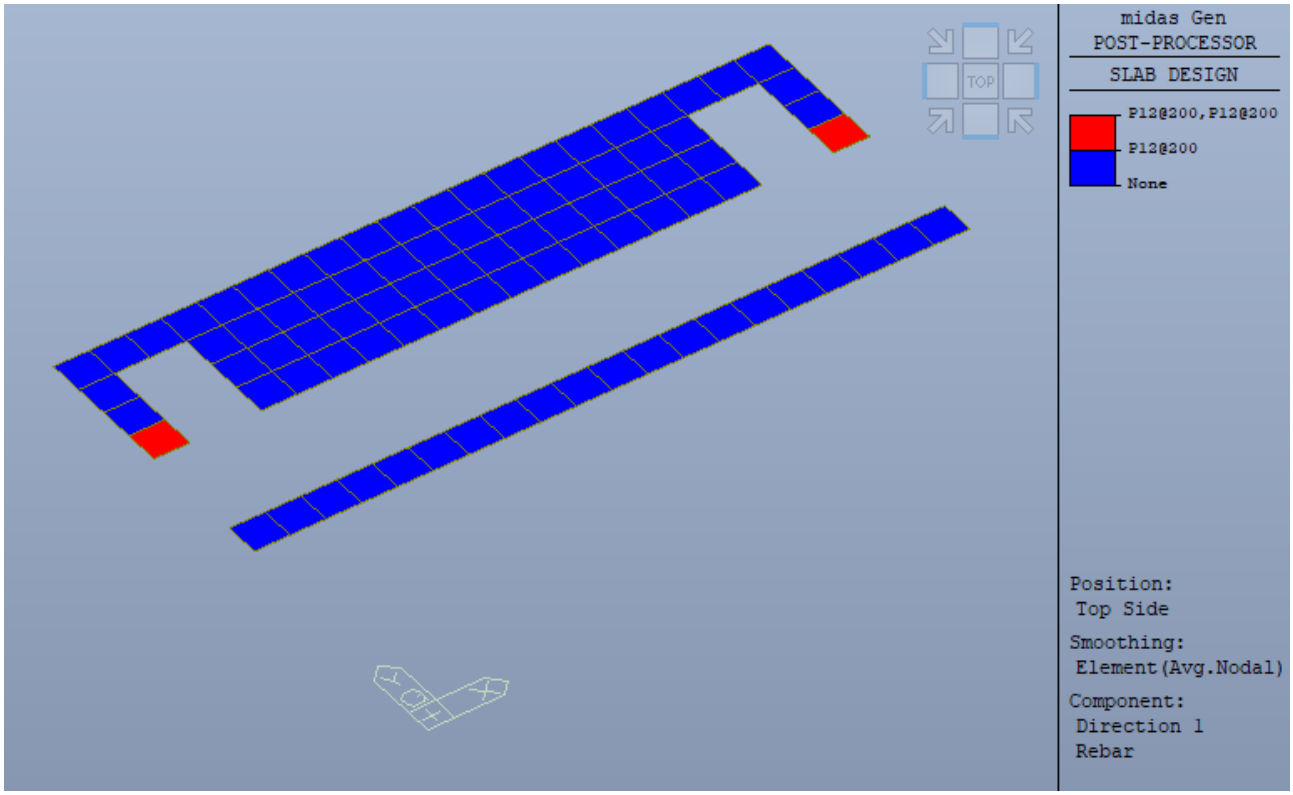
Pareti camera valvole sp.30 – armature in direzione orizzontale– ambo i lati



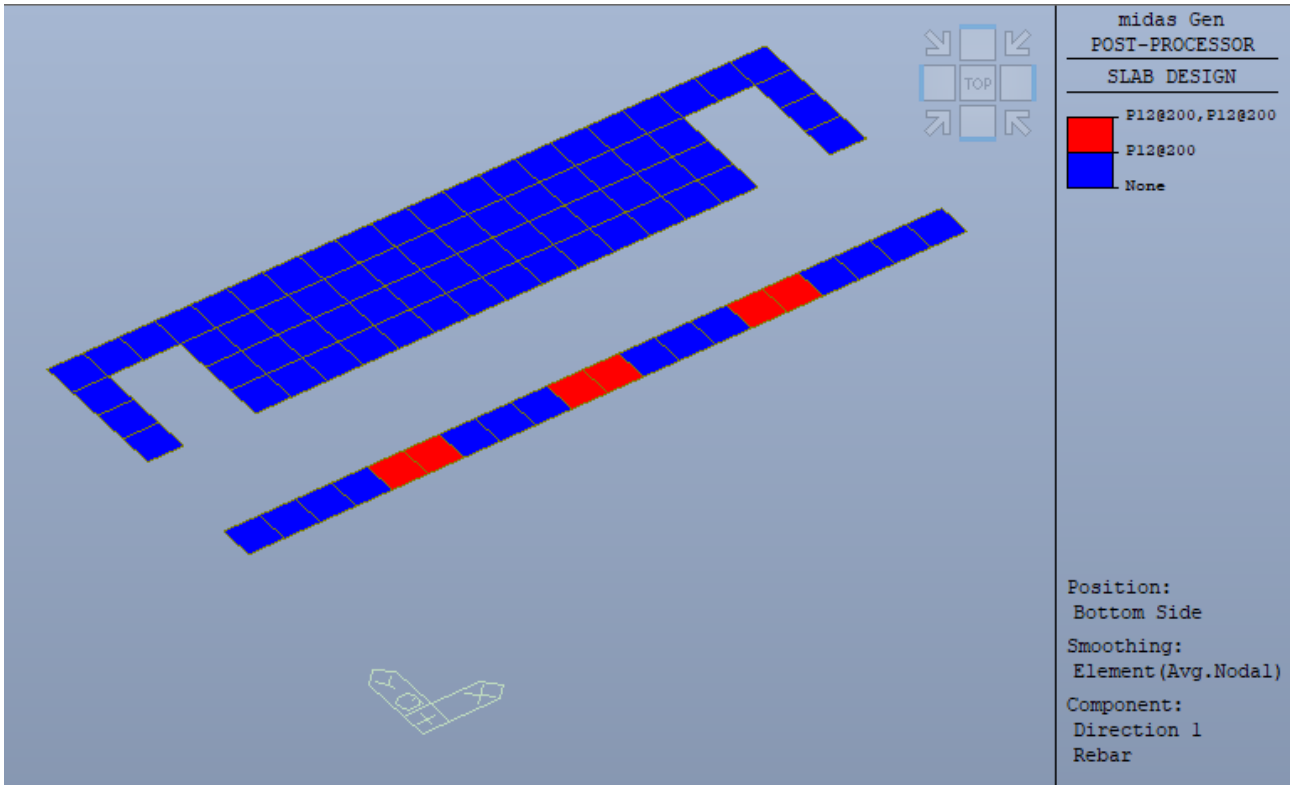
Pareti camera valvole sp.30 – armature in direzione verticale – ambo i lati



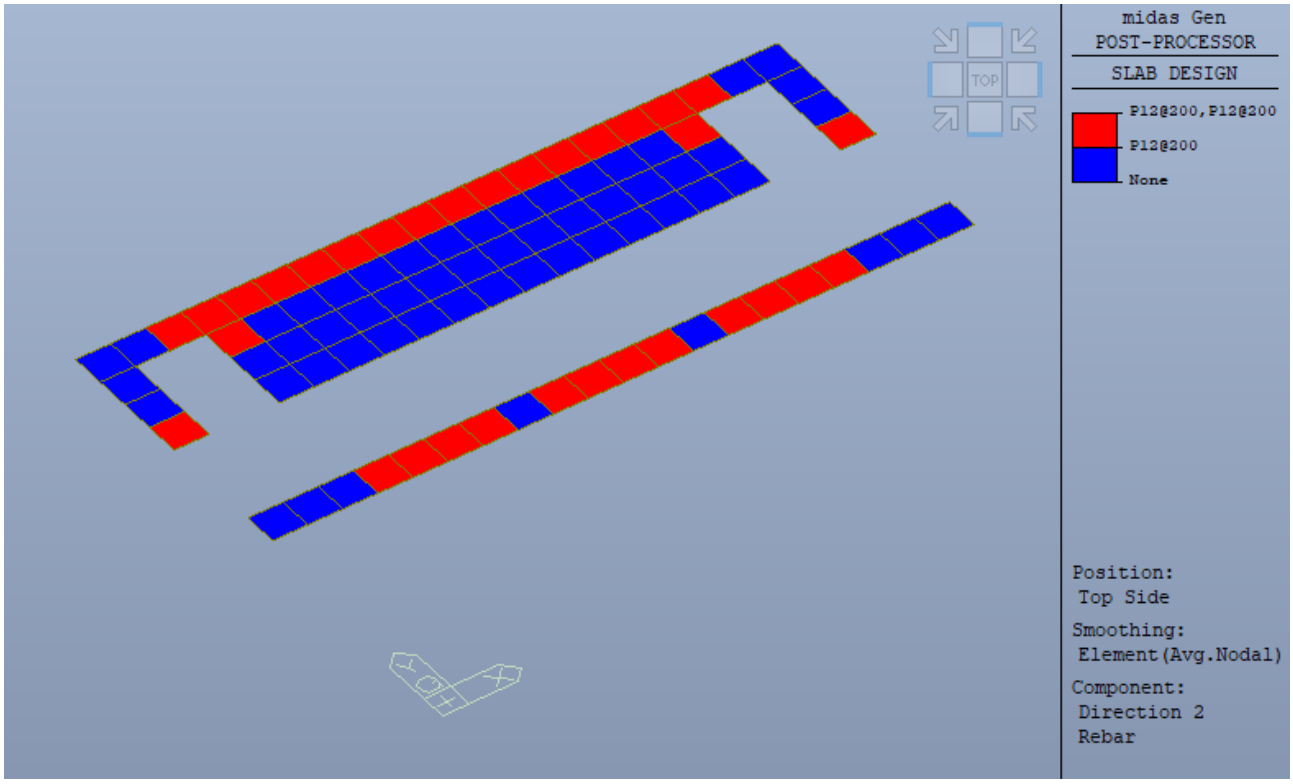
Soletta pompaggio sp.30 – armature in direzione X e Y – ambo i lati



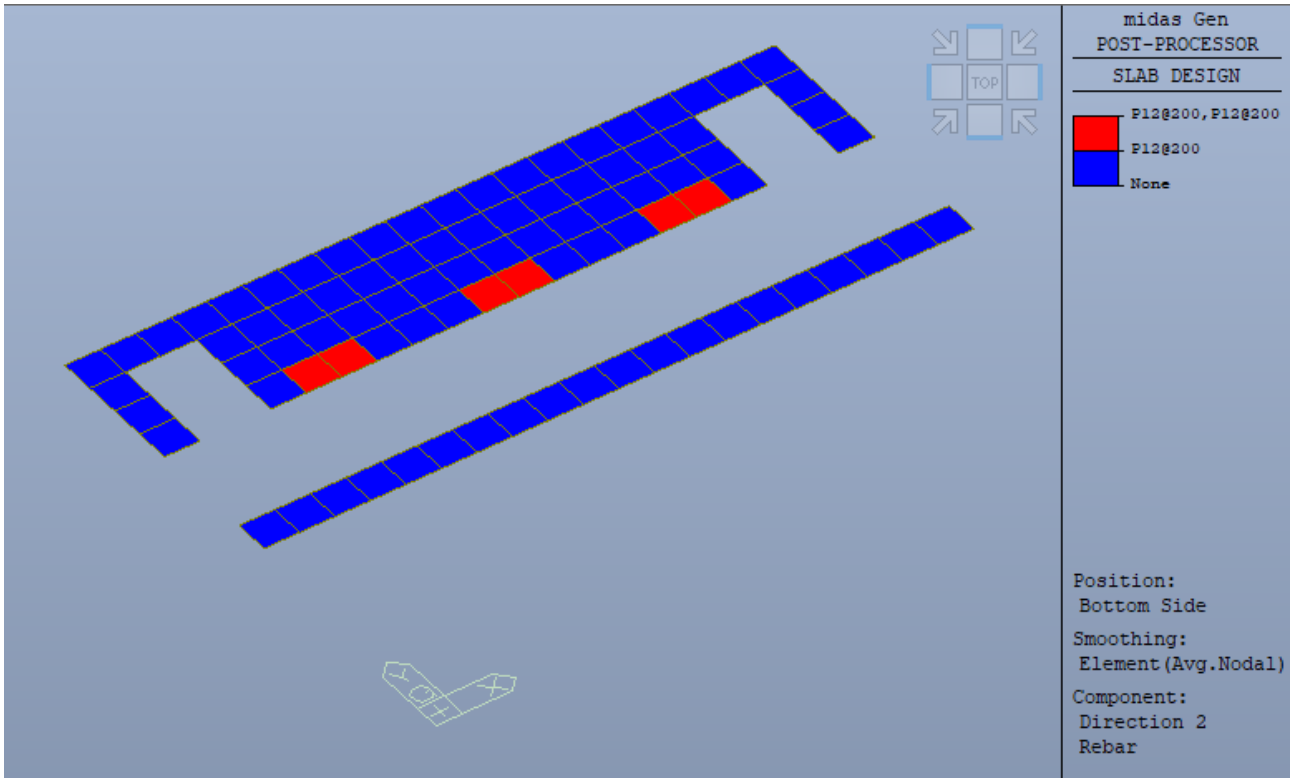
Soletta camera valvole sp.30 – armature in direzione X superiore – ambo i lati



Soletta camera valvole sp.30 – armature in direzione X inferiore – ambo i lati



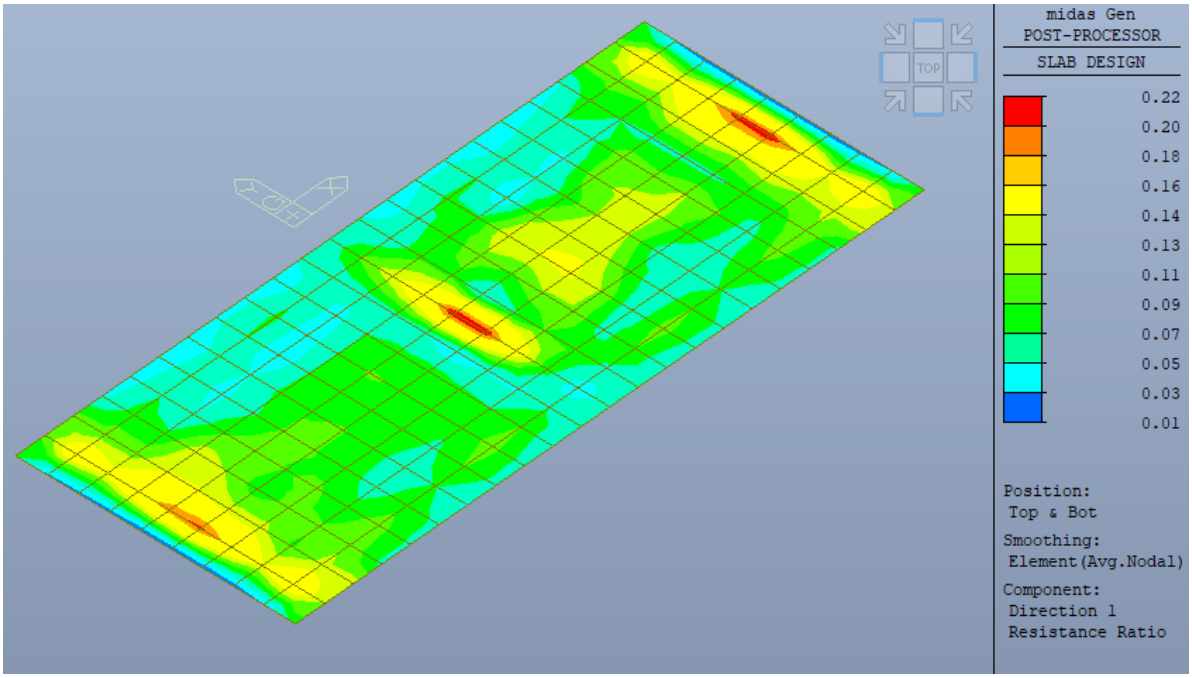
Soletta camera valvole sp.30 – armature in direzione Y superiore – ambo i lati



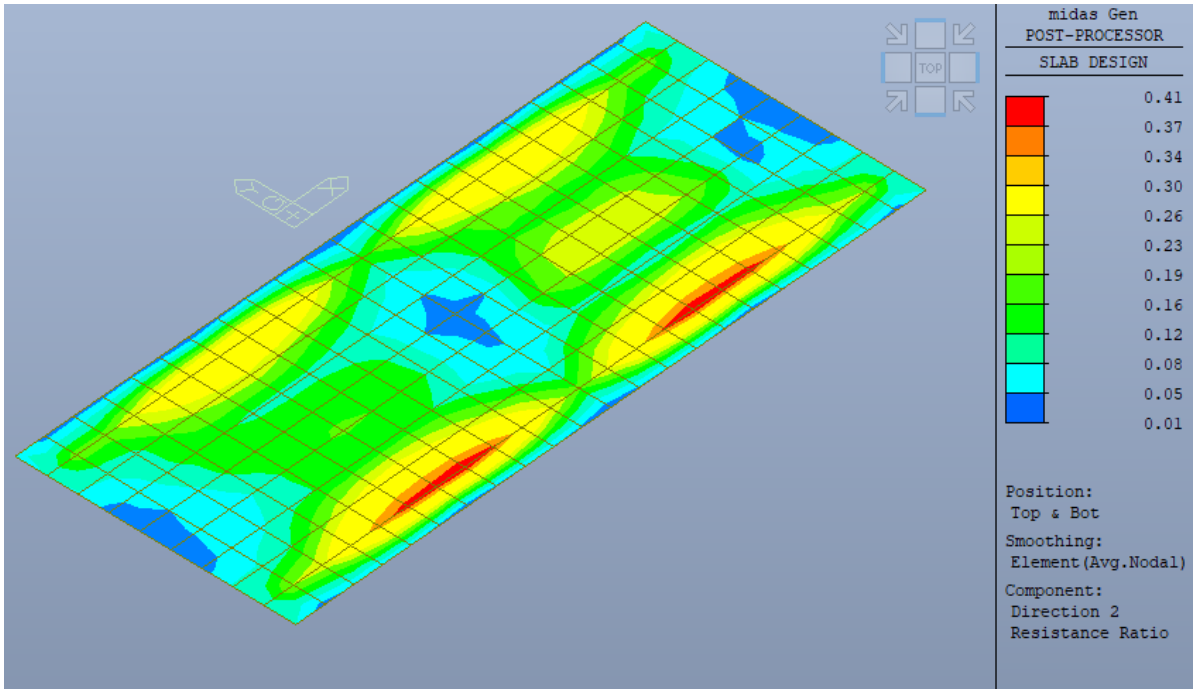
Soletta camera valvole sp.30 – armature in direzione Y inferiore – ambo i lati

1.7 Verifiche di resistenza SLU grafiche

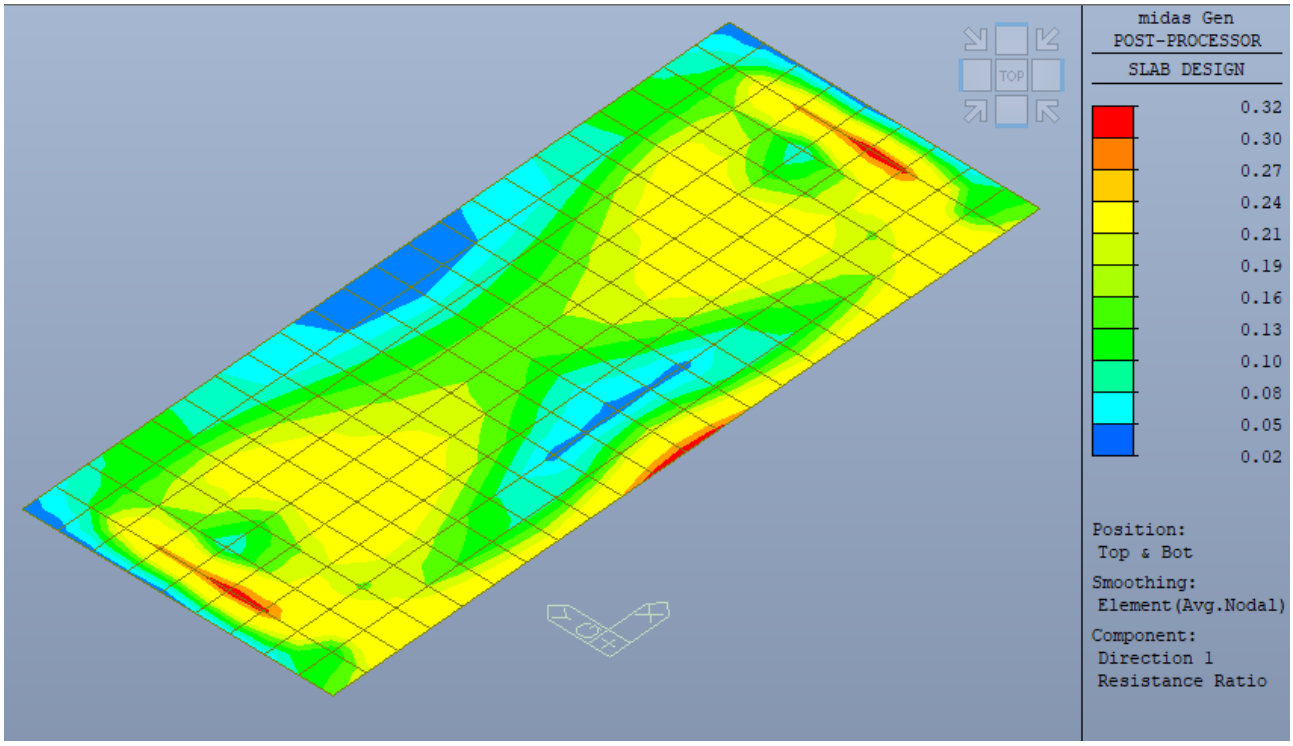
Nelle immagini seguenti vengono riportate le verifiche strutturali per via grafica, come tassi di sfruttamento dell'armatura nelle sezioni di cemento armato, sia per le sollecitazioni flessionali che taglianti:



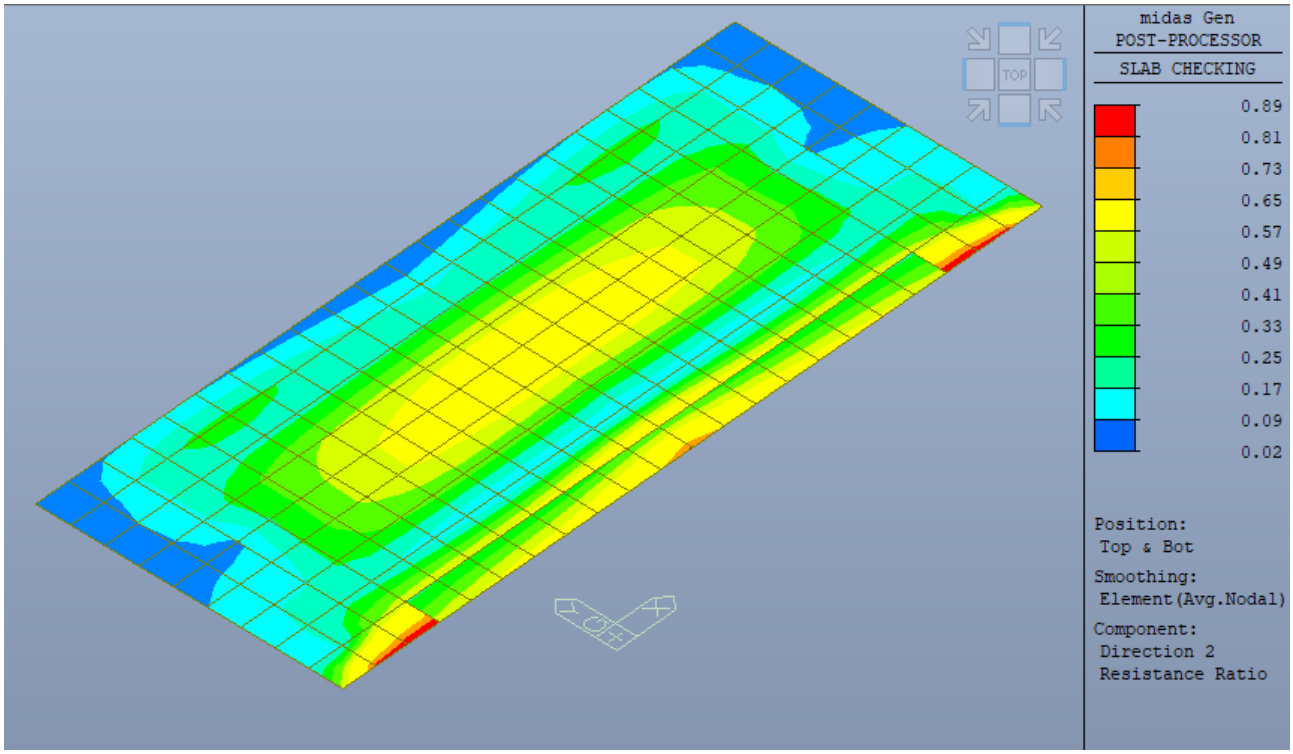
Platea pompaggio sp.40 - Indici di resistenza a flessione direzione X (inviluppo SLU e SLV)



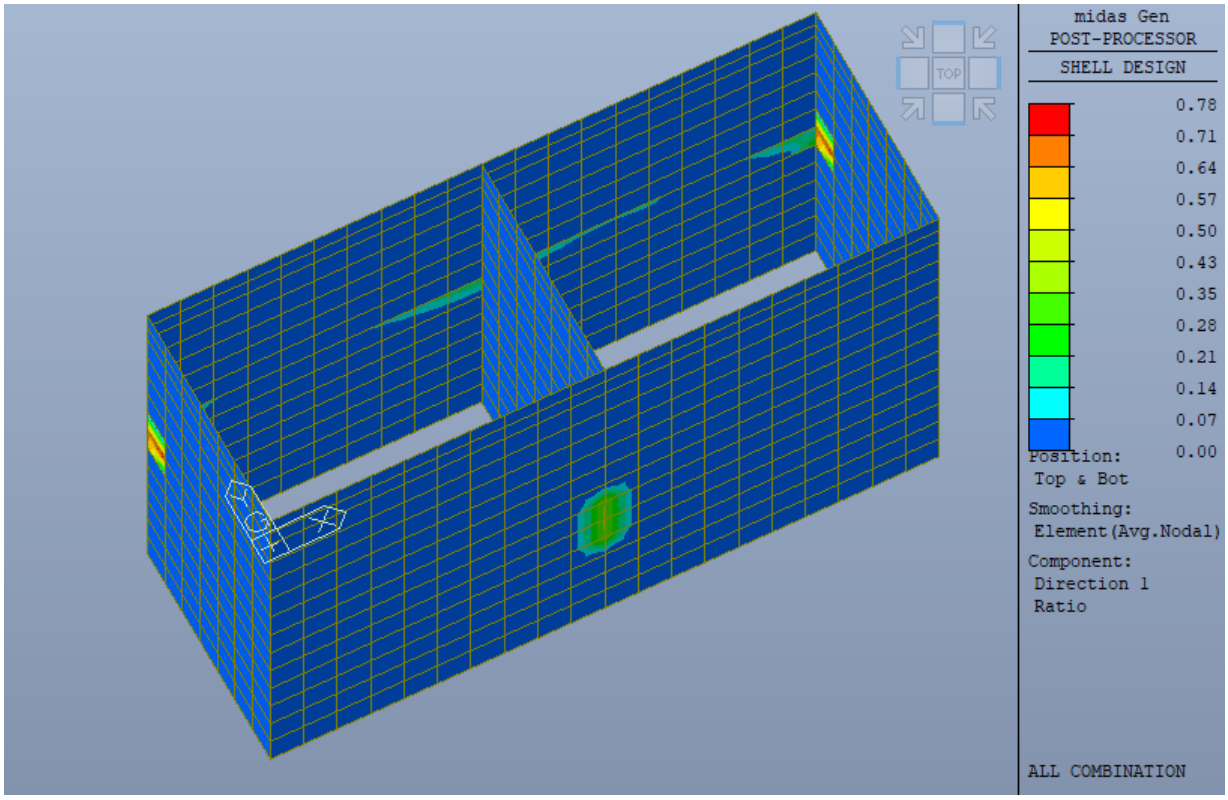
Platea pompaggio sp.40 - Indici di resistenza a flessione direzione Y (inviluppo SLU e SLV)



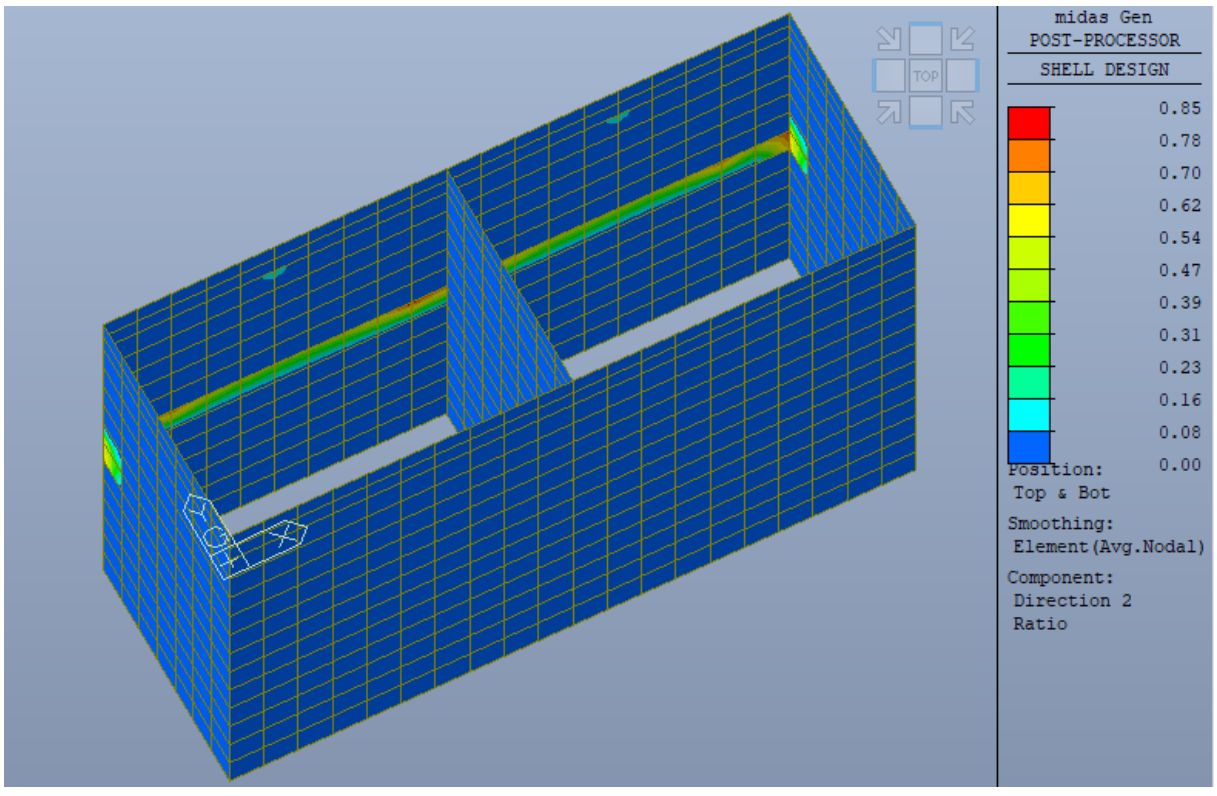
Platea camera valvole sp.40 - Indici di resistenza a flessione direzione X (inviluppo SLU e SLV)



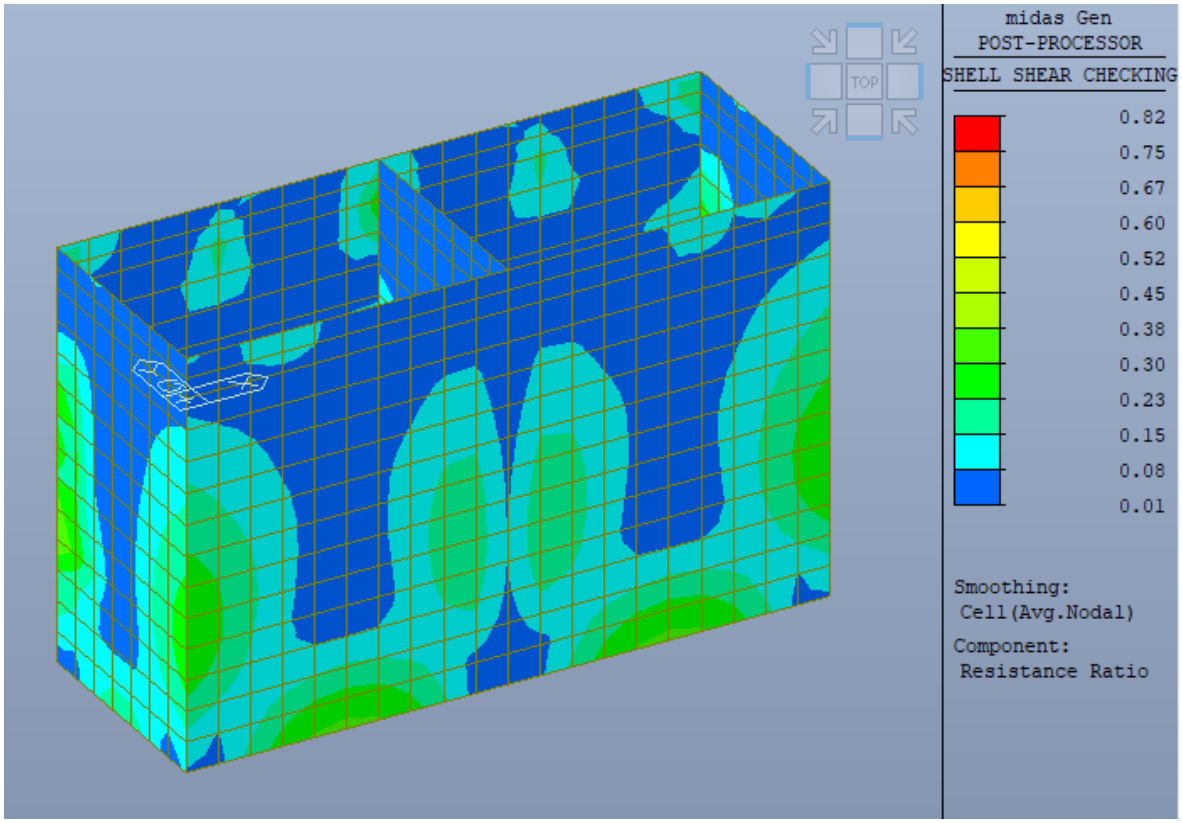
Platea camera valvole sp.40 - Indici di resistenza a flessione direzione Y (inviluppo SLU e SLV)



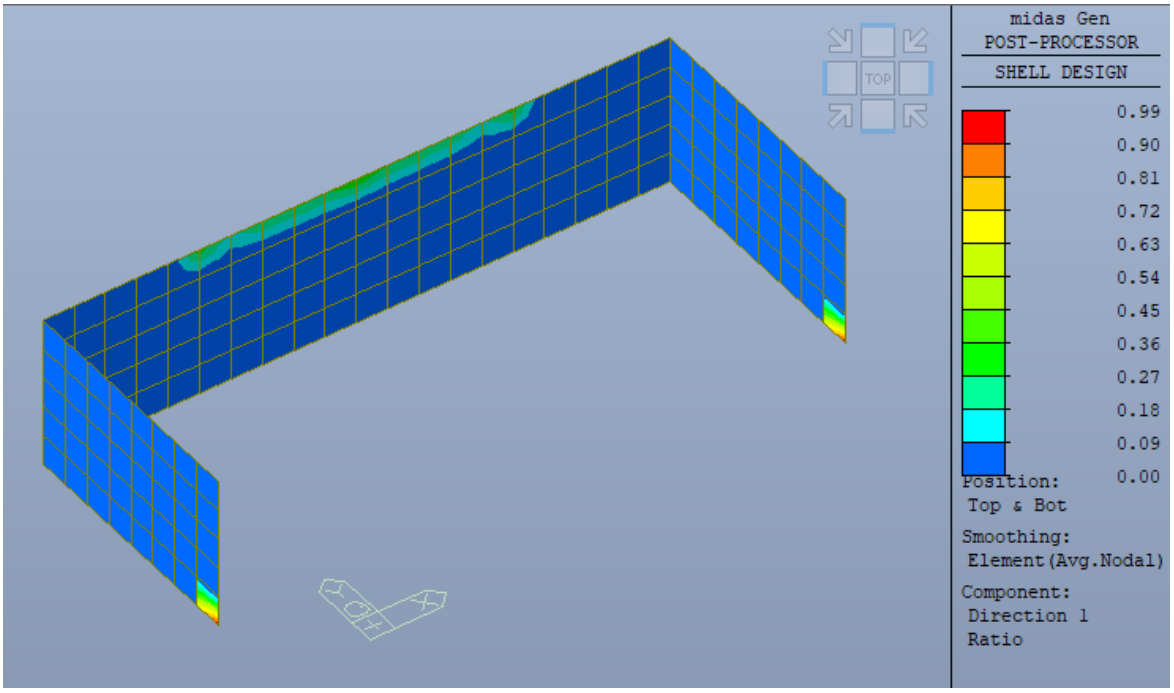
Pareti pompaggio sp.40 - Indici di resistenza a pressoflessione direzione orizzontale (inviluppo SLU e SLV)



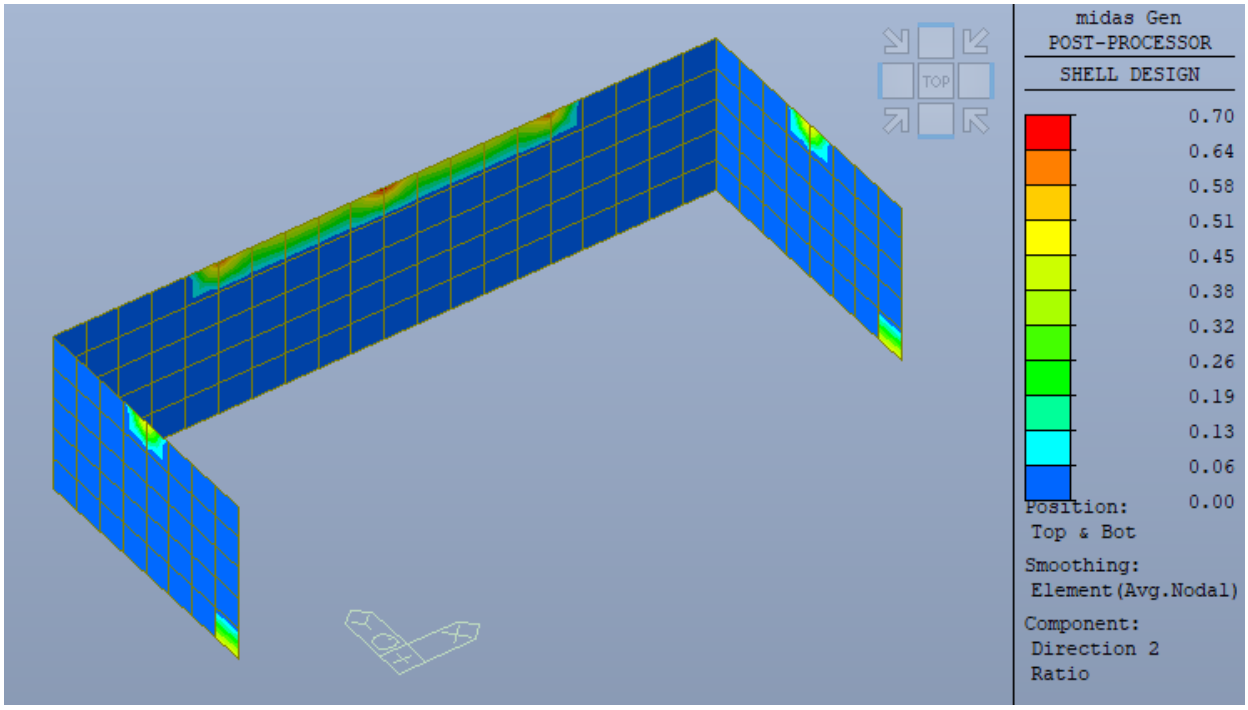
Pareti pompaggio sp.40 - Indici di resistenza a pressoflessione direzione verticale (inviluppo SLU e SLV)



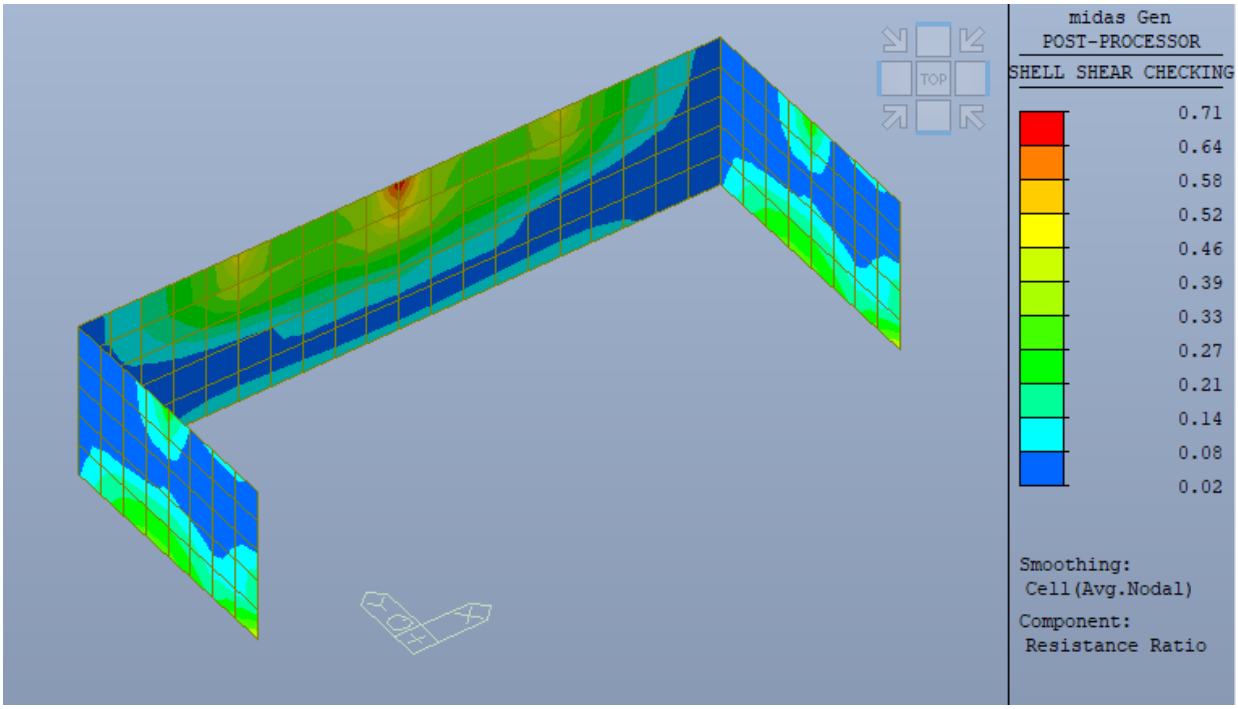
Pareti pompaggio sp.40 - Indici di resistenza a taglio (inviluppo SLU e SLV)



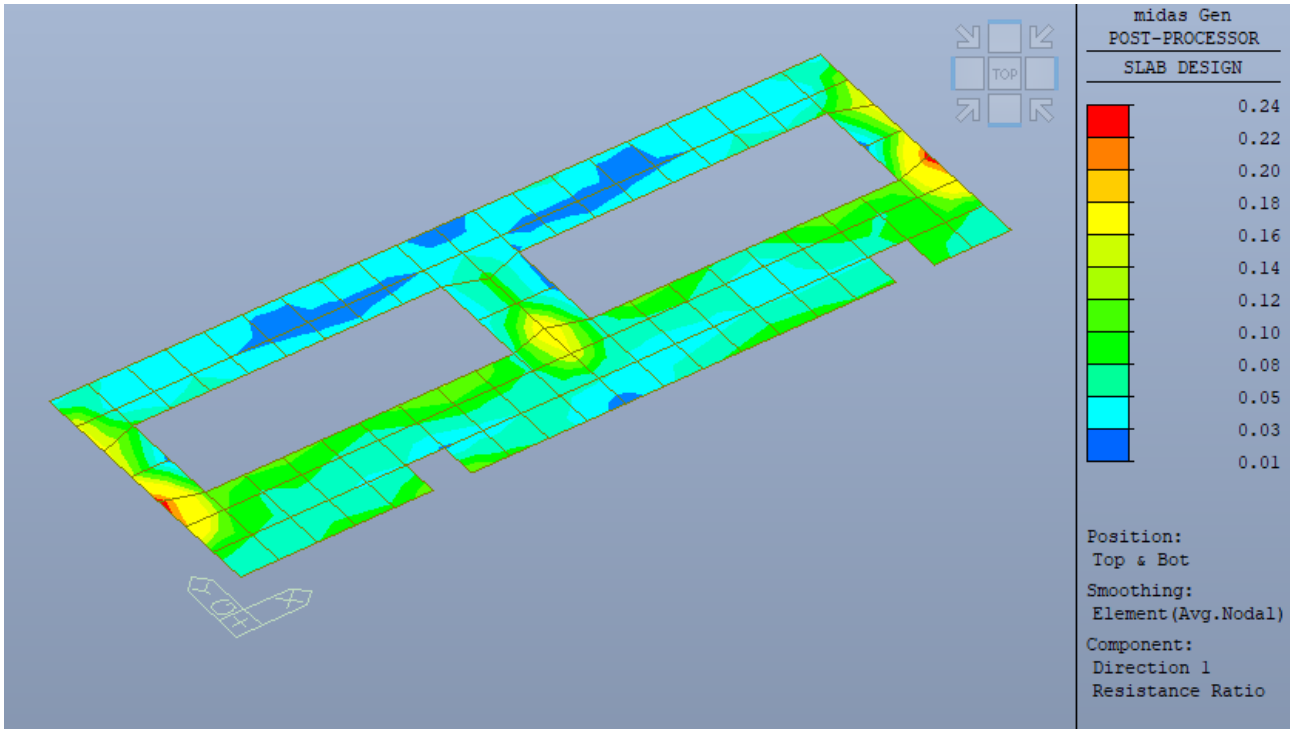
Pareti camera valvole sp.30 - Indici di resistenza a pressoflessione direzione orizzontale (inviluppo SLU e SLV)



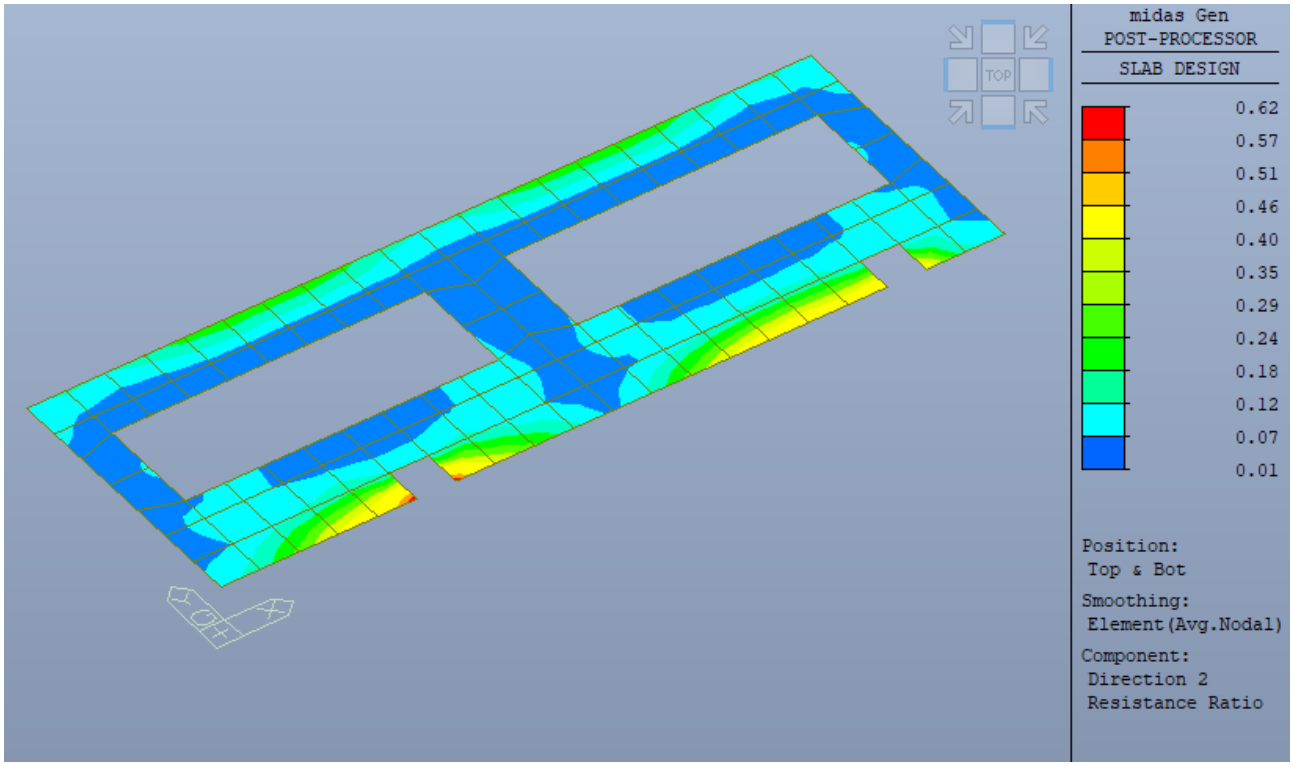
Pareti camera valvole sp.30 - Indici di resistenza a pressoflessione direzione verticale (inviluppo SLU e SLV)



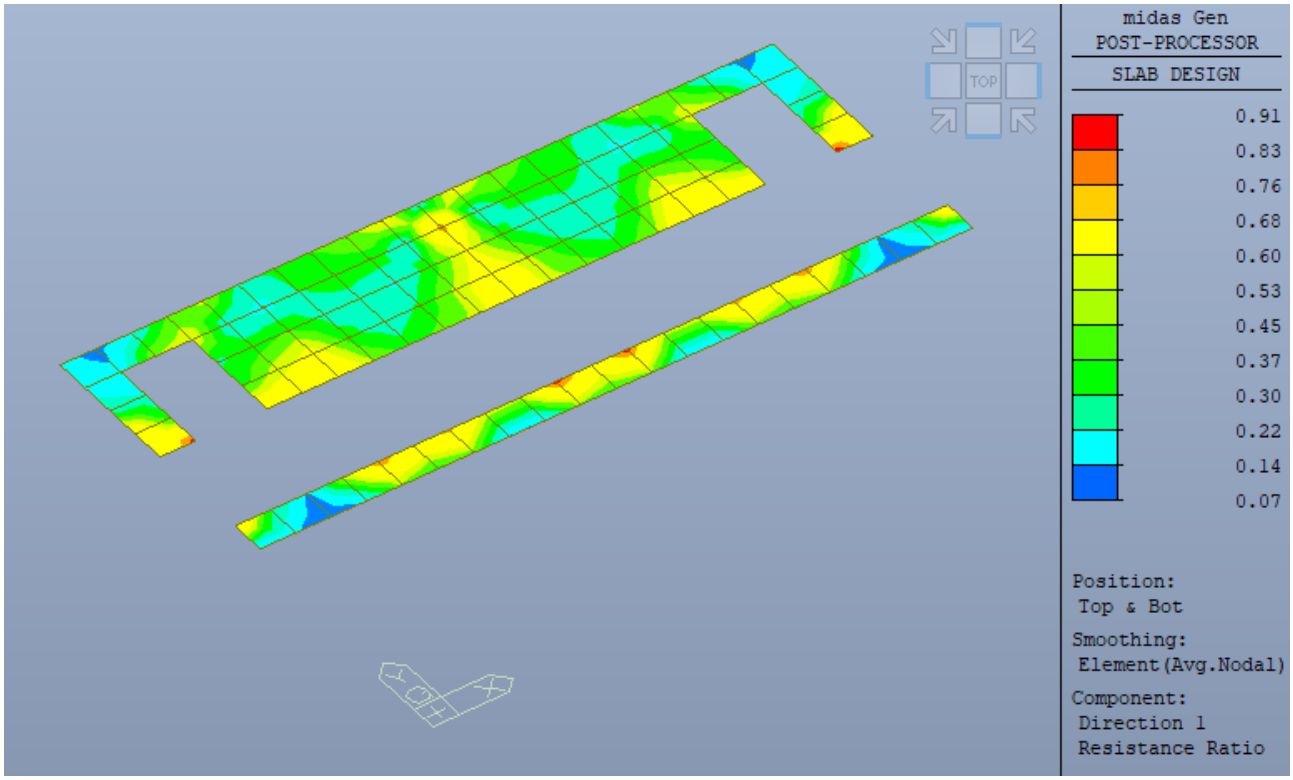
Pareti camera valvole sp.30 - Indici di resistenza a taglio (inviluppo SLU e SLV)



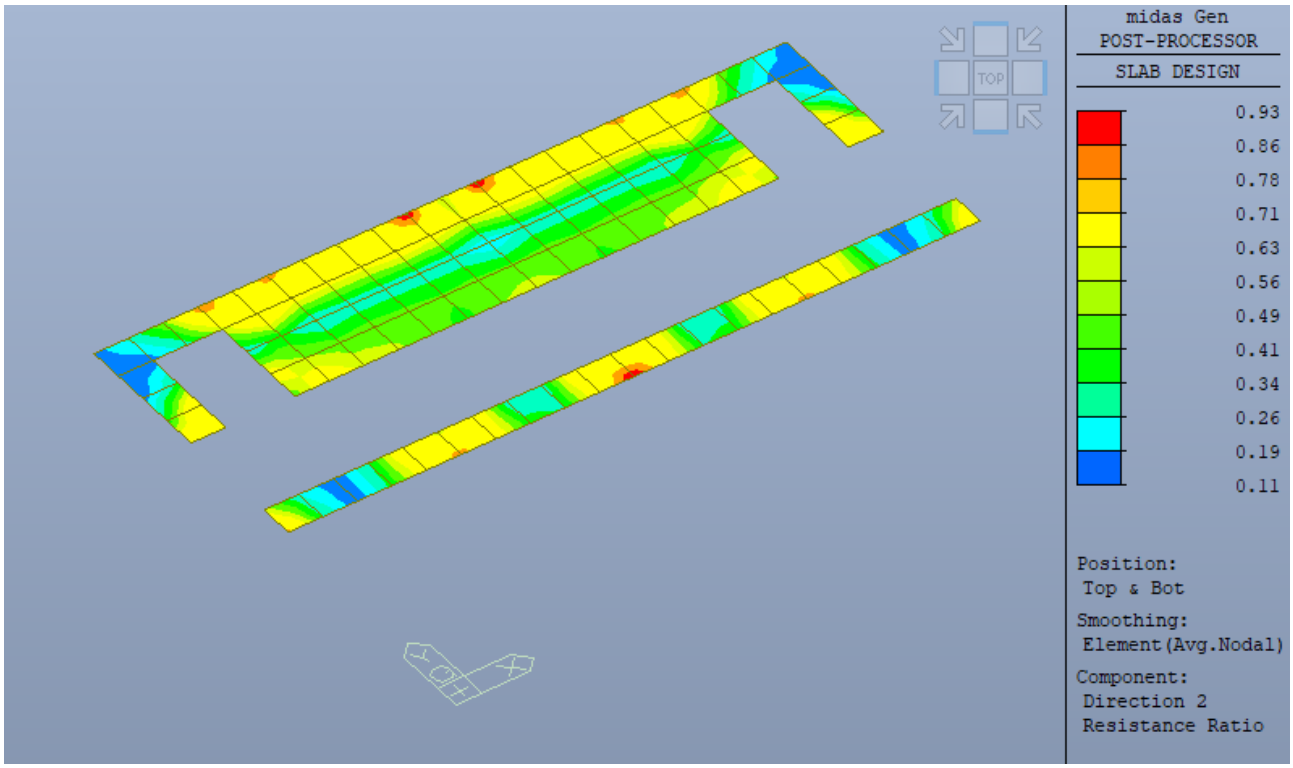
Soletta pompaggio sp.30 - Indici di resistenza a flessione direzione X (inviluppo SLU e SLV)



Soletta pompaggio sp.30 - Indici di resistenza a flessione direzione Y (inviluppo SLU e SLV)



Soletta camera valvole sp.30 - Indici di resistenza a flessione direzione X (inviluppo SLU e SLV)



Soletta camera valvole sp.30 - Indici di resistenza a flessione direzione Y (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 a flessione Platea Pompaggio sp.40

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

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

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

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

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

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

 0.4000    181 BOT 0.0004 0.0008 | 22.6094(   2) 103.031 0.219  OK

         168 TOP 0.0004 0.0008 | 13.6085(   8) 103.031 0.132  OK

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


<< BOTTOM >>


-. Information of Parameters.

  Elem No.  : 181

  Thickness :   0.4000 m.

  Materials :  fck =  32000.0000 KPa.

               fcd =  21333.3333 KPa.

               fyk = 450000.0000 KPa.

  Covering  :  dB  =   0.0500 m.

               dT  =   0.0500 m.

  LCB No.   :   2


-. Information of Design.

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

  d       =   0.3500 m.

  lambda  =   0.800

  a       = lambda * x  =   0.014 m.
```

eta = 1.000

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

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

-. Information of Moments and Result.

Rein. Bar : P14 @200

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

M_Ed = 22.6094 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.219 < 1.0 ---> O.K !

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

x/d = 0.050

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

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

<< TOP >>

-. Information of Parameters.

Elem No. : 168

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. : 8

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

M_Ed = 13.6085 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.132 < 1.0 ---> O.K !

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

x/d = 0.050

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

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

==========

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

==========

Thk	Elem	POS	AsReq	AsUse	M_Ed(LCB)	M_Rd	Rat	CHK
0.4000	1493	BOT	0.0003	0.0008	39.3992(2)	96.8116	0.407	OK
	160	TOP	0.0003	0.0008	20.9104(13)	96.8116	0.216	OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1493

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

M_Ed = 39.3992 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.407 < 1.0 ---> O.K !

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

x/d = 0.053

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

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 160

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. : 13

-. 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 m^2/m. (0.0003 m^2/m.)

M_Ed = 20.9104 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.216 < 1.0 ---> O.K !

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

x/d = 0.053

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

x/d ratio = 0.053/ 0.450 = 0.119 ---> O.K

1.8.2 Verifiche a flessione Platea Camera Valvole sp.40

==========

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

==========

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

0.4000 722 BOT 0.0004 0.0008 | 33.2621(27) 103.031 0.323 OK

615 TOP 0.0004 0.0008 | 23.2736(19) 103.031 0.226 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 722

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. : 27

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

M_Ed = 33.2621 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.323 < 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

<< TOP >>

-. Information of Parameters.

Elem No. : 615

Thickness : 0.4000 m.

Materials : fck = 32000.0000 KPa.

fcd = 21333.3333 KPa.

fyk = 450000.0000 KPa.

Covering : dB = 0.0500 m.

dT = 0.0500 m.

LCB No. : 19

-. Information of Design.

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

d = 0.3500 m.

lambda = 0.800

a = lambda * x = 0.014 m.

eta = 1.000

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

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

-. Information of Moments and Result.

Rein. Bar : P14 @200

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

M_Ed = 23.2736 kN-m./m.

M_Rd = 103.0306 kN-m./m.

RatM = M_Ed / M_Rd = 0.226 < 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 Valvole, Dir 2.

==========

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

0.4000 722 BOT 0.0013 0.0015 | 156.407(27) 189.412 0.826 OK

718 TOP 0.0005 0.0008 | 55.7394(17) 96.8116 0.576 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 722

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. : 27

-. 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 = 0.0013 m^2/m. (0.0013 m^2/m.)

M_Ed = 156.4067 kN-m./m.

M_Rd = 189.4116 kN-m./m.

RatM = M_Ed / M_Rd = 0.826 < 1.0 ---> O.K !

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

x/d = 0.094

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

x/d ratio = 0.094/ 0.450 = 0.208 ---> O.K

<< TOP >>

-. Information of Parameters.

Elem No. : 718

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. : 17

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

M_Ed = 55.7394 kN-m./m.

M_Rd = 96.8116 kN-m./m.

RatM = M_Ed / M_Rd = 0.576 < 1.0 ---> O.K !

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

x/d = 0.033

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

x/d ratio = 0.033/ 0.450 = 0.074 ---> O.K

1.8.3 Verifiche a pressoflessione Pareti pompaggio sp.40

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 5.

==========

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 34

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4652.7531 KPa.

-. Sig2 = Sig,min = 863.7944 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.3725

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.5434$$

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

( ). Membrane forces.

-. NEdx = 668.3129 kN/m.

-. NEdy = 303.4683 kN/m.

-. NEdxy = 44.3591 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 8888.0840 KPa.

-. f'tdy = 4287.8465 KPa.

-. Sigcd = 1108.9771 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0045

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0022

-. Asx,req = 0.0018 m^2/m. (0.0018 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6536

-. Rat,bary = f'tdy/ftdy = 0.4939

-. Rat,conc = Sigcd/Sigcn = 0.1040

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6536 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 26

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3428.6572 KPa.

-. Sig2 = Sig,min = -1137.7475 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1723

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.1219$$

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

( ). Membrane forces.

-. NEdx = 222.7624 kN/m.

-. NEdy = 286.2109 kN/m.

-. NEdxy = 200.9770 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5354.2931 KPa.

-. f'tdy = 6095.7091 KPa.

-. Sigcd = 5024.4245 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6167

-. Rat,bary = f'tdy/ftdy = 0.7021

-. Rat,conc = Sigcd/Sigcn = 0.4710

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7021 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3372.1893 KPa.

-. Sig2 = Sig,min = -1210.0618 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1148

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1027$$

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

( ). Membrane forces.

-. NEdx = 222.1790 kN/m.

-. NEdy = 267.5835 kN/m.

-. NEdxy = 203.3697 kN/m.

---

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==========

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5376.5334 KPa.

-. f'tdy = 5892.5558 KPa.

-. Sigcd = 5084.2414 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6193

-. Rat,bary = f'tdy/ftdy = 0.6787

-. Rat,conc = Sigcd/Sigcn = 0.4766

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6787 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 34

-. LCB No. : 24

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4759.7764 KPa.

-. Sig2 = Sig,min = 1063.0989 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.2623

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.5807$$

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Membrane forces.

-. NEdx = 676.4922 kN/m.

-. NEdy = 326.9536 kN/m.

-. NEdxy = 87.6787 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 9573.8962 KPa.

-. f'tdy = 5261.2993 KPa.

-. Sigcd = 2191.9673 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0049

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0027

-. Asx,req = 0.0020 m^2/m. (0.0020 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7041

-. Rat,bary = f'tdy/ftdy = 0.6060

-. Rat,conc = Sigcd/Sigcn = 0.2055

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7041 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 26

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

-. Thickness : t = 0.4000 m.

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3428.6572 KPa.

-. Sig2 = Sig,min = -1137.7475 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1723

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1219

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 76.2386 kN/m.

-. NEdy = 273.7460 kN/m.

-. NEdxy = 209.3786 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3512.6634 KPa.

-. f'tdy = 6033.1973 KPa.

-. Sigcd = 5234.4646 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4046

-. Rat,bary = f'tdy/ftdy = 0.6949

-. Rat,conc = Sigcd/Sigcn = 0.4907

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6949 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 19

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3372.1893 KPa.

-. Sig2 = Sig,min = -1210.0618 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1148

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1027

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 74.1411 kN/m.

-. NEdy = 252.8555 kN/m.

-. NEdxy = 214.1865 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3546.9195 KPa.

-. f'tdy = 5832.3836 KPa.

-. Sigcd = 5354.6617 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4085

-. Rat,bary = f'tdy/ftdy = 0.6718

-. Rat,conc = Sigcd/Sigcn = 0.5020

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6718 ---> O.K.

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 1.

==========

---

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

( ). Information of Parameters.

-. Elem No. : 320

-. Node No. : 263

-. LCB No. : 2

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3339.6780 KPa.

-. Sig2 = Sig,min = 423.6119 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.4971

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1030$$

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

( ). Membrane forces.

-. NEdx = 261.1691 kN/m.

-. NEdy = 13.4895 kN/m.

-. NEdxy = -0.0517 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3240.8680 KPa.

-. f'tdy = 188.7967 KPa.

-. Sigcd = 1.2935 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0008 m^2/m. (0.0008 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3766.3043 KPa.

---

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==========

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.3733

-. Rat,bary = f'tdy/ftdy = 0.0501

-. Rat,conc = Sigcd/Sigcn = 0.0001

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3733 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 185

-. Node No. : 264

-. LCB No. : 2

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3250.8940 KPa.

-. Sig2 = Sig,min = 505.3076 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.4434

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.0742$$

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

( ). Membrane forces.

-. NEdx = 252.4208 kN/m.

-. NEdy = 18.6035 kN/m.

-. NEdxy = -0.0781 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3131.3393 KPa.

-. f'tdy = 260.4651 KPa.

-. Sigcd = 1.9534 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0008 m^2/m. (0.0008 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3766.3043 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.3607

-. Rat,bary = f'tdy/ftdy = 0.0692

-. Rat,conc = Sigcd/Sigcn = 0.0002

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3607 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 219

-. Node No. : 78

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 85.0857 KPa.

-. Sig2 = Sig,min = -6.4568 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5673

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.9723

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -6.2814 kN/m.

-. NEdy = -28.9617 kN/m.

-. NEdxy = 6.7592 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -245.3062 KPa.

-. alpha = 0.0808(the ratio between the two principal stress)

1+3.80*alpha

-. Sig,cdmax = 0.85fcd * ---------- 20289.3092 KPa.

(1+alpha)^2

-. Rat,con = Sig,min/Sig,cdmax = 0.012

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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

( ). Information of Parameters.

-. Elem No. : 219

-. Node No. : 78

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 85.0857 KPa.

-. Sig2 = Sig,min = -6.4568 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5673

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.9723

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -0.8045 kN/m.

-. NEdy = -1.4654 kN/m.

-. NEdxy = 3.5077 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -6.4568 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd =3.027e-04

---

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

( ). Information of Parameters.

-. Elem No. : 219

-. Node No. : 78

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 85.0857 KPa.

-. Sig2 = Sig,min = -6.4568 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5673

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.9723

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -0.8045 kN/m.

-. NEdy = -1.4654 kN/m.

-. NEdxy = 3.5077 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -6.4568 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd =3.027e-04

---

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

( ). Information of Parameters.

-. Elem No. : 219

-. Node No. : 78

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 85.0857 KPa.

-. Sig2 = Sig,min = -6.4568 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5673

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = -0.9723$$

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

( ). Membrane forces.

-. NEdx = -0.8045 kN/m.

-. NEdy = -1.4654 kN/m.

-. NEdxy = 3.5077 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -6.4568 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd =3.027e-0

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 2.

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

( ). Information of Parameters.

-. Elem No. : 493

-. Node No. : 446

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3592.3729 KPa.

-. Sig2 = Sig,min = 1951.5550 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.2615

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.2012

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 142.5983 kN/m.

-. NEdy = 299.8750 kN/m.

-. NEdxy = 45.5742 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2359.8418 KPa.

-. f'tdy = 4538.3222 KPa.

-. Sigcd = 1139.3557 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0023

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2718

-. Rat,bary = f'tdy/ftdy = 0.5227

-. Rat,conc = Sigcd/Sigcn = 0.1068

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5227 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 493

-. Node No. : 446

-. LCB No. : 26

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3681.9191 KPa.

-. Sig2 = Sig,min = 1944.2796 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.3982

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.2307$$

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

( ). Membrane forces.

-. NEdx = 143.3073 kN/m.

-. NEdy = 318.5813 kN/m.

-. NEdxy = 38.8026 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2285.5644 KPa.

-. f'tdy = 4683.9262 KPa.

-. Sigcd = 970.0646 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0024

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2633

-. Rat,bary = f'tdy/ftdy = 0.5395

-. Rat,conc = Sigcd/Sigcn = 0.0909

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5395 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 463

-. Node No. : 615

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 687.9814 KPa.

-. Sig2 = Sig,min = 71.5105 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5311

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.7743$$

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

( ). Membrane forces.

-. NEdx = 6.2073 kN/m.

-. NEdy = 57.3807 kN/m.

-. NEdxy = 10.0102 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -590.6832 KPa.

-. alpha = 0.1144(the ratio between the two principal stress)

$$\text{-. Sig,cdmax} = 0.85 f_{cd} * \frac{1+3.80*\text{alpha}}{(1+\text{alpha})^2} = 20949.0170 \text{ KPa.}$$

-. Rat,con = Sig,min/Sig,cdmax = 0.028

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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

( ). Information of Parameters.

-. Elem No. : 423

-. Node No. : 570

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 5034.9936 KPa.

-. Sig2 = Sig,min = 1600.7726 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.8721

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.6771

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 81.5058 kN/m.

-. NEdy = 183.0795 kN/m.

-. NEdxy = 47.6188 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 1636.7514 KPa.

-. f'tdy = 3216.4666 KPa.

-. Sigcd = 1190.4695 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0016

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0008 m^2/m. (0.0008 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3766.3043 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.1885

-. Rat,bary = f'tdy/ftdy = 0.8540

-. Rat,conc = Sigcd/Sigcn = 0.1116

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.8540 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 493

-. Node No. : 34

-. LCB No. : 24

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 7327.9003 KPa.

-. Sig2 = Sig,min = 905.0990 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5025

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 1.4424

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 52.0240 kN/m.

-. NEdy = 517.7850 kN/m.

-. NEdxy = 2.6526 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 672.9948 KPa.

-. f'tdy = 7185.1104 KPa.

-. Sigcd = 66.3154 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0037

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

-. Asy,req = 0.0015 m^2/m. (0.0015 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0775

-. Rat,bary = f'tdy/ftdy = 0.8276

-. Rat,conc = Sigcd/Sigcn = 0.0062

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.8276 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 463

-. Node No. : 615

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 687.9814 KPa.

-. Sig2 = Sig,min = 71.5105 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5311

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.7743

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -5.7780 kN/m.

-. NEdy = -45.1244 kN/m.

-. NEdxy = 6.8168 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

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

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[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 3.

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

( ). Information of Parameters.

-. Elem No. : 817

-. Node No. : 35

-. LCB No. : 23

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3545.3733 KPa.

-. Sig2 = Sig,min = 1015.2125 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.0211

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.1763$$

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

( ). Membrane forces.

-. NEdx = 674.1481 kN/m.

-. NEdy = 328.4466 kN/m.

-. NEdxy = 87.1529 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 9538.0577 KPa.

-. f'tdy = 5274.8792 KPa.

-. Sigcd = 2178.8229 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0049

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0027

-. Asx,req = 0.0020 m^2/m. (0.0020 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7014

-. Rat,bary = f'tdy/ftdy = 0.6076

-. Rat,conc = Sigcd/Sigcn = 0.2043

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7014 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 23

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3424.6121 KPa.

-. Sig2 = Sig,min = -1134.2830 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1736

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.1206$$

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

( ). Membrane forces.

-. NEdx = 76.1202 kN/m.

-. NEdy = 273.9201 kN/m.

-. NEdxy = 208.8835 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3505.0208 KPa.

-. f'tdy = 6029.1838 KPa.

-. Sigcd = 5222.0874 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4037

-. Rat,bary = f'tdy/ftdy = 0.6944

-. Rat,conc = Sigcd/Sigcn = 0.4896

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6944 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 28

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3366.5134 KPa.

-. Sig2 = Sig,min = -1199.5357 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1202

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1008

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 74.0449 kN/m.

-. NEdy = 254.0965 kN/m.

-. NEdxy = 212.8319 kN/m.

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3528.8998 KPa.

-. f'tdy = 5831.1058 KPa.

-. Sigcd = 5320.7964 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4065

-. Rat,bary = f'tdy/ftdy = 0.6716

-. Rat,conc = Sigcd/Sigcn = 0.4988

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6716 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 817

-. Node No. : 35

-. LCB No. : 28

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3528.4051 KPa.

-. Sig2 = Sig,min = 959.5242 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.0827

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1702$$

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Membrane forces.

-. NEdx = 666.0059 kN/m.

-. NEdy = 304.0426 kN/m.

-. NEdxy = 43.7088 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 8851.0752 KPa.

-. f'tdy = 4285.4114 KPa.

-. Sigcd = 1092.7189 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0045

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0022

-. Asx,req = 0.0018 m^2/m. (0.0018 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6509

-. Rat,bary = f'tdy/ftdy = 0.4936

-. Rat,conc = Sigcd/Sigcn = 0.1024

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6509 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 23

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

-. Thickness : t = 0.4000 m.

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

---

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==========

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3424.6121 KPa.

-. Sig2 = Sig,min = -1134.2830 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1736

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1206

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 222.5467 kN/m.

-. NEdy = 286.3484 kN/m.

-. NEdxy = 200.5193 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5345.8514 KPa.

-. f'tdy = 6091.7080 KPa.

-. Sigcd = 5012.9829 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6157

-. Rat,bary = f'tdy/ftdy = 0.7016

-. Rat,conc = Sigcd/Sigcn = 0.4700

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7016 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 28

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==========

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3366.5134 KPa.

-. Sig2 = Sig,min = -1199.5357 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1202

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1008$$

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

( ). Membrane forces.

-. NEdx = 221.7038 kN/m.

-. NEdy = 268.6236 kN/m.

-. NEdxy = 202.1167 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5354.8164 KPa.

-. f'tdy = 5889.7514 KPa.

-. Sigcd = 5052.9179 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6168

-. Rat,bary = f'tdy/ftdy = 0.6784

-. Rat,conc = Sigcd/Sigcn = 0.4737

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6784 ---> O.K.

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 4.

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.8143 kN/m.

-. NEdy = 2.4110 kN/m.

-. NEdxy = 69.4768 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -374.1518 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.018

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

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( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8545

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 4.8143 kN/m.

-. NEdy = 2.4110 kN/m.

-. NEdxy = 69.4768 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -374.1518 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.018

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.8143 kN/m.

-. NEdy = 2.4110 kN/m.

-. NEdxy = 69.4768 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -374.1518 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.018

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8545

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 4.7640 kN/m.

-. NEdy = 2.4084 kN/m.

-. NEdxy = 69.5362 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -373.2052 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.7640 kN/m.

-. NEdy = 2.4084 kN/m.

-. NEdxy = 69.5362 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -373.2052 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.7640 kN/m.

-. NEdy = 2.4084 kN/m.

-. NEdxy = 69.5362 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -373.2052 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 5.

==========

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 34

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4652.7531 KPa.

-. Sig2 = Sig,min = 863.7944 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.3725

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.5434

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 668.3129 kN/m.

-. NEdy = 303.4683 kN/m.

-. NEdxy = 44.3591 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 8888.0840 KPa.

-. f'tdy = 4287.8465 KPa.

-. Sigcd = 1108.9771 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0045

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0022

-. Asx,req = 0.0018 m^2/m. (0.0018 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

---

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6536

-. Rat,bary = f'tdy/ftdy = 0.4939

-. Rat,conc = Sigcd/Sigcn = 0.1040

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6536 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 26

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3428.6572 KPa.

-. Sig2 = Sig,min = -1137.7475 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1723

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1219

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 222.7624 kN/m.

-. NEdy = 286.2109 kN/m.

-. NEdxy = 200.9770 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5354.2931 KPa.

-. f'tdy = 6095.7091 KPa.

-. Sigcd = 5024.4245 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6167

-. Rat,bary = f'tdy/ftdy = 0.7021

-. Rat,conc = Sigcd/Sigcn = 0.4710

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7021 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3372.1893 KPa.

-. Sig2 = Sig,min = -1210.0618 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1148

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1027

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 222.1790 kN/m.

-. NEdy = 267.5835 kN/m.

-. NEdxy = 203.3697 kN/m.

---

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( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5376.5334 KPa.

-. f'tdy = 5892.5558 KPa.

-. Sigcd = 5084.2414 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6193

-. Rat,bary = f'tdy/ftdy = 0.6787

-. Rat,conc = Sigcd/Sigcn = 0.4766

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6787 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 34

-. LCB No. : 24

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4759.7764 KPa.

-. Sig2 = Sig,min = 1063.0989 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.2623

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.5807$$

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

---

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( ). Membrane forces.

-. NEdx = 676.4922 kN/m.

-. NEdy = 326.9536 kN/m.

-. NEdxy = 87.6787 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 9573.8962 KPa.

-. f'tdy = 5261.2993 KPa.

-. Sigcd = 2191.9673 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0049

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0027

-. Asx,req = 0.0020 m^2/m. (0.0020 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7041

-. Rat,bary = f'tdy/ftdy = 0.6060

-. Rat,conc = Sigcd/Sigcn = 0.2055

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7041 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 26

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

-. Thickness : t = 0.4000 m.

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

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( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3428.6572 KPa.

-. Sig2 = Sig,min = -1137.7475 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1723

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1219

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 76.2386 kN/m.

-. NEdy = 273.7460 kN/m.

-. NEdxy = 209.3786 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3512.6634 KPa.

-. f'tdy = 6033.1973 KPa.

-. Sigcd = 5234.4646 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4046

-. Rat,bary = f'tdy/ftdy = 0.6949

-. Rat,conc = Sigcd/Sigcn = 0.4907

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6949 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 367

-. Node No. : 446

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3372.1893 KPa.

-. Sig2 = Sig,min = -1210.0618 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1148

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.1027$$

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

( ). Membrane forces.

-. NEdx = 74.1411 kN/m.

-. NEdy = 252.8555 kN/m.

-. NEdxy = 214.1865 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3546.9195 KPa.

-. f'tdy = 5832.3836 KPa.

-. Sigcd = 5354.6617 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4085

-. Rat,bary = f'tdy/ftdy = 0.6718

-. Rat,conc = Sigcd/Sigcn = 0.5020

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6718 ---> O.K.

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 2.

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

( ). Information of Parameters.

-. Elem No. : 493

-. Node No. : 446

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3592.3729 KPa.

-. Sig2 = Sig,min = 1951.5550 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.2615

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.2012$$

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

( ). Membrane forces.

-. NEdx = 142.5983 kN/m.

-. NEdy = 299.8750 kN/m.

-. NEdxy = 45.5742 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2359.8418 KPa.

-. f'tdy = 4538.3222 KPa.

-. Sigcd = 1139.3557 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0023

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2718

-. Rat,bary = f'tdy/ftdy = 0.5227

-. Rat,conc = Sigcd/Sigcn = 0.1068

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5227 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 493

-. Node No. : 446

-. LCB No. : 26

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3681.9191 KPa.

-. Sig2 = Sig,min = 1944.2796 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.3982

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.2307$$

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

( ). Membrane forces.

-. NEdx = 143.3073 kN/m.

-. NEdy = 318.5813 kN/m.

-. NEdxy = 38.8026 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2285.5644 KPa.

-. f'tdy = 4683.9262 KPa.

-. Sigcd = 970.0646 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0024

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2633

-. Rat,bary = f'tdy/ftdy = 0.5395

-. Rat,conc = Sigcd/Sigcn = 0.0909

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5395 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 463

-. Node No. : 615

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 687.9814 KPa.

-. Sig2 = Sig,min = 71.5105 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5311

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.7743$$

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

( ). Membrane forces.

-. NEdx = 6.2073 kN/m.

-. NEdy = 57.3807 kN/m.

-. NEdxy = 10.0102 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -590.6832 KPa.

-. alpha = 0.1144(the ratio between the two principal stress)

$$\text{-. Sig,cdmax} = 0.85\text{fcd} * \frac{1+3.80*\text{alpha}}{(1+\text{alpha})^2} = 20949.0170 \text{ KPa.}$$

-. Rat,con = Sig,min/Sig,cdmax = 0.028

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

( ). Information of Parameters.

-. Elem No. : 423

-. Node No. : 570

-. LCB No. : 19

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 5034.9936 KPa.

-. Sig2 = Sig,min = 1600.7726 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.8721

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.6771

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 81.5058 kN/m.

-. NEdy = 183.0795 kN/m.

-. NEdxy = 47.6188 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 1636.7514 KPa.

-. f'tdy = 3216.4666 KPa.

-. Sigcd = 1190.4695 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0016

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0008 m^2/m. (0.0008 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3766.3043 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

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( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.1885

-. Rat,bary = f'tdy/ftdy = 0.8540

-. Rat,conc = Sigcd/Sigcn = 0.1116

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.8540 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 493

-. Node No. : 34

-. LCB No. : 24

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 7327.9003 KPa.

-. Sig2 = Sig,min = 905.0990 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5025

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 1.4424

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 52.0240 kN/m.

-. NEdy = 517.7850 kN/m.

-. NEdxy = 2.6526 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 672.9948 KPa.

-. f'tdy = 7185.1104 KPa.

-. Sigcd = 66.3154 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0037

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

-. Asy,req = 0.0015 m^2/m. (0.0015 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0775

-. Rat,bary = f'tdy/ftdy = 0.8276

-. Rat,conc = Sigcd/Sigcn = 0.0062

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.8276 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 463

-. Node No. : 615

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 687.9814 KPa.

-. Sig2 = Sig,min = 71.5105 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5311

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.7743

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -5.7780 kN/m.

-. NEdy = -45.1244 kN/m.

-. NEdxy = 6.8168 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

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

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[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 3.

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

( ). Information of Parameters.

-. Elem No. : 817

-. Node No. : 35

-. LCB No. : 23

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3545.3733 KPa.

-. Sig2 = Sig,min = 1015.2125 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.0211

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.1763$$

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

( ). Membrane forces.

-. NEdx = 674.1481 kN/m.

-. NEdy = 328.4466 kN/m.

-. NEdxy = 87.1529 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 9538.0577 KPa.

-. f'tdy = 5274.8792 KPa.

-. Sigcd = 2178.8229 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0049

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0027

-. Asx,req = 0.0020 m^2/m. (0.0020 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.7014

-. Rat,bary = f'tdy/ftdy = 0.6076

-. Rat,conc = Sigcd/Sigcn = 0.2043

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7014 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 23

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3424.6121 KPa.

-. Sig2 = Sig,min = -1134.2830 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1736

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.1206$$

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

( ). Membrane forces.

-. NEdx = 76.1202 kN/m.

-. NEdy = 273.9201 kN/m.

-. NEdxy = 208.8835 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3505.0208 KPa.

-. f'tdy = 6029.1838 KPa.

-. Sigcd = 5222.0874 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4037

-. Rat,bary = f'tdy/ftdy = 0.6944

-. Rat,conc = Sigcd/Sigcn = 0.4896

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6944 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 28

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3366.5134 KPa.

-. Sig2 = Sig,min = -1199.5357 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1202

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1008$$

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

( ). Membrane forces.

-. NEdx = 74.0449 kN/m.

-. NEdy = 254.0965 kN/m.

-. NEdxy = 212.8319 kN/m.

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3528.8998 KPa.

-. f'tdy = 5831.1058 KPa.

-. Sigcd = 5320.7964 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.4065

-. Rat,bary = f'tdy/ftdy = 0.6716

-. Rat,conc = Sigcd/Sigcn = 0.4988

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6716 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 817

-. Node No. : 35

-. LCB No. : 28

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3528.4051 KPa.

-. Sig2 = Sig,min = 959.5242 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.0827

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1702$$

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Membrane forces.

-. NEdx = 666.0059 kN/m.

-. NEdy = 304.0426 kN/m.

-. NEdxy = 43.7088 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 8851.0752 KPa.

-. f'tdy = 4285.4114 KPa.

-. Sigcd = 1092.7189 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0045

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0022

-. Asx,req = 0.0018 m^2/m. (0.0018 m^2/m.)

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @100

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0028 m^2/m. (0.0028 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0070

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 13597.8261 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6509

-. Rat,bary = f'tdy/ftdy = 0.4936

-. Rat,conc = Sigcd/Sigcn = 0.1024

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6509 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 23

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

-. Thickness : t = 0.4000 m.

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3424.6121 KPa.

-. Sig2 = Sig,min = -1134.2830 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1736

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.1206

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 222.5467 kN/m.

-. NEdy = 286.3484 kN/m.

-. NEdxy = 200.5193 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5345.8514 KPa.

-. f'tdy = 6091.7080 KPa.

-. Sigcd = 5012.9829 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0031

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6157

-. Rat,bary = f'tdy/ftdy = 0.7016

-. Rat,conc = Sigcd/Sigcn = 0.4700

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7016 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 374

-. Node No. : 501

-. LCB No. : 28

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3366.5134 KPa.

-. Sig2 = Sig,min = -1199.5357 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1202

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.1008$$

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

( ). Membrane forces.

-. NEdx = 221.7038 kN/m.

-. NEdy = 268.6236 kN/m.

-. NEdxy = 202.1167 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5354.8164 KPa.

-. f'tdy = 5889.7514 KPa.

-. Sigcd = 5052.9179 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0027

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P14 @200/P16 @200

-. Rebar,y : P14 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. Asy,use = 0.0018 m^2/m. (0.0018 m^2/m.)

-. rhox,use = 0.0044

-. rhoy,use = 0.0044

-. ftdx = rhox,use*fyd*(t/ck) = 8682.0652 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 8682.0652 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6168

-. Rat,bary = f'tdy/ftdy = 0.6784

-. Rat,conc = Sigcd/Sigcn = 0.4737

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6784 ---> O.K.

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 4.

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.8143 kN/m.

-. NEdy = 2.4110 kN/m.

-. NEdxy = 69.4768 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -374.1518 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.018

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8545

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 4.8143 kN/m.

-. NEdy = 2.4110 kN/m.

-. NEdxy = 69.4768 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -374.1518 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.018

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.8143 kN/m.

-. NEdy = 2.4110 kN/m.

-. NEdxy = 69.4768 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -374.1518 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.018

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8545

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 4.7640 kN/m.

-. NEdy = 2.4084 kN/m.

-. NEdxy = 69.5362 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -373.2052 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

---

midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

==========

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8545

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 4.7640 kN/m.

-. NEdy = 2.4084 kN/m.

-. NEdxy = 69.5362 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -373.2052 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

---

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

( ). Information of Parameters.

-. Elem No. : 1683

-. Node No. : 2243

-. LCB No. : 94

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

-. Thickness : t = 0.4000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 456.3618 KPa.

-. Sig2 = Sig,min = -373.2052 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0417

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = -0.8545$$

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

( ). Membrane forces.

-. NEdx = 4.7640 kN/m.

-. NEdy = 2.4084 kN/m.

-. NEdxy = 69.5362 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -373.2052 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

1.8.4 Verifiche a taglio Pareti pompaggio sp.40

==========

[[[*]]] MESHED SHELL SHEAR MAXIMUM RESULT DATA : DOMAIN 1-Parete Pompaggio 5.

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 370

-. Node No. : 448

-. LCB No. : 3

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

-. Thickness : t = 0.4000 m.

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

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

-. V_Edx = -58.1506 kN/m.

-. V_Edy = -4.1449 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 58.2981 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 0.0713

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0019

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

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

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 132.1544 kN/m.

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

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

-. RatV = V_Edo / V_Rdc = 0.3687 ---> O.K.

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

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 226

-. Node No. : 77

-. LCB No. : 2

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

-. Thickness : t = 0.4000 m.

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

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

-. V_Edx = -0.0875 kN/m.

-. V_Edy = -122.0282 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 122.0282 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 1.3946e+03

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0019

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

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

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 349.7544 kN/m.

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

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

-. RatV = V_Edo / V_Rdc = 0.3248 ---> O.K.

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

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 1649

-. Node No. : 34

-. LCB No. : 24

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

-. Thickness : t = 0.4000 m.

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

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

-. V_Edx = -61.6685 kN/m.

-. V_Edy = -114.3021 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 129.8767 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 1.8535

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0019

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

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

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 132.1544 kN/m.

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

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

-. RatV = V_Edo / V_Rdc = 0.8214 ---> O.K.

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

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 376

-. Node No. : 499

-. LCB No. : 3

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

-. Thickness : t = 0.4000 m.

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

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

-. V_Edx = 58.1456 kN/m.

-. V_Edy = 4.1747 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 58.2953 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 0.0718

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0019

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

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

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 132.1544 kN/m.

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

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

-. RatV = V_Edo / V_Rdc = 0.3687 ---> O.K.

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

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 1746

-. Node No. : 566

-. LCB No. : 4

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

-. Thickness : t = 0.4000 m.

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

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

-. V_Edx = -49.9689 kN/m.

-. V_Edy = 6.0945 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 50.3392 kN/m.

-. tan(Phio) = V_Edy/V_Edx = -0.1220

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0019

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

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

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 132.1544 kN/m.

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

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

-. RatV = V_Edo / V_Rdc = 0.3184 ---> O.K.

1.8.5 Verifiche a pressoflessione Pareti camera valvole sp.30

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[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Valvole 1.

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

( ). Information of Parameters.

-. Elem No. : 727

-. Node No. : 763

-. LCB No. : 24

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3921.3572 KPa.

-. Sig2 = Sig,min = 405.1824 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5319

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.2961$$

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

( ). Membrane forces.

-. NEdx = 335.5603 kN/m.

-. NEdy = 32.4619 kN/m.

-. NEdxy = 57.6358 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 6577.2721 KPa.

-. f'tdy = 1495.4796 KPa.

-. Sigcd = 1921.1939 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0034

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

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

-. Asy,req = 0.0003 m^2/m. (0.0003 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3684.7826 KPa.

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6424

-. Rat,bary = f'tdy/ftdy = 0.4059

-. Rat,conc = Sigcd/Sigcn = 0.1801

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6424 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 727

-. Node No. : 34

-. LCB No. : 28

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4618.9748 KPa.

-. Sig2 = Sig,min = 1584.0187 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.7405

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.5383$$

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

( ). Membrane forces.

-. NEdx = 306.4529 kN/m.

-. NEdy = 188.8863 kN/m.

-. NEdxy = 64.3577 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5822.8044 KPa.

-. f'tdy = 4130.3783 KPa.

-. Sigcd = 2145.2576 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200/P16 @200

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5687

-. Rat,bary = f'tdy/ftdy = 0.4034

-. Rat,conc = Sigcd/Sigcn = 0.2011

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5687 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 728

-. Node No. : 952

-. LCB No. : 94

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 182.4112 KPa.

-. Sig2 = Sig,min = -1376.1001 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 8.6121

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.9528$$

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

( ). Membrane forces.

-. NEdx = -176.8153 kN/m.

-. NEdy = -28.9046 kN/m.

-. NEdxy = 75.4762 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -1154.8490 KPa.

-. alpha = 0.3245(the ratio between the two principal stress)

$$\text{-. Sig,cdmax} = 0.85\text{fcd} * \frac{1+3.80*\text{alpha}}{(1+\text{alpha})^2} = 23082.4950 \text{ KPa.}$$

-. Rat,con = Sig,min/Sig,cdmax = 0.050

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

( ). Information of Parameters.

-. Elem No. : 727

-. Node No. : 34

-. LCB No. : 24

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4641.5566 KPa.

-. Sig2 = Sig,min = 1582.5323 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.7514

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.5458

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 533.1499 kN/m.

-. NEdy = 219.8610 kN/m.

-. NEdxy = 53.8410 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 10143.0847 KPa.

-. f'tdy = 4652.2431 KPa.

-. Sigcd = 1794.7004 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0052

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0024

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

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( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.9906

-. Rat,bary = f'tdy/ftdy = 0.4544

-. Rat,conc = Sigcd/Sigcn = 0.1683

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.9906 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 738

-. Node No. : 943

-. LCB No. : 8

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4189.8605 KPa.

-. Sig2 = Sig,min = -1947.9835 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.8749

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.3727

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -124.8998 kN/m.

-. NEdy = 243.0759 kN/m.

-. NEdxy = -11.1385 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = 5084.7755 KPa.

-. Sigcd = 2098.2179 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200

-. Rebar,y : P12 @200/P16 @200

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0006 m^2/m. (0.0006 m^2/m.)

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

-. rhox,use = 0.0019

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 3684.7826 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

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

-. Rat,bary = f'tdy/ftdy = 0.4966

-. Rat,conc = Sigcd/Sigcn = 0.1967

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.4966 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 728

-. Node No. : 952

-. LCB No. : 94

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 182.4112 KPa.

-. Sig2 = Sig,min = -1376.1001 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 8.6121

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.9528

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -149.6188 kN/m.

-. NEdy = -43.4835 kN/m.

-. NEdxy = 57.4610 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -1376.1001 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.065

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Valvole 2.

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

( ). Information of Parameters.

-. Elem No. : 887

-. Node No. : 35

-. LCB No. : 23

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4619.7706 KPa.

-. Sig2 = Sig,min = 1582.7056 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.7423

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.5385$$

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

( ). Membrane forces.

-. NEdx = 530.8900 kN/m.

-. NEdy = 220.2645 kN/m.

-. NEdxy = 54.3986 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 10112.2833 KPa.

-. f'tdy = 4668.2141 KPa.

-. Sigcd = 1813.2882 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0052

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0024

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.9876

-. Rat,bary = f'tdy/ftdy = 0.4559

-. Rat,conc = Sigcd/Sigcn = 0.1700

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.9876 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 863

-. Node No. : 1111

-. LCB No. : 9

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 5147.0389 KPa.

-. Sig2 = Sig,min = 346.9309 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5699

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = 0.7049$$

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

( ). Membrane forces.

-. NEdx = -96.3123 kN/m.

-. NEdy = 265.9750 kN/m.

-. NEdxy = -5.2970 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 0.0000 KPa.

-. f'tdy = 5547.2143 KPa.

-. Sigcd = 1610.0595 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200

-. Rebar,y : P12 @200/P16 @200

---

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0006 m^2/m. (0.0006 m^2/m.)

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

-. rhox,use = 0.0019

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 3684.7826 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

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

-. Rat,bary = f'tdy/ftdy = 0.5418

-. Rat,conc = Sigcd/Sigcn = 0.1509

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5418 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 857

-. Node No. : 844

-. LCB No. : 94

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 518.9988 KPa.

-. Sig2 = Sig,min = 234.7525 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0232

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8280

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 20.8726 kN/m.

-. NEdy = 11.0863 kN/m.

-. NEdxy = 18.8911 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = 0.0000 KPa.

-. fcd = 21333.3333 KPa.

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

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

( ). Information of Parameters.

-. Elem No. : 887

-. Node No. : 838

-. LCB No. : 23

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3903.5367 KPa.

-. Sig2 = Sig,min = 400.6624 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.5328

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.2902

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 334.3112 kN/m.

-. NEdy = 32.4845 kN/m.

-. NEdxy = 57.9327 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 6560.9845 KPa.

-. f'tdy = 1499.5208 KPa.

-. Sigcd = 1931.0887 KPa.

-. rhox,req = max[f'tdx/fyd*(ck/t), rhox,min] = 0.0034

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

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

-. Asy,req = 0.0003 m^2/m. (0.0003 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3684.7826 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

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( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.6408

-. Rat,bary = f'tdy/ftdy = 0.4069

-. Rat,conc = Sigcd/Sigcn = 0.1810

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6408 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 887

-. Node No. : 35

-. LCB No. : 21

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 4605.9002 KPa.

-. Sig2 = Sig,min = 1583.2082 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.7361

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 0.5339

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 306.0601 kN/m.

-. NEdy = 189.0377 kN/m.

-. NEdxy = 64.4307 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 5818.8807 KPa.

-. f'tdy = 4134.0566 KPa.

-. Sigcd = 2147.6909 KPa.

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

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

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200/P16 @200

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( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.5683

-. Rat,bary = f'tdy/ftdy = 0.4038

-. Rat,conc = Sigcd/Sigcn = 0.2013

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.5683 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 857

-. Node No. : 844

-. LCB No. : 94

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 518.9988 KPa.

-. Sig2 = Sig,min = 234.7525 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0232

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = -0.8280$$

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

( ). Membrane forces.

-. NEdx = 3.4223 kN/m.

-. NEdy = -71.8854 kN/m.

-. NEdxy = 20.7110 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -884.7764 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.041

==========

[[[*]]] MESHED SHELL DESIGN MAXIMUM RESULT DATA : DOMAIN 1-Parete Valvole 3.

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

( ). Information of Parameters.

-. Elem No. : 983

-. Node No. : 1238

-. LCB No. : 19

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3064.1049 KPa.

-. Sig2 = Sig,min = 1443.3459 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.8779

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.0212$$

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

( ). Membrane forces.

-. NEdx = 66.3549 kN/m.

-. NEdy = -246.4611 kN/m.

-. NEdxy = -7.3744 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 953.6405 KPa.

-. f'tdy = 0.0000 KPa.

-. Sigcd = 4111.3631 KPa.

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

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

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

-. Asy,req = 0.0003 m^2/m. (0.0003 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3684.7826 KPa.

---

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( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0931

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

-. Rat,conc = Sigcd/Sigcn = 0.3854

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3854 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 951

-. Node No. : 1251

-. LCB No. : 94

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 387.4640 KPa.

-. Sig2 = Sig,min = -370.5213 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.7343

-. beta = 4.6286

$$\text{-. PHI} = \frac{\text{alpha*J2}}{\text{fcm}^2} + \frac{\text{lambda*SQRT[J2]}}{\text{fcm}} + \frac{\text{beta*I1}}{\text{fcm}} - 1.0 = -0.8770$$

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

( ). Membrane forces.

-. NEdx = -5.0578 kN/m.

-. NEdy = -15.2603 kN/m.

-. NEdxy = 46.9686 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -264.8846 KPa.

-. alpha = 0.6391(the ratio between the two principal stress)

$$\text{-. Sig,cdmax} = 0.85\text{fcd} * \frac{1+3.80*\text{alpha}}{(1+\text{alpha})^2} = 23141.0493 \text{ KPa.}$$

-. Rat,con = Sig,min/Sig,cdmax = 0.011

---

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

( ). Information of Parameters.

-. Elem No. : 908

-. Node No. : 1168

-. LCB No. : 33

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 3013.7206 KPa.

-. Sig2 = Sig,min = 1343.8667 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.0714

-. beta = 4.6286

$$\text{PHI} = \frac{\text{alpha}*J2}{fcm^2} + \frac{\text{lambda}*\text{SQRT}[J2]}{fcm} + \frac{\text{beta}*I1}{fcm} - 1.0 = 0.0035$$

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

( ). Membrane forces.

-. NEdx = 27.5917 kN/m.

-. NEdy = -226.0167 kN/m.

-. NEdxy = 11.7781 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 269.3969 KPa.

-. f'tdy = 0.0000 KPa.

-. Sigcd = 3777.1747 KPa.

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

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

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

-. Asy,req = 0.0003 m^2/m. (0.0003 m^2/m.)

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0019

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 3684.7826 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.0263

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

-. Rat,conc = Sigcd/Sigcn = 0.3541

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.3541 ---> O.K.

---

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

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midas Gen - RC-Shell Flexural Design[Eurocode2:04 & NTC2018] Gen 2021

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( ). Information of Parameters.

-. Elem No. : 983

-. Node No. : 42

-. LCB No. : 19

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 5028.3874 KPa.

-. Sig2 = Sig,min = 2035.3429 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 13.3630

-. beta = 4.6286

$$PHI = \frac{alpha*J2}{fcm^2} + \frac{lambda*SQRT[J2]}{fcm} + \frac{beta*I1}{fcm} - 1.0 = 0.6789$$

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

( ). Membrane forces.

-. NEdx = 196.0353 kN/m.

-. NEdy = 292.2973 kN/m.

-. NEdxy = -5.0866 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 3622.3329 KPa.

-. f'tdy = 6195.4971 KPa.

-. Sigcd = 169.5517 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0032

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.3538

-. Rat,bary = f'tdy/ftdy = 0.6051

-. Rat,conc = Sigcd/Sigcn = 0.0159

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.6051 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 983

-. Node No. : 42

-. LCB No. : 17

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 6884.6959 KPa.

-. Sig2 = Sig,min = 1750.0190 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 14.1534

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = 1.2984

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = 129.3273 kN/m.

-. NEdy = 345.5040 kN/m.

-. NEdxy = -0.0528 kN/m.

( ). Necessary reinforcement and concrete stress.

-. f'tdx = 2246.9115 KPa.

-. f'tdy = 7199.1003 KPa.

-. Sigcd = 1.7613 KPa.

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

-. rhoy,req = max[f'tdy/fyd*(ck/t), rhoy,min] = 0.0037

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

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

( ). Rebar Arrangement.

-. Rebar,x : P12 @200/P16 @200

-. Rebar,y : P12 @200/P16 @200

( ). Tensile strengths provided by reinforcement.

-. Asx,use = 0.0016 m^2/m. (0.0016 m^2/m.)

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

-. rhox,use = 0.0052

-. rhoy,use = 0.0052

-. ftdx = rhox,use*fyd*(t/ck) = 10239.1304 KPa.

-. ftdy = rhoy,use*fyd*(t/ck) = 10239.1304 KPa.

( ). Concrete strength limit.

-. Sigcn = nu*fcd = 10666.6667 KPa.

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( ). Check results.

-. Rat,barx = f'tdx/ftdx = 0.2194

-. Rat,bary = f'tdy/ftdy = 0.7031

-. Rat,conc = Sigcd/Sigcn = 0.0002

-. Rat = MAX[Rat,barx, Rat,bary, Rat,conc] = 0.7031 ---> O.K.

---

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

( ). Information of Parameters.

-. Elem No. : 951

-. Node No. : 1251

-. LCB No. : 94

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

-. Thickness : t = 0.3000 m.

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

( ). Check elements cracked or not.

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

-. Sig1 = Sig,max = 387.4640 KPa.

-. Sig2 = Sig,min = -370.5213 KPa.

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

-. fcm = 40000.0000 KPa.

-. alpha = 4.1292

-. lambda = 12.7343

-. beta = 4.6286

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

-. PHI = -------- + ---------- + -------- - 1.0 = -0.8770

fcm^2 fcm fcm

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

( ). Membrane forces.

-. NEdx = -14.6416 kN/m.

-. NEdy = -30.8101 kN/m.

-. NEdxy = 26.2932 kN/m.

( ). Check the minimum principal stress.

-. Sig,min = -370.5213 KPa.

-. fcd = 21333.3333 KPa.

-. Rat,con = Sig,min/fcd = 0.017

1.8.6 Verifiche a taglio Pareti camera valvole sp.30

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

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 727

-. Node No. : 34

-. LCB No. : 19

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

-. Thickness : t = 0.3000 m.

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

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

-. V_Edx = 56.6917 kN/m.

-. V_Edy = -1.7957 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 56.7201 kN/m.

-. tan(Phio) = V_Edy/V_Edx = -0.0317

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0052

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

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.9129

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 140.9465 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 125.7137 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 140.9465 kN/m.

-. RatV = V_Edo / V_Rdc = 0.4024 ---> O.K.

==========

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

==========

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 887

-. Node No. : 35

-. LCB No. : 28

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

-. Thickness : t = 0.3000 m.

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

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

-. V_Edx = -56.2588 kN/m.

-. V_Edy = 1.7564 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 56.2862 kN/m.

-. tan(Phio) = V_Edy/V_Edx = -0.0312

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0052

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

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.9129

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 140.9465 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 125.7137 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 140.9465 kN/m.

-. RatV = V_Edo / V_Rdc = 0.3993 ---> O.K.

==========

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

==========

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[*] SHEAR SHEAR MAXIMUM RESULT

( ). Information of Parameters.

-. Elem No. : 983

-. Node No. : 42

-. LCB No. : 17

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

-. Thickness : t = 0.3000 m.

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

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

-. V_Edx = -0.0107 kN/m.

-. V_Edy = -99.6693 kN/m.

-. V_Edo = SQRT[V_Edx^2 + V_Edy^2] = 99.6693 kN/m.

-. tan(Phio) = V_Edy/V_Edx = 9.2803e+03

-. Rhol = Rhox*cos(Phio)^2 + Rhoy*sin(Phio)^2 = 0.0052

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

-. k = MIN[1.0+SQRT(200/d), 2.0] = 1.9129

-. C_Rdc = 0.18/Gamma_c = 0.1200

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

-. V_Rdc1 = [C_Rdc*k*(100*Rhol*fck)^(1/3) + 0.15*Sig_cp]*d = 140.9465 kN/m.

-. V_Rdc2 = [0.035*k^(3/2)*SQRT(fck) + 0.15*Sig_cp]*d = 125.7137 kN/m.

-. V_Rdc = MAX[V_Rdc1, V_Rdc2] = 140.9465 kN/m.

-. RatV = V_Edo / V_Rdc = 0.7071 ---> O.K.

1.8.7 Verifiche a flessione Soletta pompaggio sp.30

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

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

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

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

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

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

 0.3000   1366 BOT 0.0004 0.0006 | 6.46791(   9) 54.0653 0.120  OK

        1415 TOP 0.0004 0.0006 | 13.2398(  23) 54.0653 0.245  OK

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


<< BOTTOM >>


-. Information of Parameters.

  Elem No.  : 1366

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

M_Ed = 6.4679 kN-m./m.

M_Rd = 54.0653 kN-m./m.

RatM = M_Ed / M_Rd = 0.120 < 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. : 1415

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. : 23

==========

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

==========

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

0.3000 1353 BOT 0.0004 0.0006 | 4.81516(13) 49.5572 0.097 OK

1382 TOP 0.0004 0.0006 | 30.8461(2) 49.5572 0.622 OK

<< BOTTOM >>

-. Information of Parameters.

Elem No. : 1353

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. : 13

-. 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 m^2/m. (0.0004 m^2/m.)

M_Ed = 4.8152 kN-m./m.

M_Rd = 49.5572 kN-m./m.

RatM = M_Ed / M_Rd = 0.097 < 1.0 ---> O.K !

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

x/d = 0.040

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. : 1382

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. : 2

-. 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 m^2/m. (0.0004 m^2/m.)

M_Ed = 30.8461 kN-m./m.

M_Rd = 49.5572 kN-m./m.

RatM = M_Ed / M_Rd = 0.622 < 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

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-. 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 = 13.2398 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

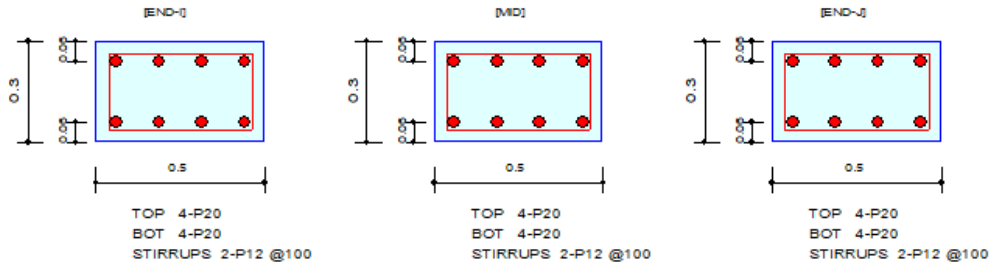
1.8.8 Verifiche a flessione Soletta camera valvole sp.30

1.8.9 Verifiche Travi in c.a. sezione 40x30 primarie su soletta camera valvole

Le travi primarie della soletta camera valvole, di sezione 40x30 sono armate con 4+4 ϕ20 correnti superiori e inferiori e staffe ϕ12/10. Di seguito le verifiche:

1. Design Information

Design Code	Eurocode2:04 & NTC2018	Unit System	kN, m
Material Data	fck = 32000, fyk = 450000, fyw = 450000 KPa		
Section Property	40x30 (No : 2)	Beam Span	3.85m



2. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	17	22	4
Moment (M_Ed)	24.89	4.40	42.77
Factored Strength (M_Rd)	106.54	106.54	106.54
Check Ratio (M_Ed/M_Rd)	0.2336	0.0413	0.4014
Neutral Axis (x/d)	0.2461	0.2461	0.2461
(+) Load Combination No.	14	9	7
Moment (M_Ed)	0.74	90.08	15.80
Factored Strength (M_Rd)	106.54	106.54	106.54
Check Ratio (M_Ed/M_Rd)	0.0069	0.8455	0.1483
Neutral Axis (x/d)	0.2461	0.2461	0.2461
Using Rebar Top (As_top)	0.0013	0.0013	0.0013
Using Rebar Bot (As_bot)	0.0013	0.0013	0.0013

3. Shear Capacity

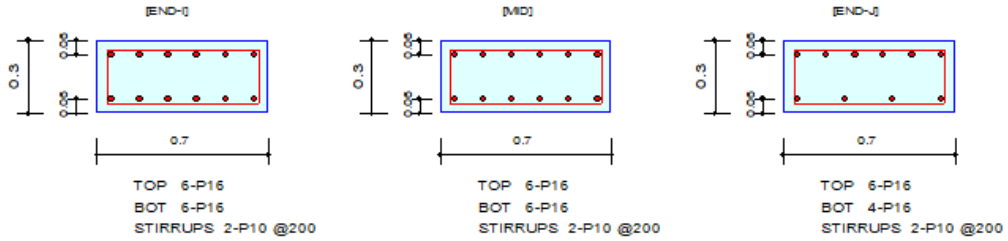
	END-I	MID	END-J
Load Combination No.	14	4	4
Factored Shear Force (V_Ed)	65.06	158.40	158.40
V_Rdc	88.79	88.79	88.79
V_Rds	191.02	191.02	191.02
V_Rdmax	576.00	576.00	576.00
Using Shear Reinf. (Asw)	0.0023	0.0023	0.0023
Using Stirrups Spacing	2-P12 @100	2-P12 @100	2-P12 @100
V_Ed / V_Rdc	0.7327	1.7840	1.7840
V_Ed / min(V_Rds, V_Rdmax)	0.3406	0.8292	0.8292
Check Ratio	0.7327	0.8292	0.8292

1.8.10 Verifiche Travi in c.a. sezione 70x30 secondarie su soletta camera valvole

Le travi secondarie della soletta camera valvole, di sezione 70x30 sono armate con 6+6 ϕ16 correnti superiori e inferiori e staffe ϕ10/20. Di seguito le verifiche:

1. Design Information

Design Code	Eurocode2:04 & NTC2018	Unit System	kN, m
Material Data	fck = 32000, fyk = 450000, fyw = 450000 KPa		
Section Property	70x30 (No : 3)	Beam Span	2.4m



2. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	8	9	9
Moment (M_Ed)	21.81	18.87	22.97
Factored Strength (M_Rd)	108.91	108.91	108.50
Check Ratio (M_Ed/M_Rd)	0.2003	0.1733	0.2117
Neutral Axis (x/d)	0.2139	0.2139	0.2061
(+) Load Combination No.	17	4	17
Moment (M_Ed)	22.61	17.93	22.62
Factored Strength (M_Rd)	108.91	108.91	79.42
Check Ratio (M_Ed/M_Rd)	0.2076	0.1646	0.2848
Neutral Axis (x/d)	0.2139	0.2139	0.1941
Using Rebar Top (As_top)	0.0012	0.0012	0.0012
Using Rebar Bot (As_bot)	0.0012	0.0012	0.0008

3. Shear Capacity

	END-I	MID	END-J
Load Combination No.	8	10	10
Factored Shear Force (V_Ed)	44.65	45.75	45.75
V_Rdc	109.62	109.62	109.62
V_Rds	66.77	66.77	66.77
V_Rdmax	806.40	806.40	806.40
Using Shear Reinf. (Asw)	0.0008	0.0008	0.0008
Using Stirrups Spacing	2-P10 @200	2-P10 @200	2-P10 @200
V_Ed / V_Rdc	0.4073	0.4173	0.4173
V_Ed / min(V_Rds, V_Rdmax)	0.6687	0.6851	0.6851
Check Ratio	0.4073	0.4173	0.4173

1.8.11 Verifiche Travi e colonne in acciaio sezione HeA180 struttura sostegno paranco

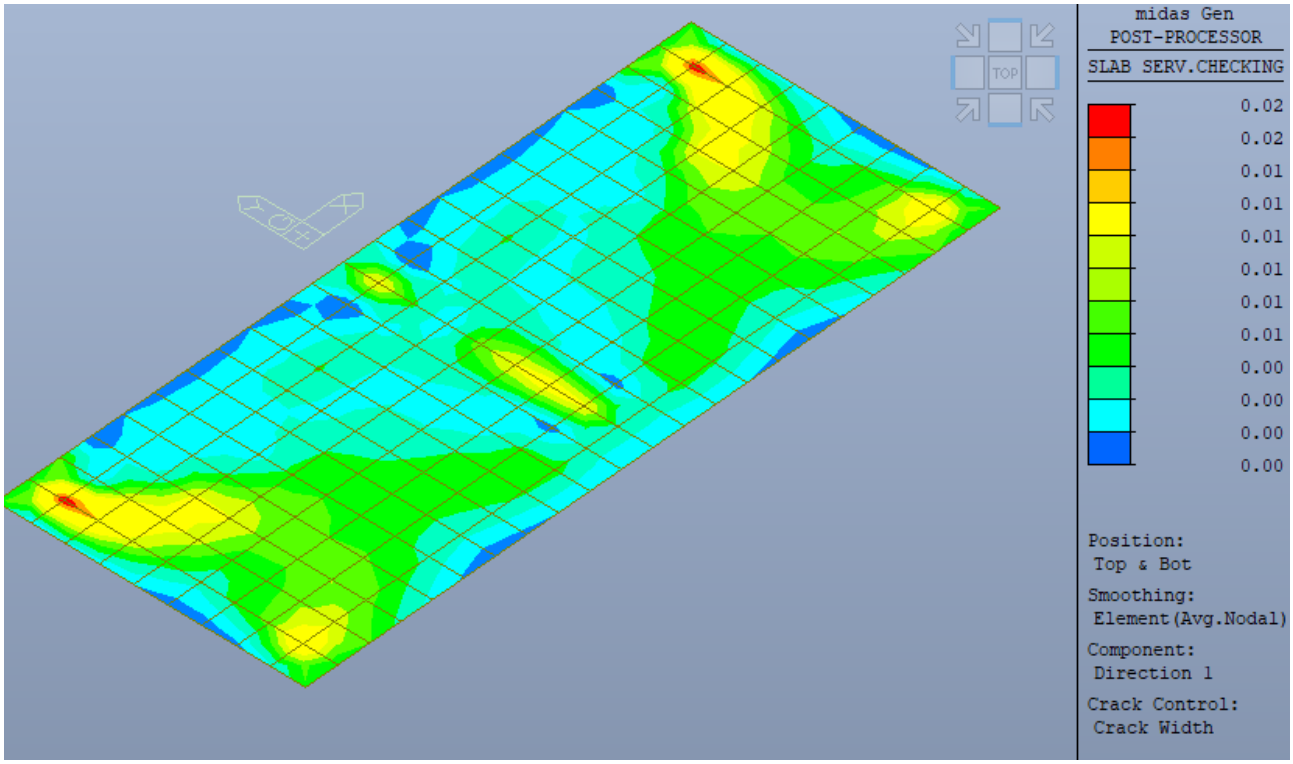
Ne presente paragrafo si riportano le verifiche degli elementi in acciaio S235 di sezione HeA180, costituenti la struttura di sostegno del paranco per estrazione delle pompe.

[Eurocode3:05] CODE CHECKING SUMMARY SHEET --- SELECTED MEMBERS IN ANALYSIS MODEL.

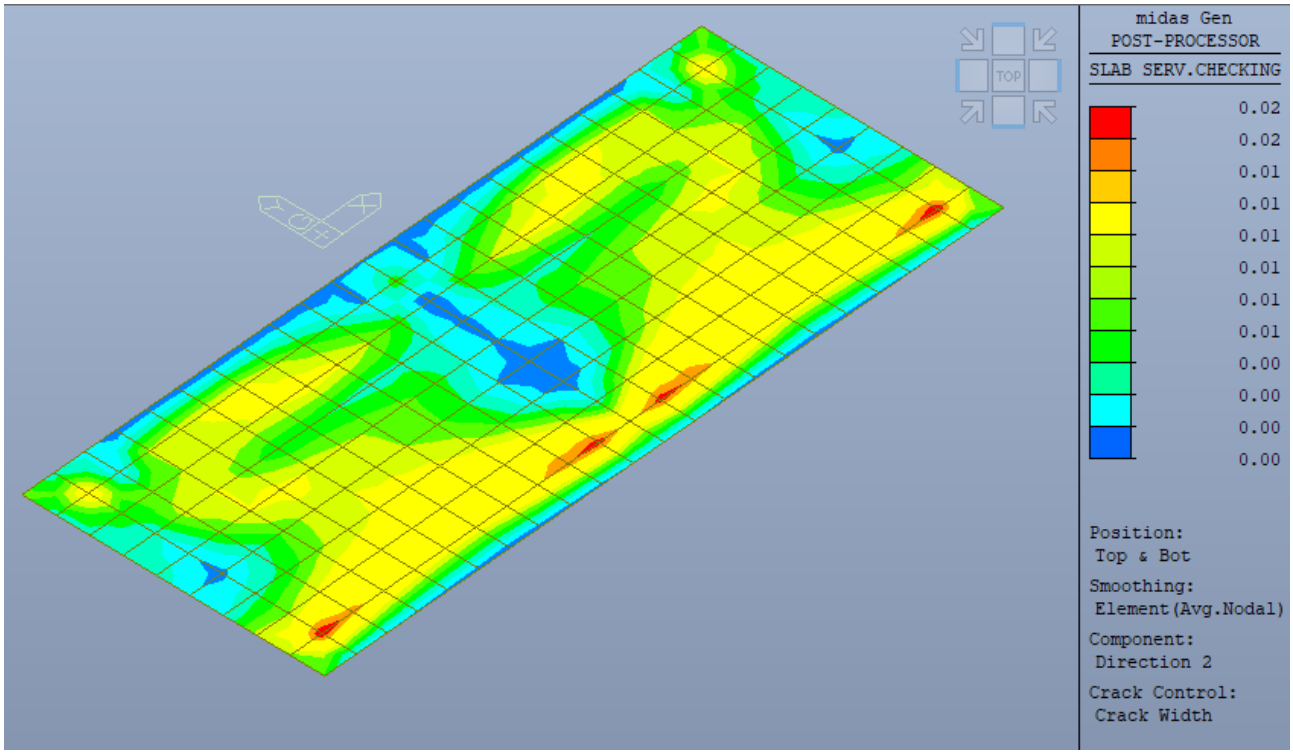
MEMB	SECT	Section	Len	Ly	Bmy	N,Ed	My,Ed	My,Ed	Mz,Ed	Vy,Ed	Vz,Ed	T,Ed	Def
CHK	COM	SHR	Material	Fy	LCB	Lu	Lz	Bmz	N,Rd	Mb,Rd	My,Rd	Mz,Rd	Vy,Rd	Vz,Rd	T,Rd	Defa
1775	1	HEA180		3.30000	3.30000	0.85	-10.120	-2.5893	-2.5893	-0.0277	-0.0701	1.16907	-	-
OK	0.04	0.01	S235	235000	24	3.30000	3.30000	0.85	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1776	1	HEA180		3.30000	3.30000	0.85	-10.092	2.56276	2.56276	-0.0283	-0.0381	-1.1530	-	-
OK	0.04	0.01	S235	235000	24	3.30000	3.30000	0.85	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1779	1	HEA180		3.30000	3.30000	0.85	-7.5341	-0.7651	-0.7651	-1.1834	-0.3662	-0.6949	-	-
OK	0.05	0.01	S235	235000	23	3.30000	3.30000	0.85	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1780	1	HEA180		3.30000	3.30000	0.85	-7.5122	0.70941	0.70941	-1.2000	-0.3713	0.67165	-	-
OK	0.05	0.01	S235	235000	28	3.30000	3.30000	0.85	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1781	1	HEA180		1.94286	1.94286	1.00	-1.0237	6.33567	6.33567	-0.0385	-0.0397	-9.1317	-	-
OK	0.09	0.05	S235	235000	27	0.97143	0.97143	1.00	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1783	1	HEA180		1.94286	1.94286	1.00	-1.1691	7.02740	7.02740	-0.0682	-0.0701	10.1198	-	-
OK	0.10	0.05	S235	235000	24	0.97143	0.97143	1.00	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1785	1	HEA180		3.30000	3.30000	0.85	-8.3874	-5.4736	-5.4736	0.00000	-0.0082	1.45210	-	-
OK	0.08	0.01	S235	235000	28	3.30000	3.30000	0.85	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1786	1	HEA180		5.60000	5.60000	1.00	0.12066	12.7855	12.7855	-0.0020	0.01366	10.2193	-	-
OK	0.17	0.08	S235	235000	21	4.80000	4.80000	1.00	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-
1788	1	HEA180		4.80000	4.80000	1.00	-1.4491	13.3508	13.3508	-0.0200	-0.0084	-8.7889	-	-
OK	0.18	0.04	S235	235000	23	4.80000	4.80000	1.00	1064.55	0.00000	76.1400	36.4880	490.881	197.003	-	-

1.9 Verifiche in condizioni di esercizio SLE

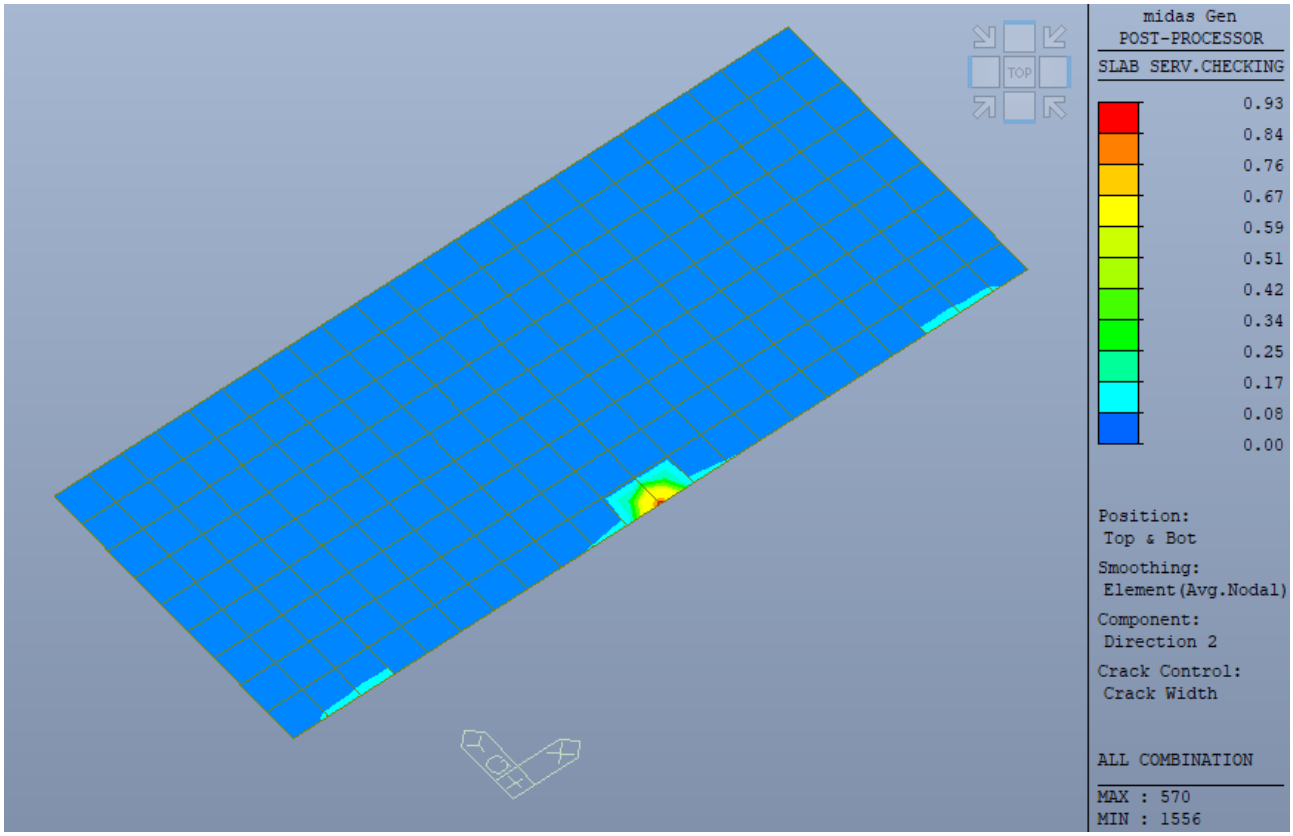
1.9.1 Elementi bidimensionali



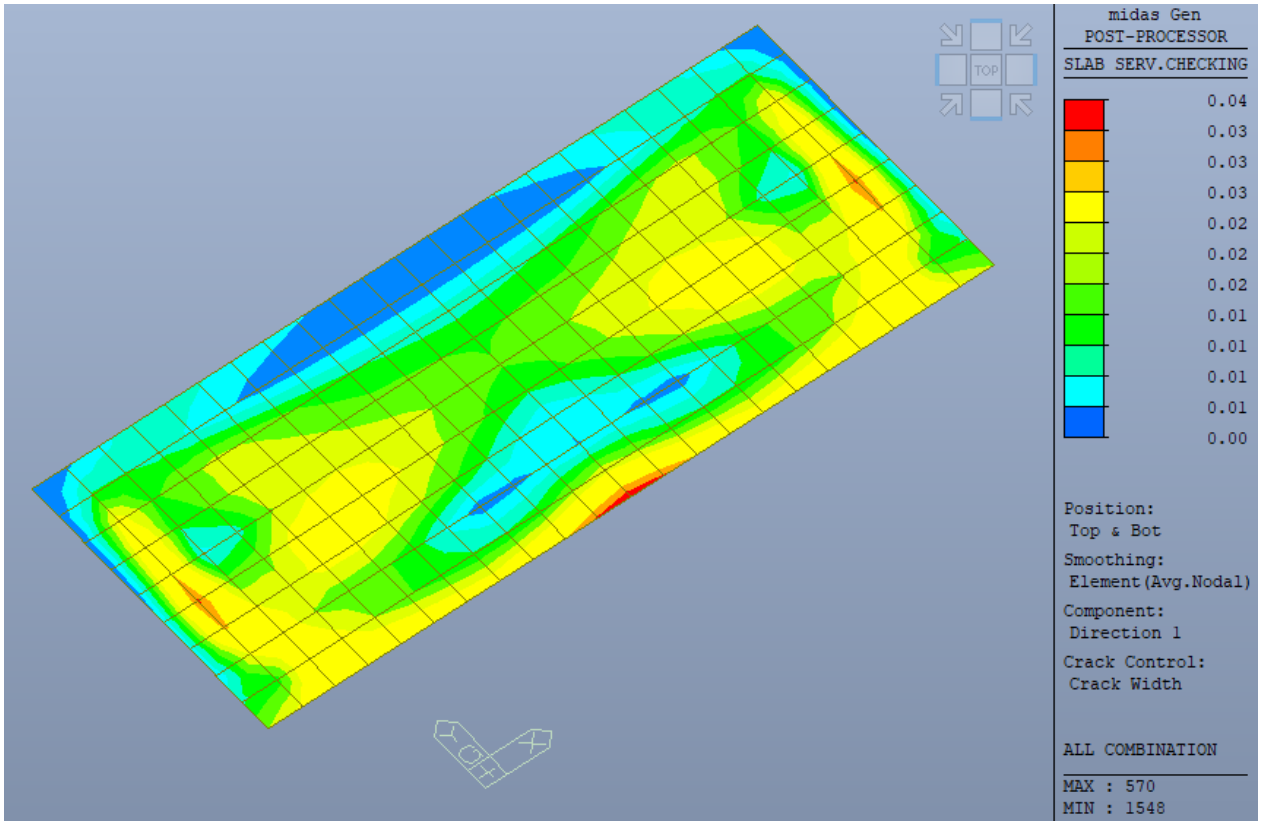
Platea pompaggio – Verifica a fessurazione SLE - ratio direzione X



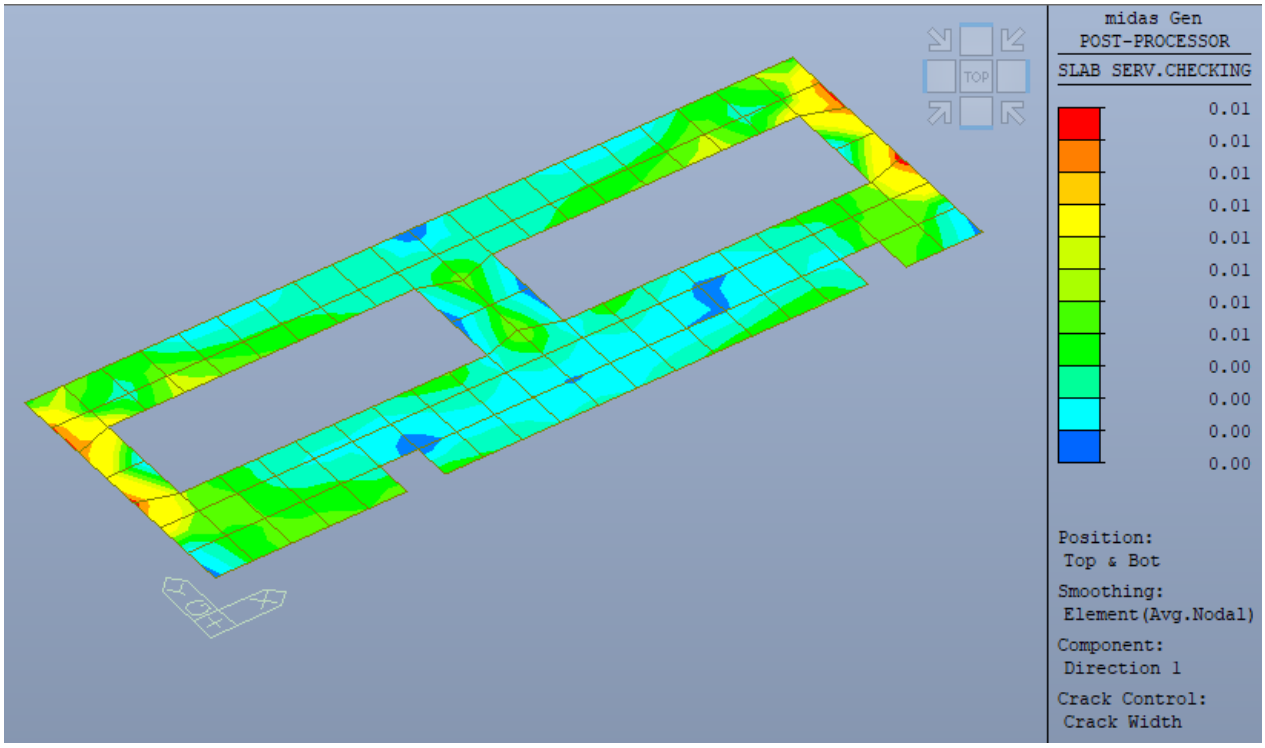
Platea pompaggio – Verifica a fessurazione SLE - ratio direzione Y



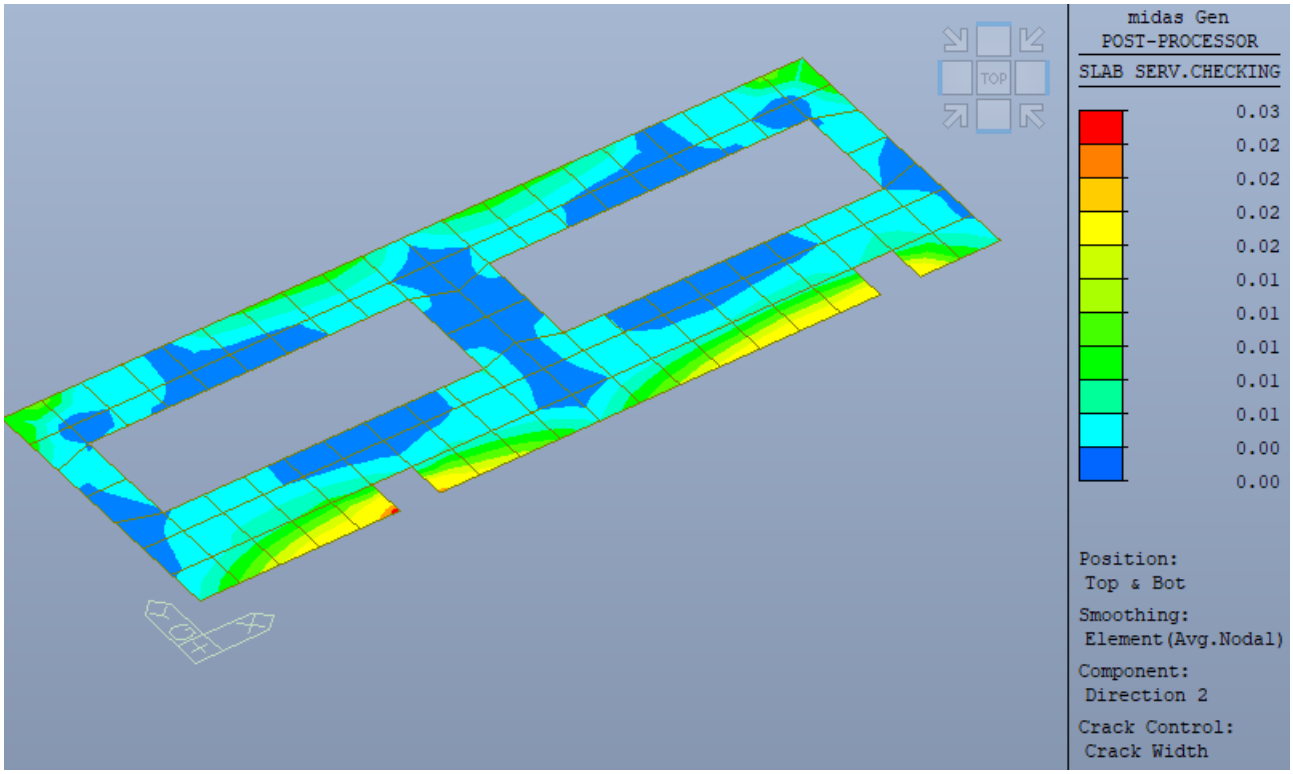
Platea camera valvole – Verifica a fessurazione SLE - ratio direzione Y



Platea camera valvole – Verifica a fessurazione SLE - ratio direzione X



Soletta pompaggio – Verifica a fessurazione SLE - ratio direzione X

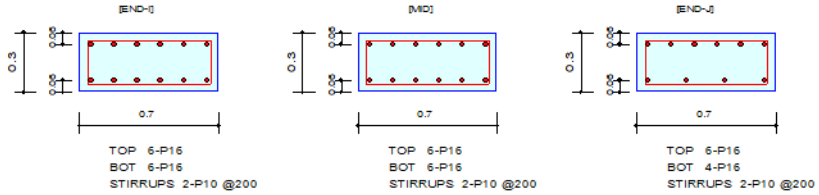


Soletta pompaggio – Verifica a fessurazione SLE - ratio direzione Y

1.9.2 Travi 70x30

1. Design Information

Design Code	Eurocode2:04 & NTC2018	Unit System	kN, m
Material Data	fck = 32000, fyk = 450000, fyw = 450000 KPa		
Section Property	70x30 (No : 3)	Beam Span	2.4m



2. Stress Check

	END-I		MID		END-J	
	Concrete	Rebar	Concrete	Rebar	Concrete	Rebar
(-) Load Combination No.	57(C)	57(C)	58(C)	58(C)	58(C)	58(C)
Stress(s)	1292.65	9303.61	1042.08	7500.15	1338.63	9344.32
Allowable Stress(sa)	19200.00	360000.00	19200.00	360000.00	19200.00	360000.00
Stress Ratio(s/sa)	0.0673	0.0258	0.0543	0.0208	0.0697	0.0260
(+) Load Combination No.	62(C)	62(C)	61(C)	61(C)	62(C)	62(C)
Stress(s)	1191.98	8579.08	1026.54	7388.30	1203.30	8927.44
Allowable Stress(sa)	19200.00	360000.00	19200.00	360000.00	19200.00	360000.00
Stress Ratio(s/sa)	0.0621	0.0238	0.0535	0.0205	0.0627	0.0248

3. Check Linear Creep

	END-I	MID	END-J
(-) Load Combination No.	86(Q)	86(Q)	86(Q)
Stress(s)	193.89	66.81	200.40
Allowable Stress(sa)	14400.00	14400.00	14400.00
Stress Ratio(s/sa)	0.0135	0.0046	0.0139
Result	Linear Creep	Linear Creep	Linear Creep
(+) Load Combination No.	86(Q)	86(Q)	86(Q)
Stress(s)	136.64	297.66	137.86
Allowable Stress(sa)	14400.00	14400.00	14400.00
Stress Ratio(s/sa)	0.0095	0.0207	0.0096
Result	Linear Creep	Linear Creep	Linear Creep

4. Crack Control

	END-I	MID	END-J
(-) Load Combination No.	86(Q)	86(Q)	86(Q)
Crack Width(w)	0.00	0.00	0.00
Allowable Crack Width(wa)	0.00	0.00	0.00
Check Ratio(w/wa)	0.0041	0.0014	0.0041
(+) Load Combination No.	86(Q)	86(Q)	86(Q)
Crack Width(w)	0.00	0.00	0.00
Allowable Crack Width(wa)	0.00	0.00	0.00
Check Ratio(w/wa)	0.0029	0.0063	0.0037

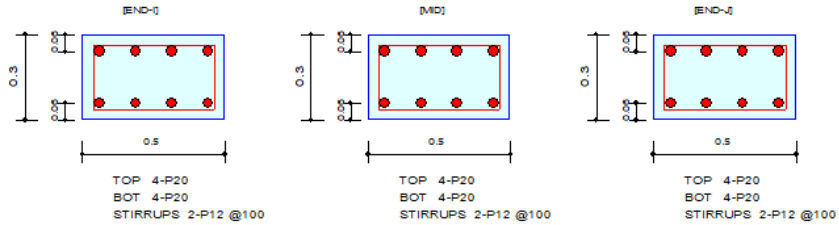
5. Deflection Control

L/250 = 0.009600 > 0.0001 (LCB:58, POS: 1.3m from END-I)..... O.K

1.9.3 Travi 40x30

1. Design Information

Design Code	Eurocode2:04 & NTC2018	Unit System	kN, m
Material Data	fck = 32000, fyk = 450000, fyw = 450000 KPa		
Section Property	40x30 (No : 2)	Beam Span	3.85m



2. Stress Check

	END-I		MID		END-J	
	Concrete	Rebar	Concrete	Rebar	Concrete	Rebar
(-) Load Combination No.	62(C)	62(C)	66(C)	66(C)	57(C)	57(C)
Stress(s)	1686.54	12138.59	304.88	2194.29	3449.76	24828.99
Allowable Stress(sa)	19200.00	360000.00	19200.00	360000.00	19200.00	360000.00
Stress Ratio(s/sa)	0.0878	0.0337	0.0159	0.0061	0.1797	0.0690
(+) Load Combination No.	59(C)	59(C)	58(C)	58(C)	66(C)	66(C)
Stress(s)	237.85	1711.85	14903.01	226247.99	1180.31	8495.09
Allowable Stress(sa)	19200.00	360000.00	19200.00	360000.00	19200.00	360000.00
Stress Ratio(s/sa)	0.0124	0.0048	0.7762	0.6285	0.0615	0.0236

3. Check Linear Creep

	END-I	MID	END-J
(-) Load Combination No.	86(Q)	86(Q)	86(Q)
Stress(s)	655.84	187.22	73.92
Allowable Stress(sa)	14400.00	14400.00	14400.00
Stress Ratio(s/sa)	0.0455	0.0130	0.0051
Result	Linear Creep	Linear Creep	Linear Creep
(+) Load Combination No.	86(Q)	86(Q)	86(Q)
Stress(s)	0.00	1003.06	755.59
Allowable Stress(sa)	0.00	14400.00	14400.00
Stress Ratio(s/sa)	0.0000	0.0697	0.0525
Result	Linear Creep	Linear Creep	Linear Creep

4. Crack Control

	END-I	MID	END-J
(-) Load Combination No.	86(Q)	86(Q)	86(Q)
Crack Width(w)	0.00	0.00	0.00
Allowable Crack Width(wa)	0.00	0.00	0.00
Check Ratio(w/wa)	0.0125	0.0036	0.0014
(+) Load Combination No.	86(Q)	86(Q)	86(Q)
Crack Width(w)	0.00	0.00	0.00
Allowable Crack Width(wa)	0.00	0.00	0.00
Check Ratio(w/wa)	0.0000	0.0192	0.0145

5. Deflection Control

L/250 = 0.015400 > 0.0009 (LCB:61, POS: 2.2m from END-I)..... O.K