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GRUPPO FS ITALIANE

Direzione Progettazione e Realizzazione Lavori

ITINERARIO RAGUSA-CATANIA

Collegamento viario compreso tra lo Svincolo della S.S. 514 "di Chiaramonte" con la S.S. 115 e lo Svincolo della S.S. 194 "Ragusana"

LOTTO 1 - Dallo svincolo n. 1 sulla S.S. 115 (compreso) allo svincolo n. 3 sulla S.P. 5 (escluso)

PROGETTO ESECUTIVO

COD. PA895

PROGETTAZIONE: ATI SINTAGMA - GP INGEGNERIA - COOPROGETTI -GDG - ICARIA - OMNISERVICE

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CAVALCAVIA
CAVALCAVIA AL KM 15+818
Relazione di calcolo impalcato

CODICE PROGETTO	NOME FILE	REVISIONE	SCALA:
PROGETTO: LO408Z – LIV. PROG.: E – N. PROG.: 2101	T01CV06STRRE01B		
CODICE ELAB. T01CV06STRRE01		B	-

REV.	DESCRIZIONE	DATA	REDATTO	VERIFICATO	APPROVATO
D					
C					
B	REVISIONE A SEGUITO DI RAPPORTO DI VERIFICA	NOVEMBRE 2021	RAGNACCI	PELLE	GRANIERI
A	EMISSIONE	GIUGNO 2021	RAGNACCI	PELLE	GRANIERI

INDICE

1 DESCRIZIONE DELLE OPERE

La presente relazione di calcolo riguarda l'impalcato posizionato alla progressiva 15+518 del Lotto 1. L'impalcato è realizzato in struttura mista acciaio-calcestruzzo e presenta una larghezza complessiva di 8,50 metri e luce di 45,50 metri, con cordoli laterali da 75cm. La soletta ha uno spessore totale medio di di 25cm. Le travi in acciaio sono poste ad interasse pari a 3m e presentano un'altezza totale di 2100mm. Le piattabande hanno larghezze e spessori variabili. I traversi sono costituiti da profili a doppio T saldati di altezza pari a 800mm e posti ad interasse 4400mm. L'impalcato viene realizzato a mezzo di 3 conci diversi (Concio C1, C2 e C3) che vengono saldati in opera, collegati agli elemeni trasverssali e poi il tutto viene sollevato da autogru di grossa portata posizionate in corridpondenza dei rilevati delle spalle. Per dettagli circa le geometrie delle travi fare riferimento agli elaborati specifici, comunque nel proseguo vengono riportate delle immagini rappresentative delle opere in oggetto

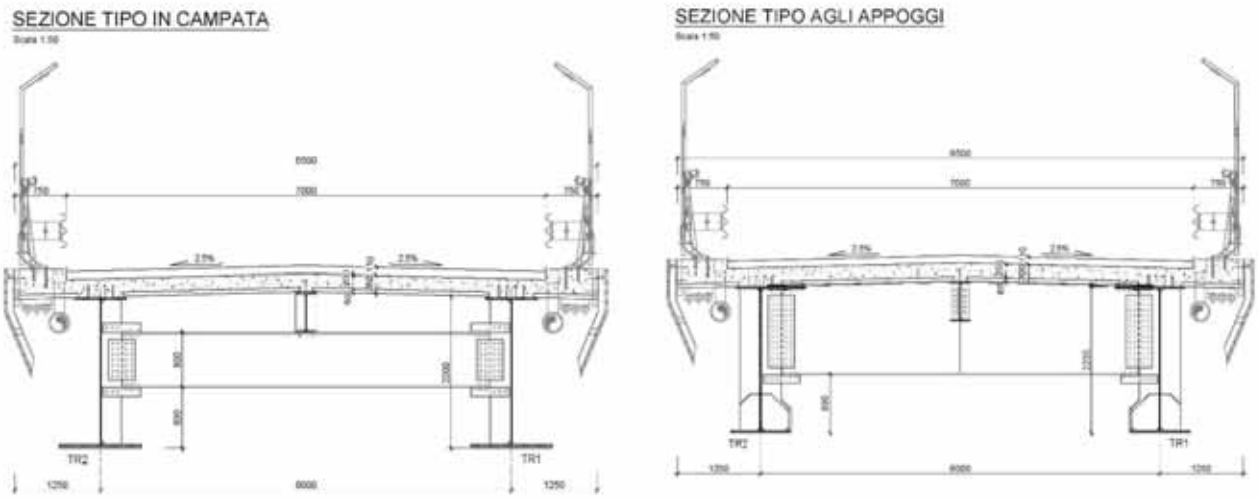
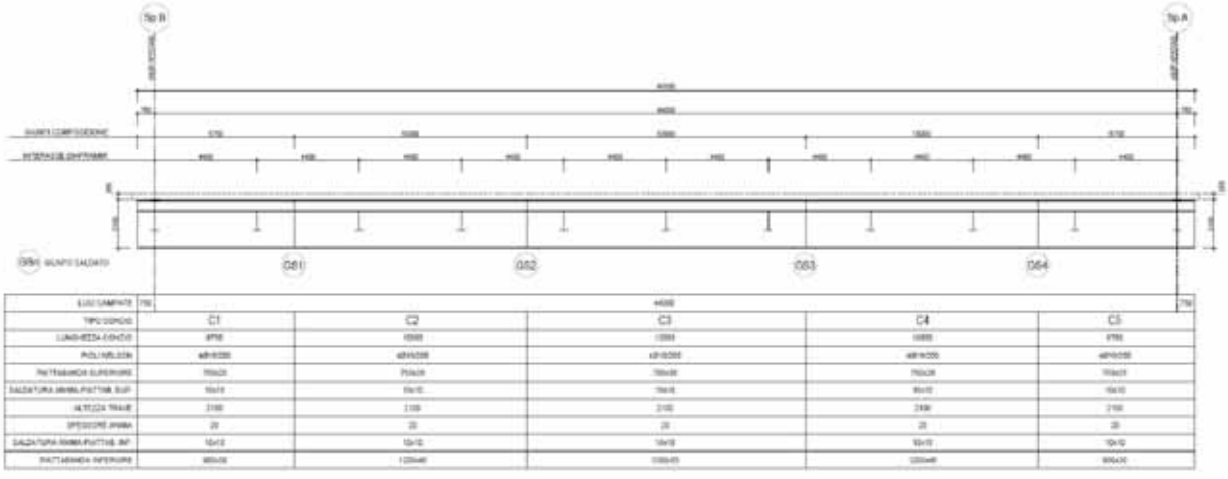


Figura 1 - Sezioni trasversali dell'impalcato



TIPO CONCIO	C1	C2	C3	C4	C5

Figura 2 - Pianta Conci

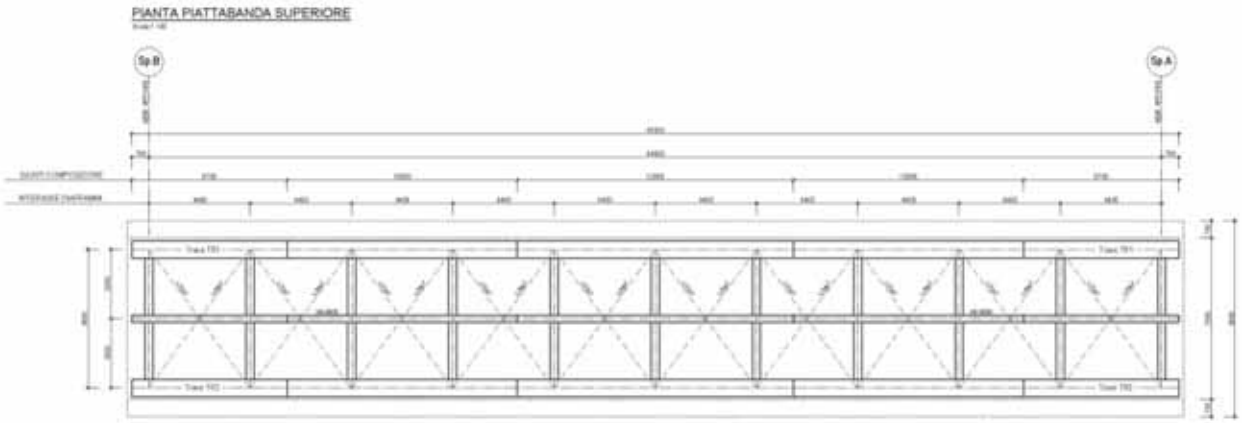


Figura 3 - Pianta conci

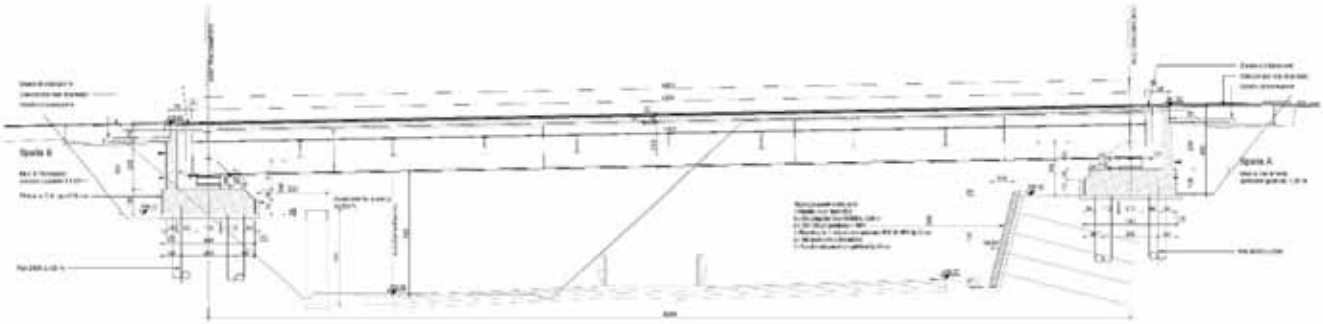


Figura 4 - Sezione prospetto

Lo schema di vincolo prevede l'utilizzo di 4 dispositivi di appoggio tipo isolatori elastomerici con nucleo di piombo che consentono uno spostamento di ±250mm e di conseguenza un giunto di dilatazione di spalla che permetta il corrispondente spostamento. Si riporta di seguito le caratteristiche che deve avere il dispositivo di appoggio.

V	Fzd	Ke	ξe	Kv	Dg	te	h	H	Z
kN	kN	kN/mm	%	kN/mm	mm	mm	mm	mm	mm
23710	37010	4,49	21	4330	1100	190	322	402	1150

V	Carico verticale massimo agente in presenza del sisma allo SLC
Fzd	Carico verticale massimo in assenza di SISMA e spostamento 10mm
Ke	Rigidezza orizzontale equivalente
ξe	Coefficientae di smorzamento viscoso equivalente
Kv	Rigidezza verticale
Dg	Diametro elastomero
te	Spessore totale gomma
h	Altezza escluse piastre di ancoraggio
H	Altezza totale incluse piastre di ancoraggio
Z	Lato piastre di ancoraggio

Figura 5 - Schema di vincolo

2 NORMATIVA DI RIFERIMENTO E RIFERIMENTI TECNICI

Le strutture sono state verificate con il criterio degli stati limite (SL). I calcoli sono stati eseguiti in osservanza alle seguenti disposizioni normative e regole tecniche:

2.1 NORME TECNICHE

- Ministero delle infrastrutture - D.M. 14/01/2008. Norme tecniche per le costruzioni.
- Consiglio superiore dei lavori pubblici. Istruzioni per l'applicazione delle "Norme tecniche per le costruzioni" di cui al D.M. 14/01/2008.

2.2 RIFERIMENTI TECNICI

2.2.1 CNR e UNI

- Norma UNI EN 11104:2004
- Calcestruzzo – Specificazione, prestazione, produzione e conformità – Istruzioni complementari per l'applicazione della EN 206-1.
- Norma UNI EN 13369:2013
- Regole comuni per i prodotti prefabbricati di calcestruzzo.
- Norma UNI EN 15050:2012
- Prodotti prefabbricati di calcestruzzo. Elementi da ponte.

2.2.2 EUROCODICI

- UNI EN 1993-1-1: Eurocodice 3 – Progettazione delle strutture in acciaio. Parte 1-1: Regole generali e regole per gli edifici.
- UNI EN 1993-1-5: Eurocodice 3 – Progettazione delle strutture in acciaio. Parte 1-5: Regole generali – Regole supplementari per lastre ortotrope in assenza di carichi trasversali.
- UNI EN 1993-1-9: Eurocodice 3 - Progettazione delle strutture in acciaio. Parte 1-9: Fatica.
- UNI EN 1993-1-10: Eurocodice 3 - Progettazione delle strutture in acciaio. Parte 1-10: Resilienza del materiale e proprietà attraverso lo spessore.
- UNI EN 1993-2: Eurocodice 3 – Progettazione delle strutture in acciaio. Parte 2: Ponti in acciaio.
- UNI EN 1998-2: Eurocodice 8 - Indicazioni progettuali per la resistenza sismica delle strutture. Parte 2: Ponti.

3 METODO DI CALCOLO

Lo studio delle strutture è stato condotto secondo i metodi della scienza delle costruzioni supponendo i materiali elastici, omogenei ed isotropi.

La ricerca dei parametri di sollecitazione è stata fatta secondo le disposizioni di carico più gravose avvalendosi di codici di calcolo automatico per l'analisi strutturale.

Le verifiche di resistenza delle sezioni sono state eseguite secondo il metodo degli stati limite.

3.1 CODICI DI CALCOLO

Tutti i codici di calcolo automatico utilizzati per il calcolo e la verifica delle strutture e la redazione della presente relazione di calcolo sono di sicura ed accertata validità e sono stati impiegati conformemente alle loro caratteristiche. Tale affermazione è suffragata dai seguenti elementi:

- grande diffusione del codice di calcolo sul mercato;
- storia consolidata del codice di calcolo (svariati anni di utilizzo);
- utilizzo delle versioni più aggiornate (dopo test);
- pratica d'uso frequente in studio.

In considerazione dei casi-studio, caratterizzati da piccoli spostamenti e tensioni inferiori ai limiti elastici dei materiali, si è ritenuto sufficiente adottare una schematizzazione della geometria e dei materiali di tipo lineare con leggi elastiche e isotrope ed omogenee.

3.1.1 Programmi di Verifica

Per la verifica delle sezioni in acciaio e composte è stato utilizzato un foglio di excel opportunamente testato.

4 MATERIALI

4.1 CONGLOMERATO CEMENTIZIO

4.1.1 Calcestruzzo - solette

Classe di resistenza C32/40 fck/Rck = 32/40 MPa

Resistenza di calcolo (SLU) $f_{cd} = \frac{\alpha_{cc} \cdot f_{ck}}{\gamma_c} = 18.81$ MPa

Resistenza a compressione media $f_{cm} = f_{ck} + 8 = 41.20$ MPa

Resistenza a trazione semplice $f_{ctm} = 0,3 \cdot f_{ck}^{2/3} = 3.10$ MPa

Modulo elastico $E_{cm} = 22000 \cdot [f_{cm}/10]^{0.3} = 33642.78$ MPa

4.1.2 Calcestruzzo – pile e spalle

Classe di resistenza C32/40 fck/Rck = 32/40 MPa

Resistenza di calcolo (SLU) $f_{cd} = \frac{\alpha_{cc} \cdot f_{ck}}{\gamma_c} = 18.81$ MPa

Resistenza a compressione media $f_{cm} = f_{ck} + 8 = 41.20$ MPa

Resistenza a trazione semplice $f_{ctm} = 0,3 \cdot f_{ck}^{2/3} = 3.10$ MPa

Modulo elastico $E_{cm} = 22000 \cdot [f_{cm}/10]^{0.3} = 33642.78$ MPa

4.2 ACCIAIO

4.2.1 Acciaio per cemento armato tipo B450C

Tensione caratteristica di snervamento $f_{yk} \geq 450$ MPa

Tensione caratteristica di rottura $f_{tk} \geq 540$ MPa

Resistenza di calcolo $f_{yd} = \frac{f_{yk}}{1,15} = 391$ MPa

4.2.2 Acciaio per carpenteria tipo S355

Tensione caratteristica di rottura $f_{tk} = 470$ MPa (per s>40mm)

$f_{tk} = 510$ MPa (per s<40mm)

Resistenza caratteristica di snervamento f_{yk} 335 MPa (per s>40mm)

f_{yk} 355 MPa (per s<40mm)

Coefficiente di sicurezza $\gamma_{M0} = 1,05$

Coefficiente di sicurezza per verifiche a fatica $\gamma_{M,F} = 1{,}35$

4.2.3 Acciaio in reti e tralicci elettrosaldati ad aderenza migliorata per c.a.

Tipo di acciaio: B450C ad aderenza migliorata, controllato in stabilimento

Tensione caratteristica di snervamento: $f_{yk} \geq 450$ MPa

Tensione caratteristica di rottura: $f_{tk} \geq 540$ MPa

Allungamento percentuale: $A_{gtk} \geq 7.5\%$

4.3 BULLONI AD ALTA RESISTENZA – CLASSE 10.9

Vite:	classe 10.9 (UNI EN 14399:2005)
Tensione di rottura a trazione	$f_{tk} \geq 1000$ MPa
Tensione di snervamento	$f_{yk} \geq 900$ MPa

4.4 PIOLI CON TESTA

Acciaio:	S235J2G3+C450
Tensione di rottura a trazione	$f_{tk} \geq 450$ MPa
Tensione di snervamento	$f_{yk} \geq 370$ MPa
Allungamento	$A_5 \geq 15\%$

4.5 SALDATURE DI TESTA O A T A COMPLETA PENETRAZIONE

Giunto di prima classe: $f_{d,S355} = 338$ MPa

Giunto di seconda classe: $0.85 f_{d,S355} = 287.38$ MPa

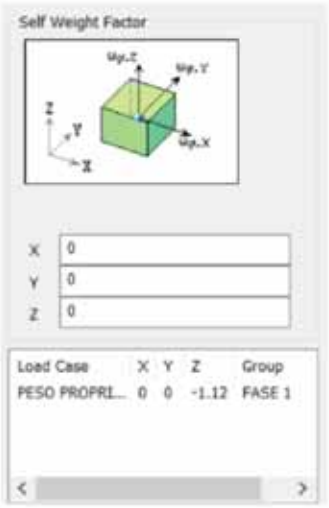
4.6 SALDATURE A CORDONE D'ANGOLO

Per S355: $|\sigma_{\perp}|\ ,\ |\tau_{\perp}|\ ,\ |\tau_{//}| \leq 0.70 f_{d,S355} = 236.6$ MPa

5 ANALISI GENERALE DEI CARICHI

5.1 PESI PROPRI STRUTTURALI

I pesi strutturali delle opere in acciaio comprensive di travi principali, trave di spina, traversi e controventi, vengono considerati in automatico nel programma di calcolo. Per considerare l'effetto del "piastrame", è stato scelto di aumentare il peso proprio del 12%, come riportato nell'immagine che segue.



5.2 PESI PROPRI PORTATI

I pesi proprio portati sono stati presi in conto nel modello di calcolo utilizzato, come carichi lineari direttamente applicati alle singole travi portanti. Si riporta di seguito la definizione dei carichi applicati.

5.2.1 PESO PROPRIO SOLETTA E CORDOLI

Per la determinazione delle azioni da applicare alle singole travi è stata schematizzata una trave su più appoggi a cui è stata applicato il carico distribuito della soletta e dei cordoli laterali. Le reazioni vincolari risultanti sono poi state applicate alle travi del modello.

PESO SOLETTA		
Hsoletta =	**0,26**	m
γ =	25	kN/mc
peso =	6,5	kN/mq
Carico trave SX =	**17,976**	
Carico trave Centrale =	**19,299**	
Carico trave DX =	**17,976**	

CORDOLI		
Hcordoli =	**0,15**	m
γ =	25	kN/mc
peso =	3,75	kN/mq
Carico trave SX =	**4,037**	
Carico trave Centrale =	**-2,449**	
Carico trave DX =	**4,037**	

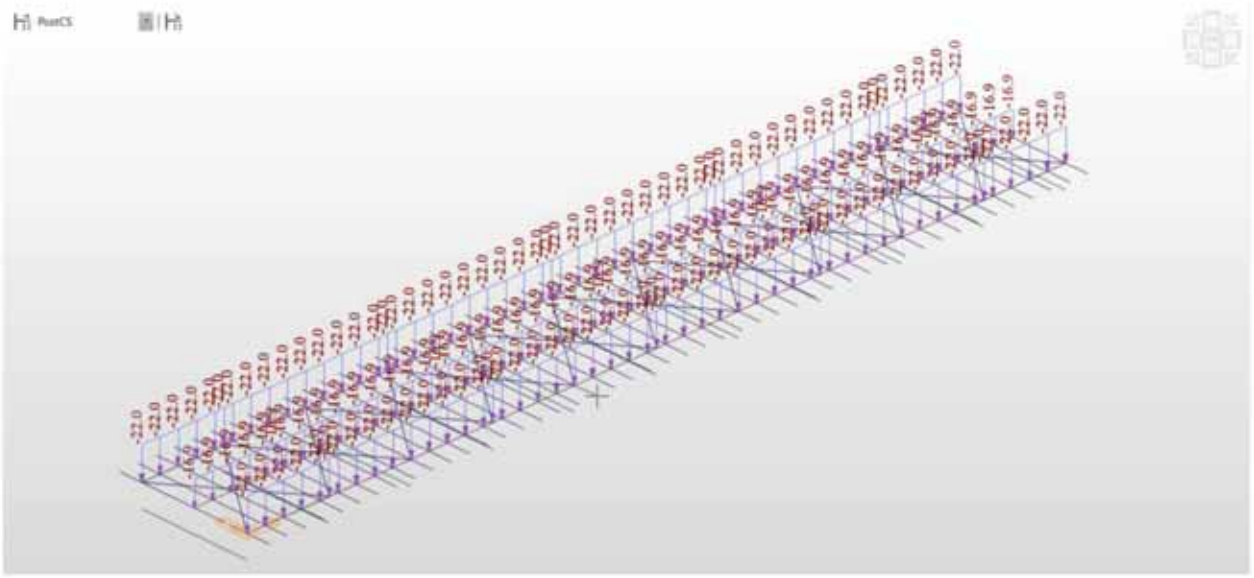


Figura 6 – Pesi propri soletta e cordoli

5.2.2 PESO PERMANENTE PORTATO

Per la determinazione delle azioni da applicare alle singole travi è stata schematizzata una trave su più appoggi a cui è stata applicato il carico del pacchetto stradale e delle barriere bordo ponte. Le reazioni vincolari risultanti sono poi state applicate alle travi del modello.

PERMANENTE PORTATO		
Hsoletta =	**0,11**	cm
γ =	24	kN/mc
peso =	**2,64**	kN/mq
Carico trave SX =	**4,459**	
Carico trave Centrale =	**9,562**	
Carico trave DX =	**4,459**	

BARRIERE+VELETTE E TUBAZIONI		
Barriere =	1.5	kN/ml
Tubazioni =	0.1	kN/ml
Veletta =	0.4	kN/ml
Totale	**2.000**	kN/ml
Carico trave SX =	2.498	
Carico trave Centrale =	-0.995	
Carico trave DX =	2.498	

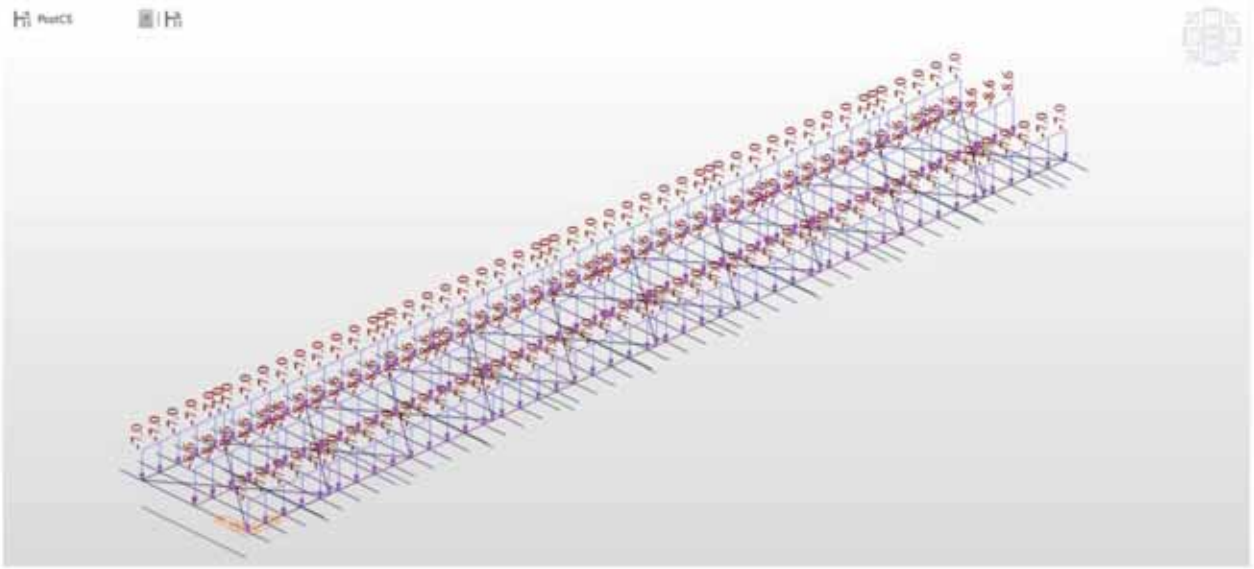


Figura 7 - Peso permanente portato

5.3 AZIONI ACCIDENTALI

5.3.1 Carichi mobili

Le azioni accidentali considerate nei calcoli sono quelle previste dall'attuale D.M. 14.1.2008 per i ponti classificati di prima categoria e calcolate in relazione alla larghezza dell'impalcato.

La carreggiata tra i cordoli ha larghezza di 7,00 m, pertanto sono state considerate ai fini del calcolo 2 corsie da 3,00 m più una parte rimanente di 1,00 m.

Si riporta lo schema di carico 1:

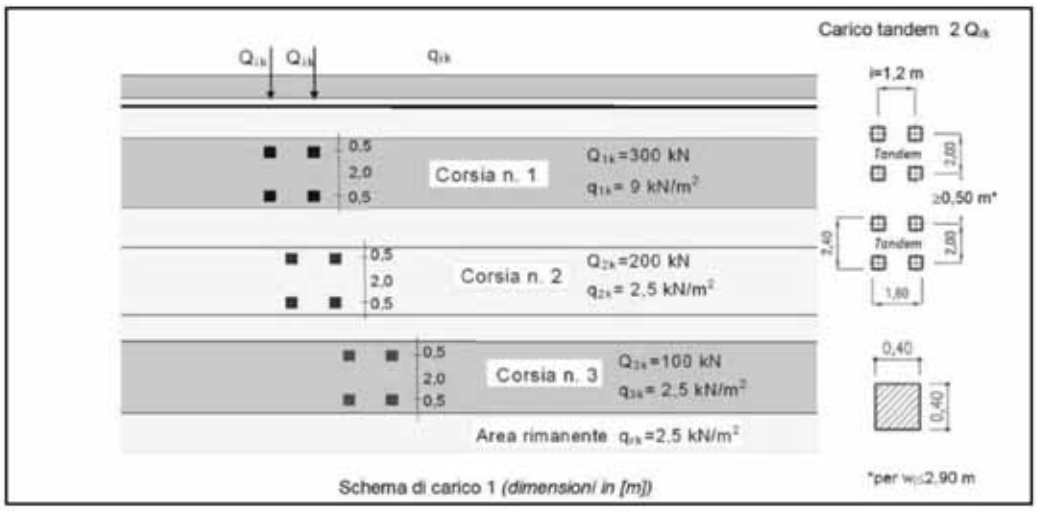


Figura 8 - Schema di carico 1

L'intensità dei carichi da applicare è riportata nella seguente tabella:

Tabella 5.1.II - *Intensità dei carichi* Q_{ik} *e* q_{ik} *per le diverse corsie*

Posizione	Carico asse Q_{ik} [kN]	q_{ik} [kN/m^2]
Corsia Numero 1	300	9,00
Corsia Numero 2	200	2,50
Corsia Numero 3	100	2,50
Altre corsie	0,00	2,50

Le suddette colonne di carico sono state disposte secondo lo schema longitudinale che produce le azioni accidentali più gravose per la struttura in esame.

Si riportano di seguito alcune immagini dei carichi considerati.

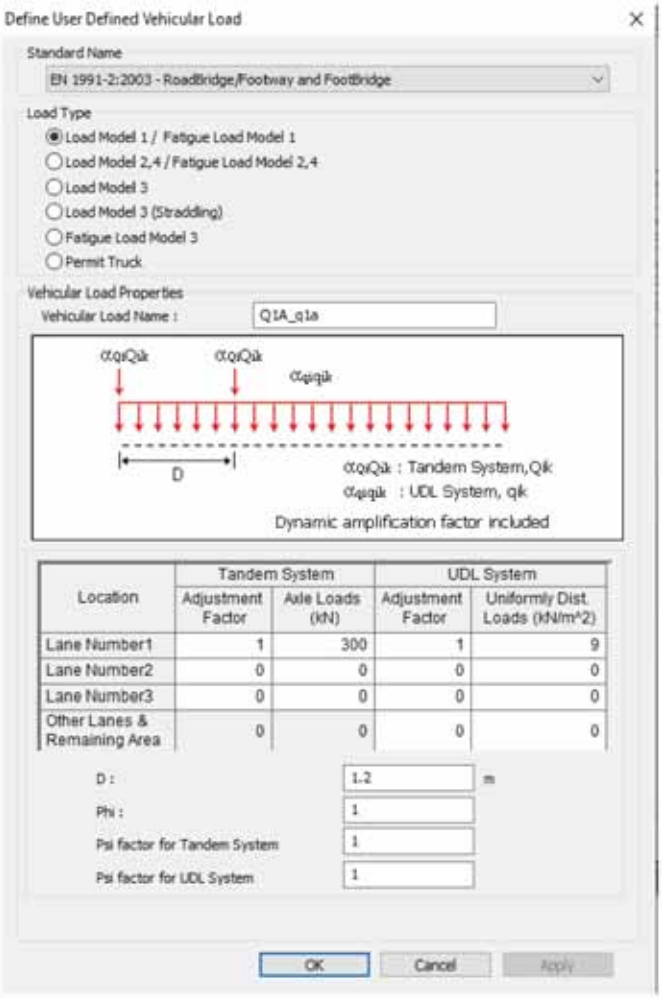


Figura 9 - Colonna di carico 1

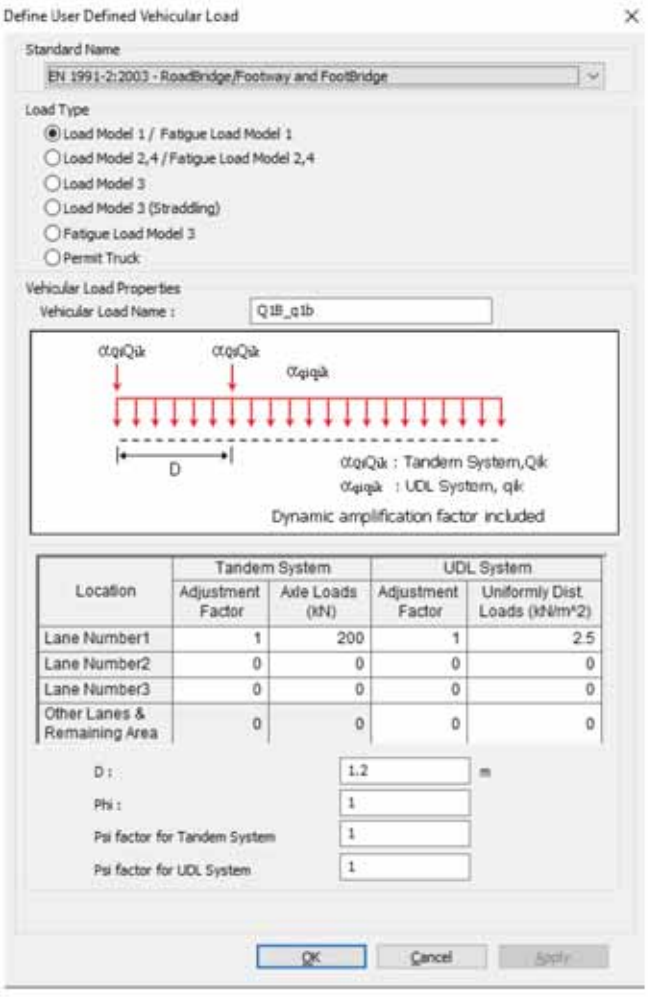


Figura 10 - Colonna di carico 2

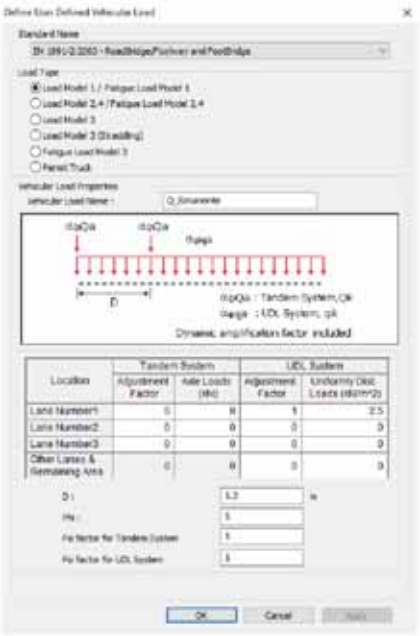


Figura 11 - Colonna di carico 3

5.3.2 Frenamento

FRENATURA		
Si considera un'azione longitudinale funzione del carico verticale agente sulla corsia convenzionale n°1		
Qlk = 0.6 x (2 x Q1k) + 0.10 x q1k x W1 x L		
Qlk =	482,850	kN
qlk =	3,537	kN

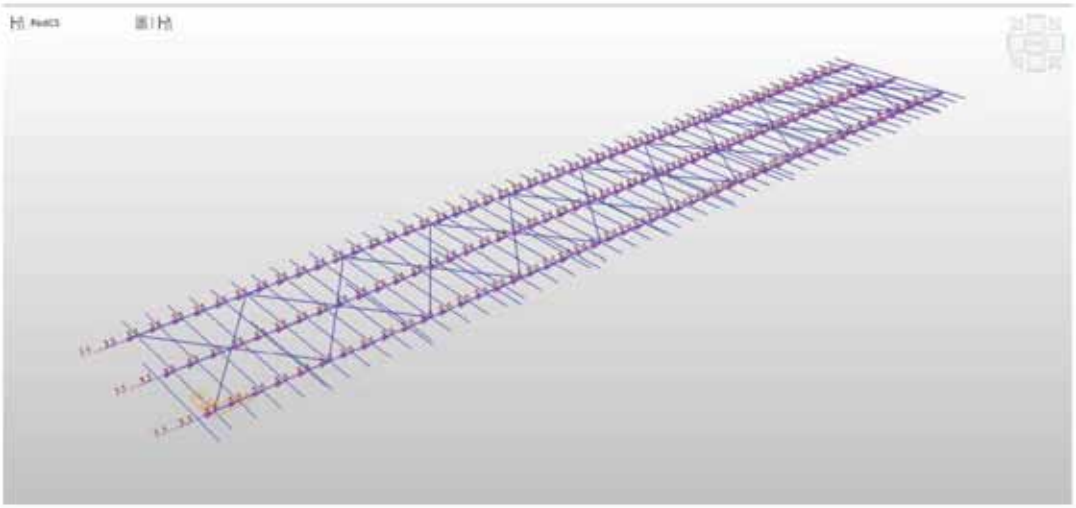
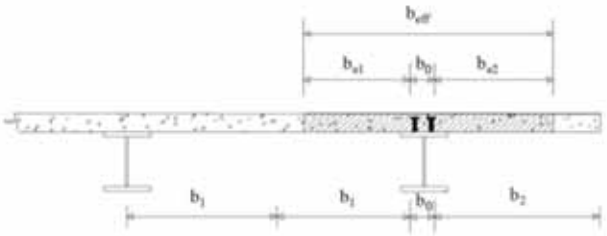


Figura 12 - Frenamento

5.4 CALCOLO SEZIONE COLLABORANTE

La distribuzione delle tensioni normali negli elementi composti è stata determinata mediante un modello che tiene conto della diffusione degli sforzi nelle ali della trave metallica e nella soletta in calcestruzzo. La larghezza efficace, beff, della soletta in calcestruzzo è stata determinata, in conformità a quanto prescritto dalla normativa, mediante l'espressione: beff = b0 + be1 + be2, in cui b0 è la distanza tra gli assi dei connettori esterni e bei = min (Le/8, bi) è il valore della larghezza collaborante da ciascun lato della sezione composta.



L_e, nelle travate in semplice appoggio, indica la luce della trave.

Per il caso in esame si ha:

Le =	44,00	m			
Le/8 =	5,5	m			
b0 =	0,382	m			
bi2 =	1,059	m	SBALZO		
bi1 =	1,402	m	DISTANZA		
be2 =	1,059				
be1=	1,402				
	2,843	m	**TRAVE PRINCIPALE**		
beff =					
	2,804	m	**TRAVE DI SPINA**		

5.5 AZIONI METEORICHE

5.5.1 Azioni dovute alla neve

Il carico dovuto alla neve, non risulta dimensionante per il tipo di struttura

5.5.2 Azioni dovute al vento

Viene di seguito riportata una tabella di calcolo per la determinazione della pressione del vento da applicare alla struttura

AZIONE DEL VENTO				
(Inserire i dati necessari nelle celle campite)	*simbolo*	*valore*	*unità*	*formula*
Altitudine sul livello del mare	a_s =	630	[m]	
Regione	Sicilia e Provincia di Reggio Calabria			
	Zona =	4		
Parametri tabella 3.3.I	v_{b0} =	28	[m/s]	
Parametri tabella 3.3.I	a_0 =	500	[m]	
Parametri tabella 3.3.I	k_s =	0.360	[-]	
Coefficiente di altitudine	c_a =	1.094	[-]	
Velocità di riferimento	v_b =	30.6	[m/s]	
Periodo di ritorno	T_R =	50	[anni]	
Velocità di riferimento associata a T_R = 50	v_b =	30.6	[m/s]	
Velocità di riferimento	v_r =	30.6	[m/s]	$v_r = v_b \times c_r$
CALCOLO PRESSIONE DEL VENTO				
Densità dell'aria	ρ =	1.25	[kg/m^3]	
Pressione cinetica di riferimento	**q_r =**	**586.9**	**[N/m^2]**	$1/2 \times \rho v_r^2$
Categoria di esposizione del terreno		II		
Parametri per la definizione del coefficiente di esposizione	k_r =	0.19	[-]	
	z_0 =	0.05	[m]	
	z_{min} =	4.00	[m]	
Quota struttura	z =	9	[m]	
Coefficiente di topografia	c_t =	1		
Classe di rugosità		D		
Coefficiente di esposizione	c_e =	2.29		
Coefficiente di forma	c_p =	1.40		
Coefficiente dinamico	c_d =	1		
Pressione del vento	**p =**	**1.88**	**[kN/m^2]**	$p = q_b \times c_e \times c_p \times c_d$

Sulla base delle caratteristiche geometriche dell'impalcato, sono state determinate le azioni da applicare alle strutture in caso di ponte scarico e ponte carico.

VENTO A PONTE SCARICO		
Fh =	4.507	kN/ml
Pv =	0.789	kN/ml
VENTO A PONTE CARICO		
Fh =	10.142	kN/ml
Pv =	0.406	kN/ml

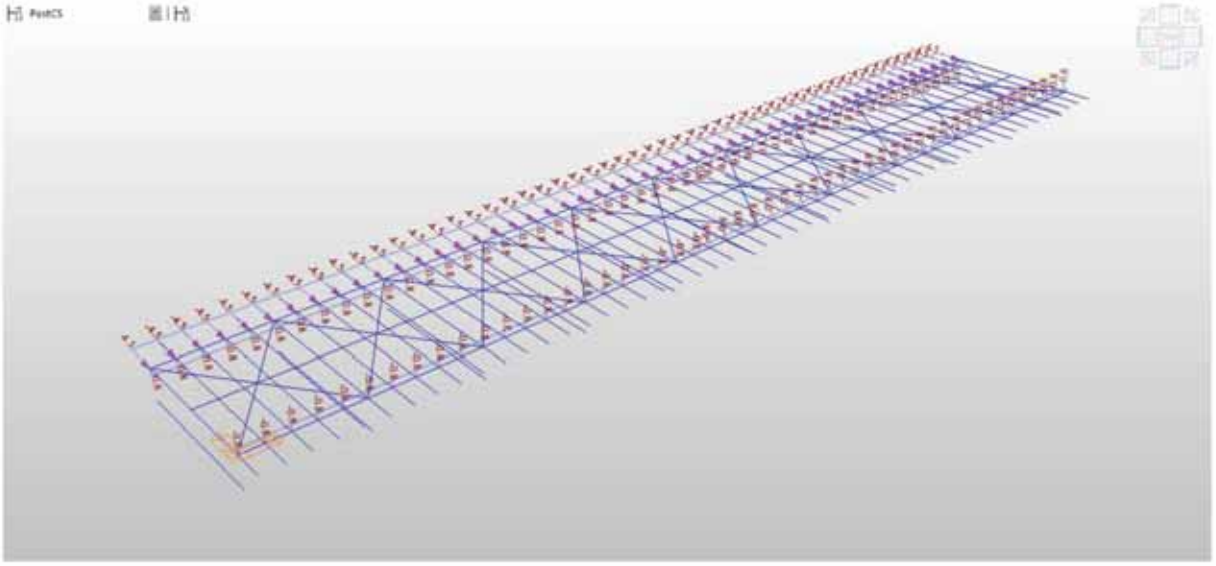


Figura 13 - Vento a ponte scarico

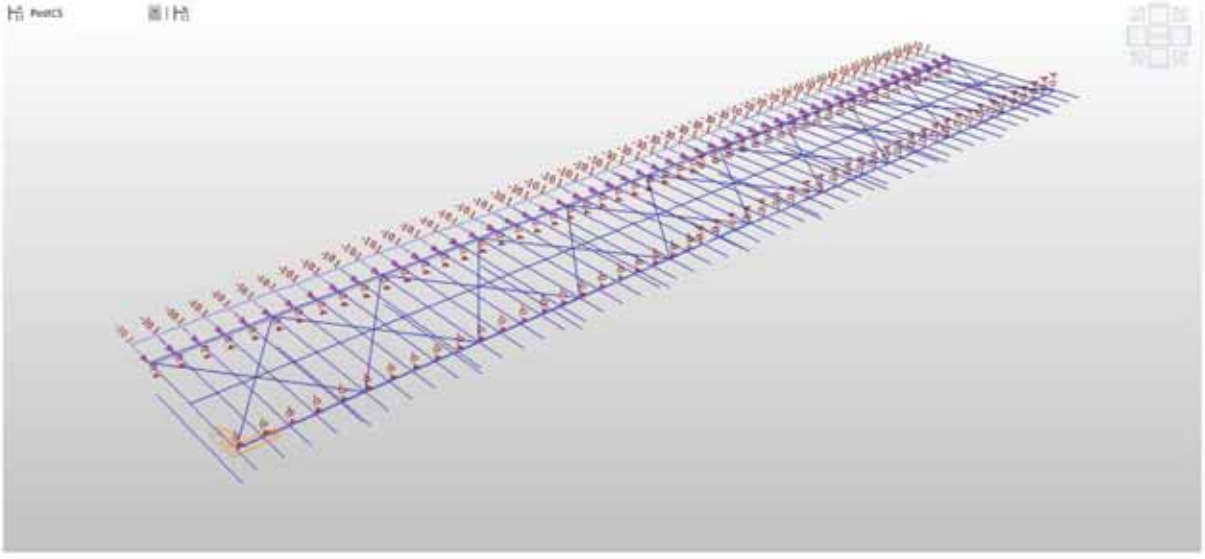
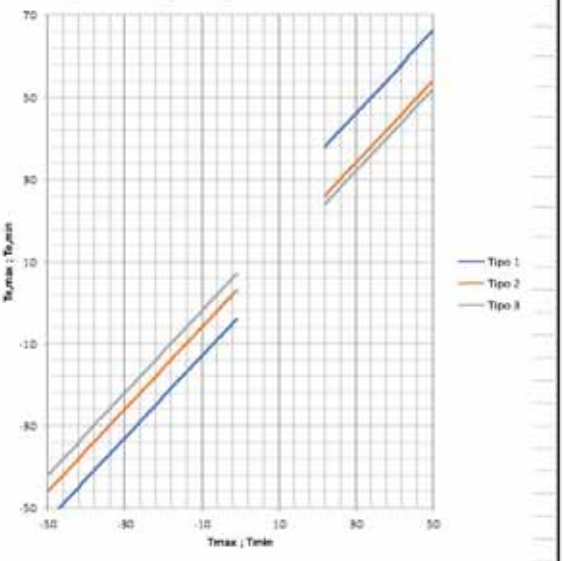


Figura 14 - Vento a ponte carico

5.5.3 Azioni dovute alla temperatura

L'azione termica, sia uniforme che a forma di gradiente, è stata applicata in base a quanto previsto dalla normativa vigente.

AZIONE DELLA TEMPERATURA				
(Inserire i dati necessari nelle celle campite)				
	simbolo	*valore*	*unità*	*formula*
Altitudine di riferimento	a_s =	630	*[m]*	
Individuazione della zona :		Zona IV		
Calabria, Sicilia				
Temperatura massima estiva dell'aria	T_{max} =	45	[°C]	Valore raccomandato in assenza di studi specifici
Temperatura minima invernale dell'aria	T_{min} =	-15	[°C]	Valore raccomandato in assenza di studi specifici
				I valori di Tmax e Tmin sono riferiti ad un periodo di ritorno di 50 anni
Per la valutazione della temperatura uniforme minima/massima del ponte, si considera il grafico riportato nell'eurocodice nella sezione Ponti				
Tipologia di impalcato		Tipo 2		
		Impalcati a struttura mista		
		-		
	T_0 =	15	[°C]	Annesso Nazionale A.1(3)
Legenda 1 - Tipo 1 Te,max = Tmax +16 2 - Tipo 2 Te,max = Tmax +4 3 - Tipo 3 Te,max = Tmax +2 4 - Tipo 1 Te,min = Tmin -3 5 - Tipo 2 Te,min = Tmin +4 6 - Tipo 3 Te,min = Tmin +8				
Calcolo variazione termica uniforme				
Temperatura uniforme del ponte massima	$Te_{,max}$ =	49	[°C]	
Temperatura uniforme del ponte minima	$Te_{,min}$ =	-11	[°C]	
Variazione termica di espansione	$\Delta T_{N,exp}$ =	34	[°C]	
Variazione termica di contrazione	$\Delta T_{N,cont}$ =	-26	[°C]	
Calcolo variazione termica lineare				
Spessore della superficie		100	[mm]	
Coefficiente riduttivo heat	$K_{sur\,heat}$ =	1.00	[-]	
Coefficiente riduttivo cool	$K_{sur\,cool}$ =	1.00	[-]	
Variazione termica lineare (heat)	$\Delta T_{M,heat}$ =	15	[°C]	
Variazione termica lineare (cool)	$\Delta T_{M,cool}$ =	-18	[°C]	

5.6 AZIONE SISMICA

Con riferimento al DM 14.01.2008, sono stati presi in considerazione i seguenti parametri, per il sito in esame:

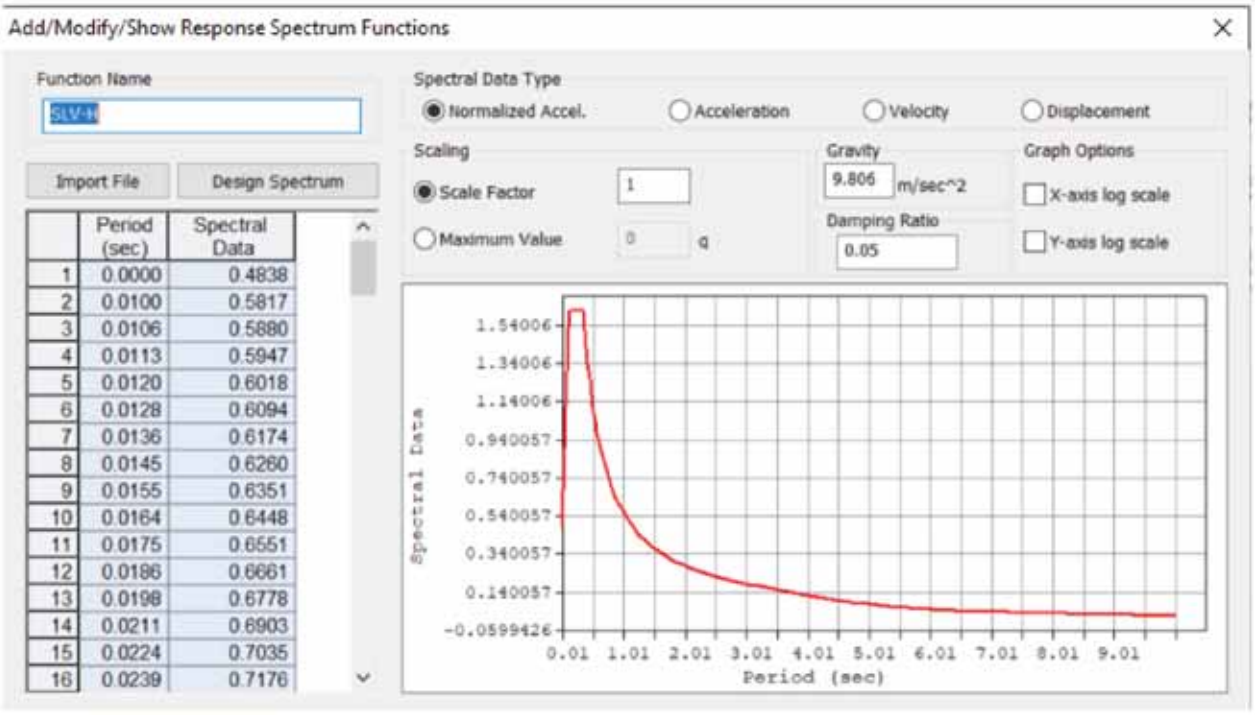
Vita nominale della costruzione – VN = 50 anni

Coefficiente d'uso della costruzione – cu = 2.0

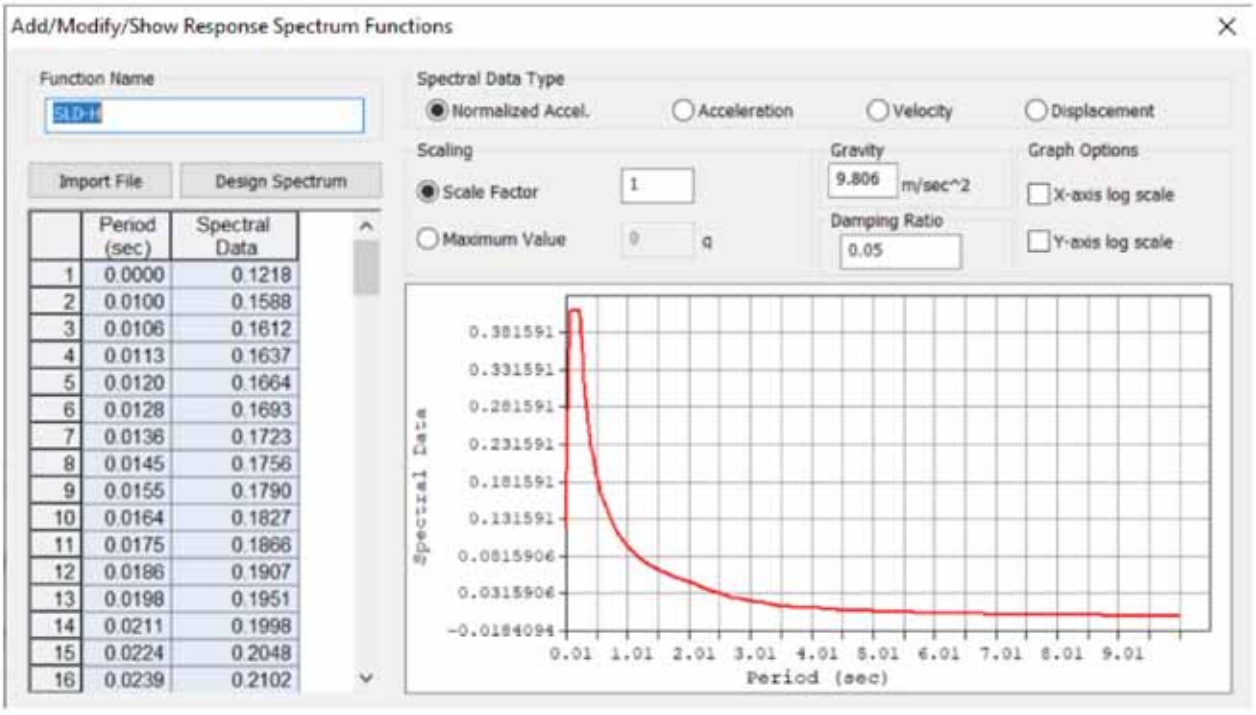
Ne deriva un periodo di riferimento per la costruzione VR=100 anni.

Chilometrica	Categoria di sottosuolo NTC	Categoria topografica	S_T	S_s	ag	F0	Tc*	Latitudine	Longitudine
1+459	RSL	T1							
3+005	B	T1	1,00	1,116	0,301	2,361	0,454	36,959319	14,669724
5+204	B	T1	1,00	1,105	0,312	2,36	0,455	36,975768	14,67698
12+235	RSL	T1							
15+818	RSL	T1							
0+553	RSL	T1							
1+259	B	T1	1,00	1,087	0,332	2,355	0,456	37,091473	14,63782
2+065	B	T1	1,00	1,086	0,333	2,356	0,457	37,098526	14,640441
2+781	B	T1	1,00	1,085	0,334	2,357	0,457	37,104181	14,643716
4+182	B	T1	1,00	1,081	0,337	2,36	0,458	37,114961	14,650551
8+318	B	T1	1,00	1,075	0,344	2,364	0,461	37,147444	14,671512
8+746	B	T1	1,00	1,075	0,344	2,363	0,462	37,151077	14,673177

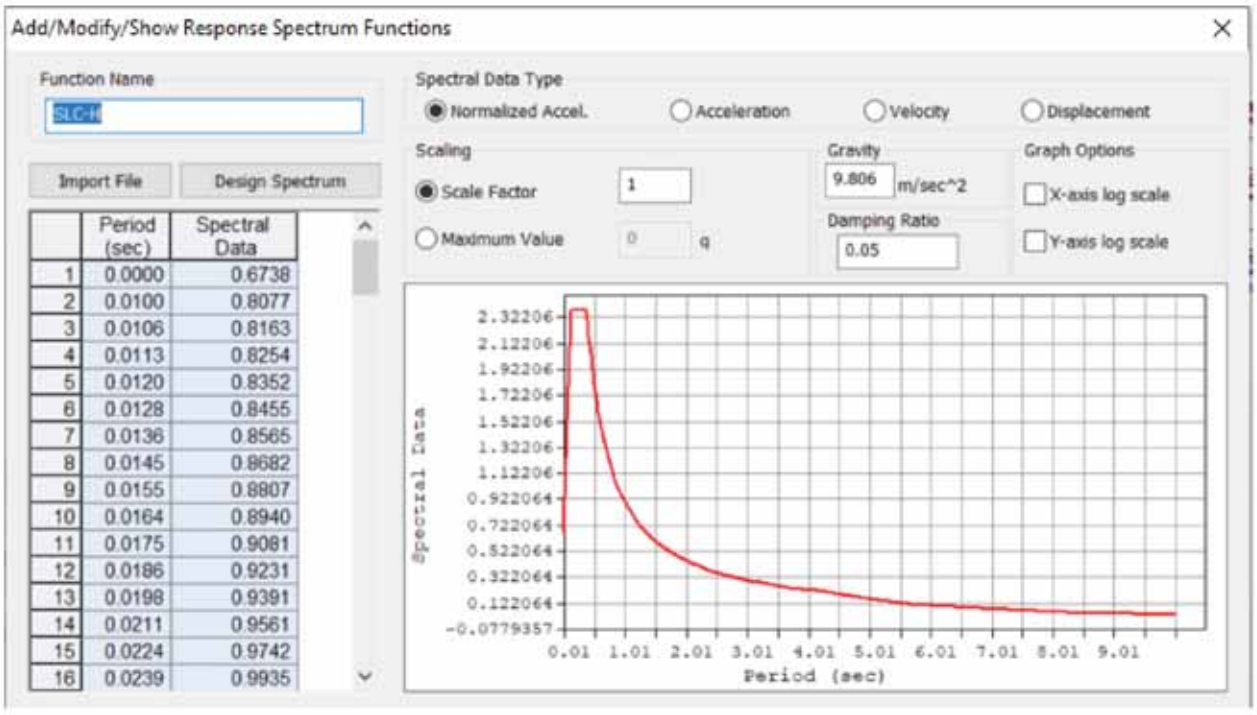
Gli spettri di risposta utilizzati nel programma di calcolo sono rappresentati nelle figure seguenti e sono stati determinati da un analisi sismica locale del sito:



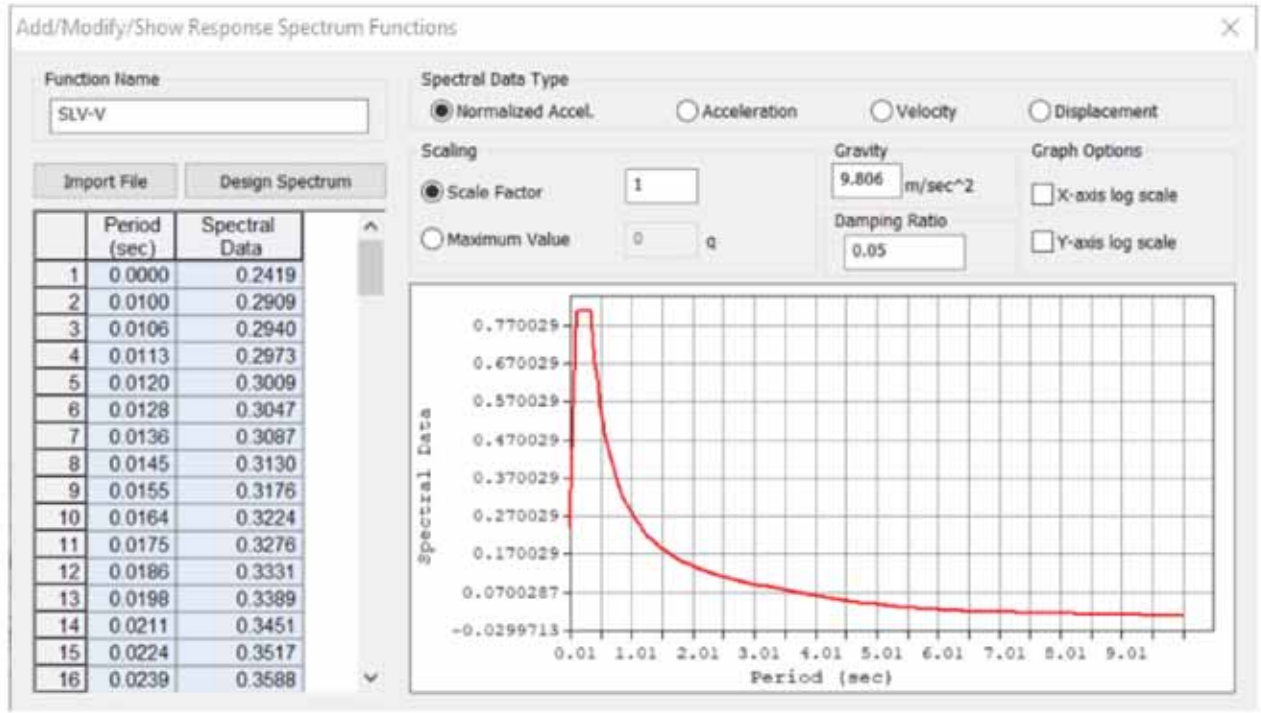
	Period (sec)	Spectral Data
1	0.0000	0.4838
2	0.0100	0.5817
3	0.0106	0.5880
4	0.0113	0.5947
5	0.0120	0.6018
6	0.0128	0.6094
7	0.0136	0.6174
8	0.0145	0.6260
9	0.0155	0.6351
10	0.0164	0.6448
11	0.0175	0.6551
12	0.0186	0.6661
13	0.0198	0.6778
14	0.0211	0.6903
15	0.0224	0.7035
16	0.0239	0.7176



	Period (sec)	Spectral Data
1	0.0000	0.1218
2	0.0100	0.1588
3	0.0106	0.1612
4	0.0113	0.1637
5	0.0120	0.1664
6	0.0128	0.1693
7	0.0136	0.1723
8	0.0145	0.1756
9	0.0155	0.1790
10	0.0164	0.1827
11	0.0175	0.1866
12	0.0186	0.1907
13	0.0198	0.1951
14	0.0211	0.1998
15	0.0224	0.2048
16	0.0239	0.2102



	Period (sec)	Spectral Data
1	0.0000	0.6738
2	0.0100	0.8077
3	0.0106	0.8163
4	0.0113	0.8254
5	0.0120	0.8352
6	0.0128	0.8455
7	0.0136	0.8565
8	0.0145	0.8682
9	0.0155	0.8807
10	0.0164	0.8940
11	0.0175	0.9081
12	0.0186	0.9231
13	0.0198	0.9391
14	0.0211	0.9561
15	0.0224	0.9742
16	0.0239	0.9935



	Period (sec)	Spectral Data
1	0.0000	0.2419
2	0.0100	0.2909
3	0.0106	0.2940
4	0.0113	0.2973
5	0.0120	0.3009
6	0.0128	0.3047
7	0.0136	0.3087
8	0.0145	0.3130
9	0.0155	0.3176
10	0.0164	0.3224
11	0.0175	0.3276
12	0.0186	0.3331
13	0.0198	0.3389
14	0.0211	0.3451
15	0.0224	0.3517
16	0.0239	0.3588

Node	Mode	UX		UY		UZ		RX		RY		RZ	
EIGENVALUE ANALYSIS													
	Mode No	Frequency				Period		Tolerance					
		(rad/sec)		(cycle/sec)		(sec)							
	1	6.005995		0.955884		1.046152		0.0000e+000					
	2	6.129563		0.975550		1.025063		0.0000e+000					
	3	10.475246		1.667187		0.599813		0.0000e+000					
	4	14.718550		2.342530		0.426889		0.0000e+000					
	5	17.977606		2.861225		0.349501		0.0000e+000					
	6	50.076717		7.969957		0.125471		0.0000e+000					
	7	58.521622		9.314005		0.107385		0.0000e+000					
	8	68.042501		10.829300		0.092342		0.0000e+000					
	9	95.765787		15.241598		0.065610		6.2767e-056					
	10	113.897373		18.127330		0.055165		2.8109e-047					
MODAL PARTICIPATION MASSES PRINTOUT													
	Mode No	TRAN-X		TRAN-Y		TRAN-Z		ROTN-X		ROTN-Y		ROTN-Z	
		MASS(%)	SUM(%)	MASS(%)	SUM(%)	MASS(%)	SUM(%)	MASS(%)	SUM(%)	MASS(%)	SUM(%)	MASS(%)	SUM(%)
	1	0.00	0.00	99.94	99.94	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00
	2	100.00	100.00	0.00	99.94	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
	3	0.00	100.00	0.00	99.94	0.00	0.00	0.00	0.03	0.00	0.00	99.99	99.99
	4	0.00	100.00	0.00	99.94	81.58	81.58	0.00	0.03	0.00	0.00	0.00	99.99
	5	0.00	100.00	0.04	99.98	0.00	81.58	79.44	79.47	0.00	0.00	0.00	99.99
	6	0.00	100.00	0.00	99.98	0.00	81.58	0.00	79.47	81.47	81.47	0.00	99.99
	7	0.00	100.00	0.00	99.98	0.00	81.58	0.00	79.47	0.00	81.47	0.00	99.99
	8	0.00	100.00	0.02	100.00	0.00	81.58	0.98	80.45	0.00	81.47	0.00	99.99
	9	0.00	100.00	0.00	100.00	8.58	90.16	0.00	80.45	0.00	81.47	0.00	99.99
	10	0.00	100.00	0.00	100.00	0.00	90.16	8.41	88.85	0.00	81.47	0.00	99.99
	Mode No	TRAN-X		TRAN-Y		TRAN-Z		ROTN-X		ROTN-Y		ROTN-Z	
		MASS	SUM	MASS	SUM	MASS	SUM	MASS	SUM	MASS	SUM	MASS	SUM
	1	0.00	0.00	475.82	475.82	0.00	0.00	0.90	0.90	0.00	0.00	0.00	0.00
	2	476.11	476.11	0.00	475.82	0.00	0.00	0.00	0.90	0.97	0.97	0.00	0.00
	3	0.00	476.11	0.00	475.82	0.00	0.00	0.00	0.90	0.00	0.97	79054.83	79054.83
	4	0.00	476.11	0.00	475.82	388.44	388.44	0.00	0.90	0.00	0.97	0.00	79054.83
	5	0.00	476.11	0.20	476.02	0.00	388.44	2724.18	2725.09	0.00	0.97	0.00	79054.83
	6	0.01	476.12	0.00	476.02	0.00	388.44	0.00	2725.09	46884.35	46885.32	0.00	79054.83
	7	0.00	476.12	0.00	476.02	0.00	388.44	0.00	2725.09	0.00	46885.32	0.05	79054.88
	8	0.00	476.12	0.10	476.12	0.00	388.44	33.50	2758.59	0.00	46885.32	0.00	79054.88
	9	0.00	476.12	0.00	476.12	40.86	429.29	0.00	2758.59	0.00	46885.32	0.00	79054.88
	10	0.00	476.12	0.00	476.12	0.00	429.29	288.26	3046.85	0.00	46885.32	0.00	79054.88

E' stata eseguita un'analisi modale a spettro di risposta. Come si nota dall'immagine sopra riportata, avendo introdotto come appoggi degli isolatori, le azioni sismiche orizzontali si dimostrano praticamente disaccoppiate. In altre parole, andando ad analizzare i modi di vibrare che "muovono" maggior quantitativo di masse, si nota che il modo di vibrare numero 1 e 2 muovono massa in direzione rispettivamente Y ed X in modo disaccoppiato.

6 MODELLAZIONE STRUTTURALE

La modellazione strutturale è stata effettuata tramite il programma di calcolo Midas-Civil, schematizzando l'opera come un graticcio equivalente.

Trattandosi di un impalcato a sezione mista acciaio-cls, nell'ambito della modellazione, sono state introdotte le fasi di maturazione del cls necessarie per le verifiche degli elementi portanti e nel dettaglio:

- ✓ Fase1 : Presenza della sola struttura in acciaio soggetta al solo peso proprio strutturale (durata per la sola fase di varo)

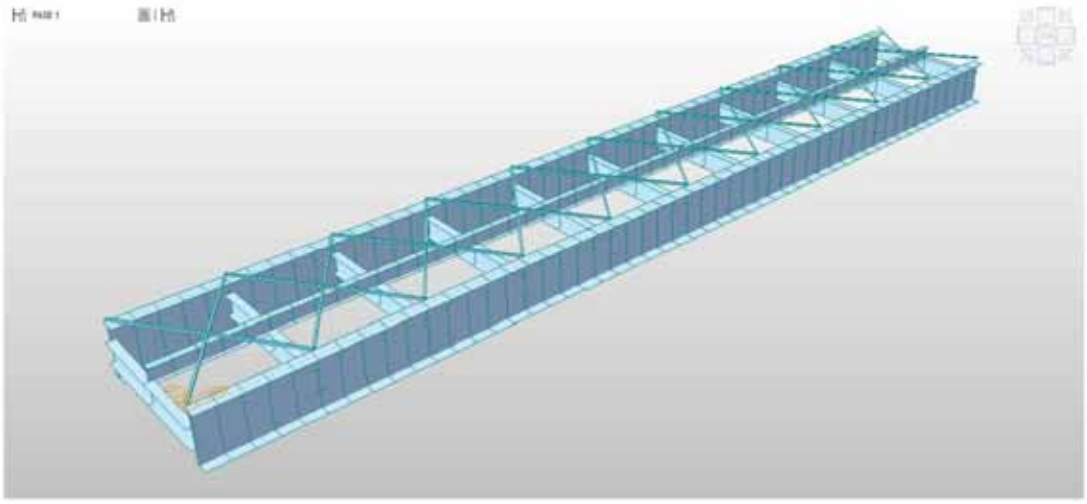


Figura 15 - Schema struttura in Fase 1

- ✓ Fase2: Presenza della struttura in acciaio e della soletta (non ancora collaborante) ma che interviene solo come peso portato (durata della fase 28giorni).

- ✓ Fase 3: Fase in cui hanno corso gli effetti reologici del calcestruzzo e in cui viene posato anche il carico permanente portato (durata giorni – fino alla fine degli effetti reologici).

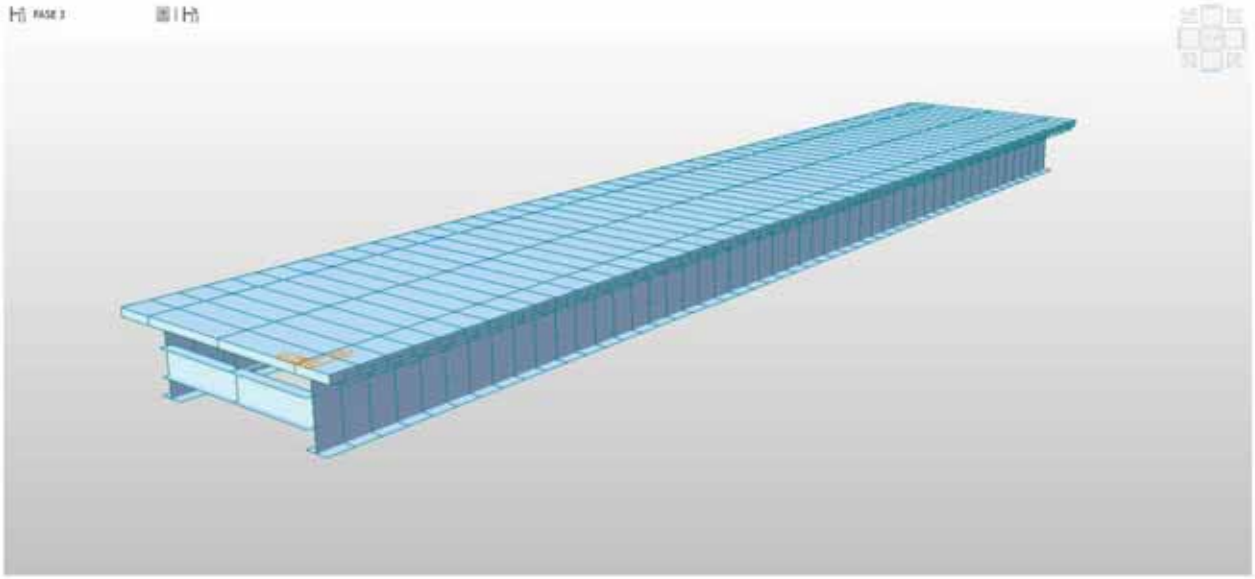
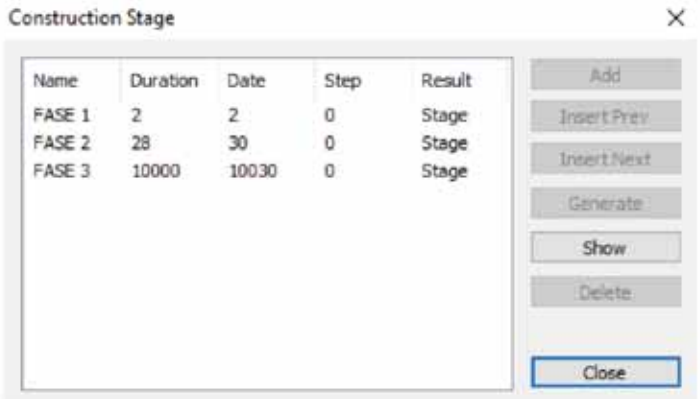
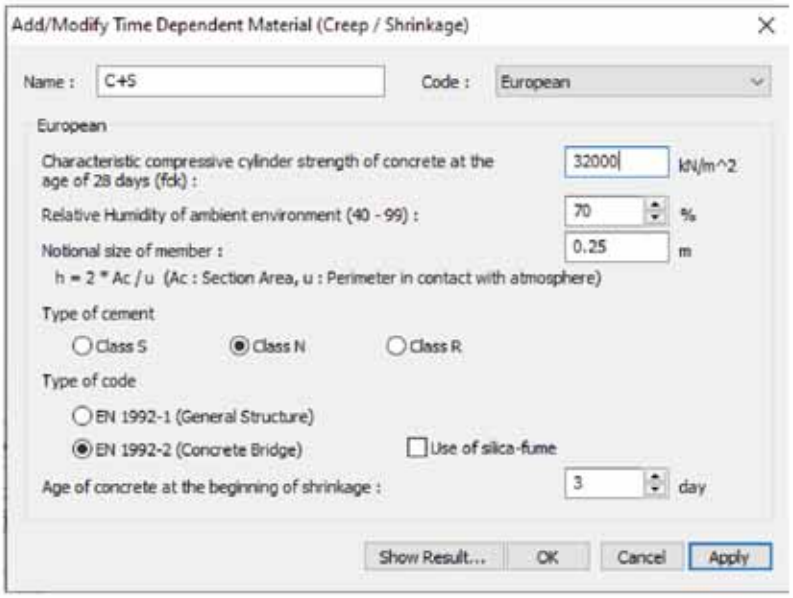
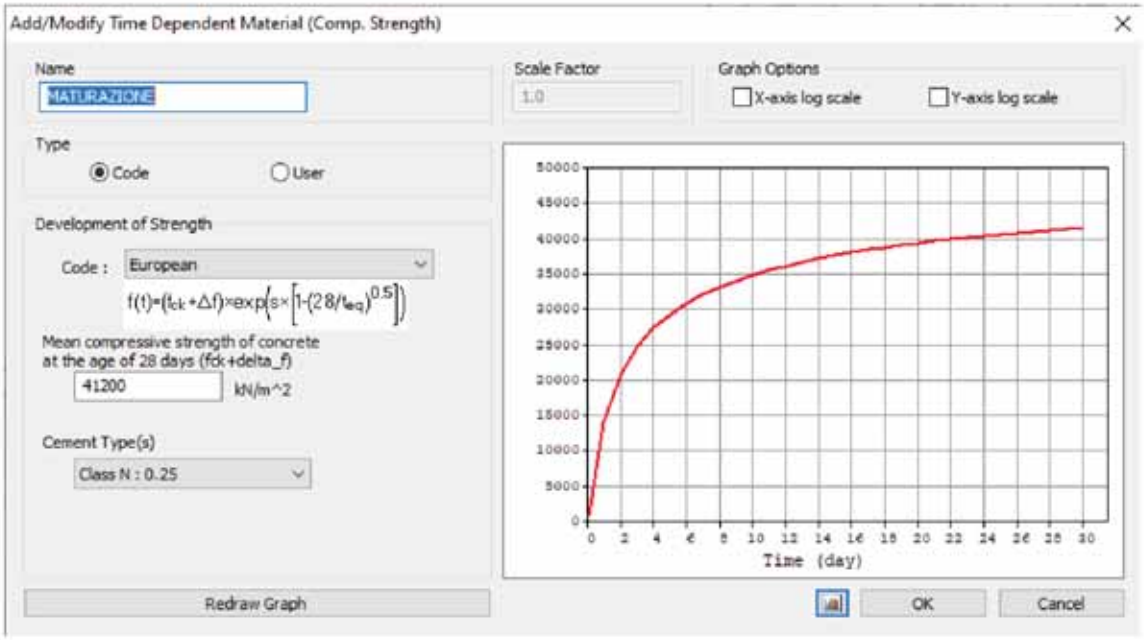


Figura 16 - Schema struttura in Fase 2-3

Inserendo in modo opportuno le varie curve di maturazione e ritiro del calcestruzzo, il programma di calcolo tiene in conto in automatico degli effetti reologici nel tempo. Pertanto, nelle varie fasi di carico, e di maturazione del getto, si instaurano effetti dovuti a ritiro e viscosità che vengono tenuti in conto in automatico dal programma di calcolo nell'ambito delle singole fasi introdotte. La fase 3, che ha una durata effettiva di circa 10000 giorni, ha lo scopo di esaurire tutti gli effetti reologici del calcestruzzo e precede la successiva fase di applicazione dei carichi variabili da traffico e meteorologici.







Per quanto riguarda la soletta, la stessa viene modellata con elementi tipo frame di dimensioni pari all'interasse previsto, e viene utilizzata per l'applicazione in senso trasversale dei carichi mobili. In altre parole, i carichi mobili vengono ripartiti lungo gli elementi principali tramite la soletta.

6.1 COMBINAZIONI DI CARICO

Le combinazioni di carico considerate sono quelle desunte secondo lo schema seguente.

	Carichi sulla carreggiata					*Carichi su marciapiedi e piste ciclabili*
	Carichi verticali			**Carichi orizzontali**		**Carichi verticali**
Gruppo di azioni	Modello principale (Schemi di carico 1, 2, 3, 4, 6)	Veicoli speciali	Folla (Schema di carico 5)	Frenatura q_3	Forza centrifuga q_4	Carico uniformemente distribuito
1	Valore caratteristico					Schema di carico 5 con valore di combinazione 2,5 kN/m^2
2 a	Valore frequente			Valore caratteristico		
2 b	Valore frequente				Valore caratteristico	
3 (*)						Schema di carico 5 con valore caratteristico 5,0 kN/m^2
4 (**)			Schema di carico 5 con valore caratteristico 5,0 kN/m^2			Schema di carico 5 con valore caratteristico 5,0 kN/m^2
5 (***)	Da definirsi per il singolo progetto	Valore caratteristico o nominale				

(*) Ponti di 3ª categoria
(**) Da considerare solo se richiesto dal particolare progetto (ad es. ponti in zona urbana)
(***) Da considerare solo se si considerano veicoli speciali

I coefficienti parziali di sicurezza per le combinazioni di carico SLU sono i seguenti.

		Coefficiente	EQU[1]	A1 STR	A2 GEO
Carichi permanenti	favorevoli sfavorevoli	γ_{G1}	0,90 1,10	1,00 1,35	1,00 1,00
Carichi permanenti non strutturali[2]	favorevoli sfavorevoli	γ_{G2}	0,00 1,50	0,00 1,50	0,00 1,30
Carichi variabili da traffico	favorevoli sfavorevoli	γ_{Q}	0,00 1,35	0,00 1,35	0,00 1,15
Carichi variabili	favorevoli sfavorevoli	γ_{Qi}	0,00 1,50	0,00 1,50	0,00 1,30
Distorsioni e presollecitazioni di progetto	favorevoli sfavorevoli	$\gamma_{\varepsilon 1}$	0,90 1,00[3]	1,00 1,00[4]	1,00 1,00
Ritiro e viscosità, Variazioni termiche, Cedimenti vincolari	favorevoli sfavorevoli	$\gamma_{\varepsilon 2}$, $\gamma_{\varepsilon 3}$, $\gamma_{\varepsilon 4}$	0,00 1,20	0,00 1,20	0,00 1,00

(1) Equilibrio che non coinvolga i parametri di deformabilità e resistenza del terreno: altrimenti si applicano i valori di GEO.
(2) Nel caso in cui i carichi permanenti non strutturali (ad es. carichi permanenti portati) siano compiutamente definiti si potranno adottare gli stessi coefficienti validi per le azioni permanenti.
(3) 1,30 per instabilità in strutture con precompressione esterna
(4) 1,20 per effetti locali

I coefficienti ψ per le azioni variabili per i ponti stradali sono i seguenti.

Azioni	*Gruppo di azioni (Tabella 5.1.IV)*	*Coefficiente ψ_0 di combinazione*	*Coefficiente ψ_1 (valori frequenti)*	*Coefficiente ψ_2 (valori quasi permanenti)*
Azioni da traffico (Tabella 5.1.IV)	Schema 1 (Carichi tandem)	0,75	0,75	0,0
	Schemi 1, 5 e 6 (Carichi distribuiti	0,40	0,40	0,0
	Schemi 3 e 4 (carichi concentrati)	0,40	0,40	0,0
	Schema 2	0,0	0,75	0,0
	2	0,0	0,0	0,0
	3	0,0	0,0	0,0
	4 (folla)	----	0,75	0,0
	5	0,0	0,0	0,0
Vento q_3	Vento a ponte scarico			
	SLU e SLE	0,6	0,2	0,0
	Esecuzione	0,8	----	0,0
	Vento a ponte carico	0,6		
Neve q_5	SLU e SLE	0,0	0,0	0,0
	esecuzione	0,8	0,6	0,5
Temperatura	T_k	0,6	0,6	0,5

Si riporta di seguito una tabella raffigurante tutte le combinazioni di carico utilizzate.

		PESO PROPRIO ACCIAIO	PESO PROPRIO SOLETTA	PERMANENTE PORTATO	VENTO PONTE SCARICO	VENTO PONTE CARICO	TERMICA UNIFORME +	TERMICA UNIFORME -	TERMICA GRADIENTE +	TERMICA GRADIENTE +	FRENATURA	LM01	LM02	LM03	SISMA X	SISMA Y	SISMA Z
SLU	SLU1	1.35	1.35	1.35	1.5	0	0.9	0	0	0	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU2	1.35	1.35	1.35	1.5	0	0	0.9	0	0	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU3	1.35	1.35	1.35	1.5	0	0	0	0.9	0	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU4	1.35	1.35	1.35	1.5	0	0	0	0	0.9	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU5	1.35	1.35	1.35	0	1.5	0.9	0	0	0	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU6	1.35	1.35	1.35	0	1.5	0	0.9	0	0	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU7	1.35	1.35	1.35	0	1.5	0	0	0.9	0	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU8	1.35	1.35	1.35	0	1.5	0	0	0	0.9	1.0125	1.0125	1.0125	1.0125	0	0	0
	SLU9	1.35	1.35	1.35	0.9	0	0.9	0	0	0	1.35	1.35	0	0	0	0	0
	SLU10	1.35	1.35	1.35	0.9	0	0	0.9	0	0	1.35	1.35	0	0	0	0	0
	SLU11	1.35	1.35	1.35	0.9	0	0	0	0.9	0	1.35	1.35	0	0	0	0	0
	SLU12	1.35	1.35	1.35	0.9	0	0	0	0	0.9	1.35	1.35	0	0	0	0	0
	SLU13	1.35	1.35	1.35	0	0.9	0.9	0	0	0	1.35	1.35	0	0	0	0	0
	SLU14	1.35	1.35	1.35	0	0.9	0	0.9	0	0	1.35	1.35	0	0	0	0	0
	SLU15	1.35	1.35	1.35	0	0.9	0	0	0.9	0	1.35	1.35	0	0	0	0	0
	SLU16	1.35	1.35	1.35	0	0.9	0	0	0	0.9	1.35	1.35	0	0	0	0	0
	SLU17	1.35	1.35	1.35	0.9	0	0.9	0	0	0	1.35	1.35	1.35	1.35	0	0	0
	SLU18	1.35	1.35	1.35	0.9	0	0	0.9	0	0	1.35	1.35	1.35	1.35	0	0	0
	SLU19	1.35	1.35	1.35	0.9	0	0	0	0.9	0	1.35	1.35	1.35	1.35	0	0	0
	SLU20	1.35	1.35	1.35	0.9	0	0	0	0	0.9	1.35	1.35	1.35	1.35	0	0	0
	SLU21	1.35	1.35	1.35	0	0.9	0.9	0	0	0	1.35	1.35	1.35	1.35	0	0	0
	SLU22	1.35	1.35	1.35	0	0.9	0	0.9	0	0	1.35	1.35	1.35	1.35	0	0	0
	SLU23	1.35	1.35	1.35	0	0.9	0	0	0.9	0	1.35	1.35	1.35	1.35	0	0	0
	SLU24	1.35	1.35	1.35	0	0.9	0	0	0	0.9	1.35	1.35	1.35	1.35	0	0	0
RARA	RARA_1	1	1	1	1	0	0.6	0	0	0	0.75	0.75	0	0	0	0	0
	RARA_2	1	1	1	1	0	0	0.6	0	0	0.75	0.75	0	0	0	0	0
	RARA_3	1	1	1	1	0	0	0	0.6	0	0.75	0.75	0	0	0	0	0
	RARA_4	1	1	1	1	0	0	0	0	0.6	0.75	0.75	0	0	0	0	0
	RARA_5	1	1	1	0	1	0.6	0	0	0	0.75	0.75	0	0	0	0	0
	RARA_6	1	1	1	0	1	0	0.6	0	0	0.75	0.75	0	0	0	0	0
	RARA_7	1	1	1	0	1	0	0	0.6	0	0.75	0.75	0	0	0	0	0
	RARA_8	1	1	1	0	1	0	0	0	0.6	0.75	0.75	0	0	0	0	0
	RARA_9	1	1	1	0.6	0	0.6	0	0	0	1	1	0	0	0	0	0
	RARA_10	1	1	1	0.6	0	0	0.6	0	0	1	1	0	0	0	0	0
	RARA_11	1	1	1	0.6	0	0	0	0.6	0	1	1	0	0	0	0	0
	RARA_12	1	1	1	0.6	0	0	0	0	0.6	1	1	0	0	0	0	0
	RARA_13	1	1	1	0	0.6	0.6	0	0	0	1	1	0	0	0	0	0
	RARA_14	1	1	1	0	0.6	0	0.6	0	0	1	1	0	0	0	0	0
	RARA_15	1	1	1	0	0.6	0	0	0.6	0	1	1	0	0	0	0	0
	RARA_16	1	1	1	0	0.6	0	0	0	0.6	1	1	0	0	0	0	0
FREQ	FREQ_1	1	1	1	0.2	0	0.5	0	0	0	0.75	0.75	0	0	0	0	0
	FREQ_2	1	1	1	0.2	0	0	0.5	0	0	0.75	0.75	0	0	0	0	0
	FREQ_3	1	1	1	0.2	0	0	0	0.5	0	0.75	0.75	0	0	0	0	0
	FREQ_4	1	1	1	0.2	0	0	0	0	0.5	0.75	0.75	0	0	0	0	0
	FREQ_5	1	1	1	0	0	0.5	0	0	0	0.75	0.75	0	0	0	0	0
	FREQ_6	1	1	1	0	0	0	0.5	0	0	0.75	0.75	0	0	0	0	0
	FREQ_7	1	1	1	0	0	0	0	0.5	0	0.75	0.75	0	0	0	0	0
	FREQ_8	1	1	1	0	0	0	0	0	0.5	0.75	0.75	0	0	0	0	0
	FREQ_9	1	1	1	0.2	0	0.5	0	0	0	0.75	0.75	0.75	0.75	0	0	0
	FREQ_10	1	1	1	0.2	0	0	0.5	0	0	0.75	0.75	0.75	0.75	0	0	0
	FREQ_11	1	1	1	0.2	0	0	0	0.5	0	0.75	0.75	0.75	0.75	0	0	0
	FREQ_12	1	1	1	0.2	0	0	0	0	0.5	0.75	0.75	0.75	0.75	0	0	0
	FREQ_13	1	1	1	0	0	0.5	0	0	0	0.75	0.75	0.75	0.75	0	0	0
	FREQ_14	1	1	1	0	0	0	0.5	0	0	0.75	0.75	0.75	0.75	0	0	0
	FREQ_15	1	1	1	0	0	0	0	0.5	0	0.75	0.75	0.75	0.75	0	0	0
	FREQ_16	1	1	1	0	0	0	0	0	0.5	0.75	0.75	0.75	0.75	0	0	0

QP	QP_1	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
	QP_2	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
	QP_3	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
	QP_4	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
SISMA SLV	SLV1	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	1	0.3	0
	SLV2	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-1	0.3	0
	SLV3	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	1	-0.3	0
	SLV4	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-1	-0.3	0
	SLV5	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0.3	1	0
	SLV6	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0.3	-1	0
	SLV7	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-0.3	1	0
	SLV8	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-0.3	-1	0
	SLV9	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	1	0.3	0
	SLV10	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-1	0.3	0
	SLV11	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	1	-0.3	0
	SLV12	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-1	-0.3	0
	SLV13	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0.3	1	0
	SLV14	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0.3	-1	0
	SLV15	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-0.3	1	0
	SLV16	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-0.3	-1	0
	SLV17	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	1	0.3	0
	SLV18	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-1	0.3	0
	SLV19	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	1	-0.3	0
	SLV20	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-1	-0.3	0
	SLV21	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0.3	1	0
	SLV22	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0.3	-1	0
	SLV23	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-0.3	1	0
	SLV24	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-0.3	-1	0
	SLV25	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	1	0.3	0
	SLV26	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	-1	0.3	0
	SLV27	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	1	-0.3	0
	SLV28	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	-1	-0.3	0
	SLV29	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	0.3	1	0
	SLV30	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	0.3	-1	0
	SLV31	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	-0.3	1	0
	SLV32	1	1	1	0	0	0	0	0	0.5	0	0	0	0	0	-0.3	-1	0
	SLV33	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0.3	0.3	1
	SLV34	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-0.3	0.3	1
	SLV35	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0.3	-0.3	1
	SLV36	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-0.3	-0.3	1
	SLV37	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0.3	0.3	1
	SLV38	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-0.3	0.3	1
	SLV39	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0.3	-0.3	1
	SLV40	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-0.3	-0.3	1
	SLV41	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0.3	0.3	1
	SLV42	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-0.3	0.3	1
	SLV43	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0.3	-0.3	1
	SLV44	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-0.3	-0.3	1
	SLV45	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0.3	0.3	-1
	SLV46	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-0.3	0.3	-1
	SLV47	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	0.3	-0.3	-1
	SLV48	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-0.3	-0.3	-1
	SLV49	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0.3	0.3	-1
	SLV50	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-0.3	0.3	-1
	SLV51	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	0.3	-0.3	-1
	SLV52	1	1	1	0	0	0	0.5	0	0	0	0	0	0	0	-0.3	-0.3	-1
	SLV53	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0.3	0.3	-1
	SLV54	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-0.3	0.3	-1
	SLV55	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	0.3	-0.3	-1
	SLV56	1	1	1	0	0	0	0	0.5	0	0	0	0	0	0	-0.3	-0.3	-1
SISMA SLD	SLD1	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	1	0	0
	SLD2	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-1	0	0
	SLD3	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	1	0	0
	SLD4	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0	-1	0	0

6.2 VERIFICHE STRUTTURALI

6.2.1 VERIFICA ELEMENTI DI IMPALCATO

Si riportano di seguito alcune immagini del modello 3D effettuato con la suddivisione in conci delle travi principali.

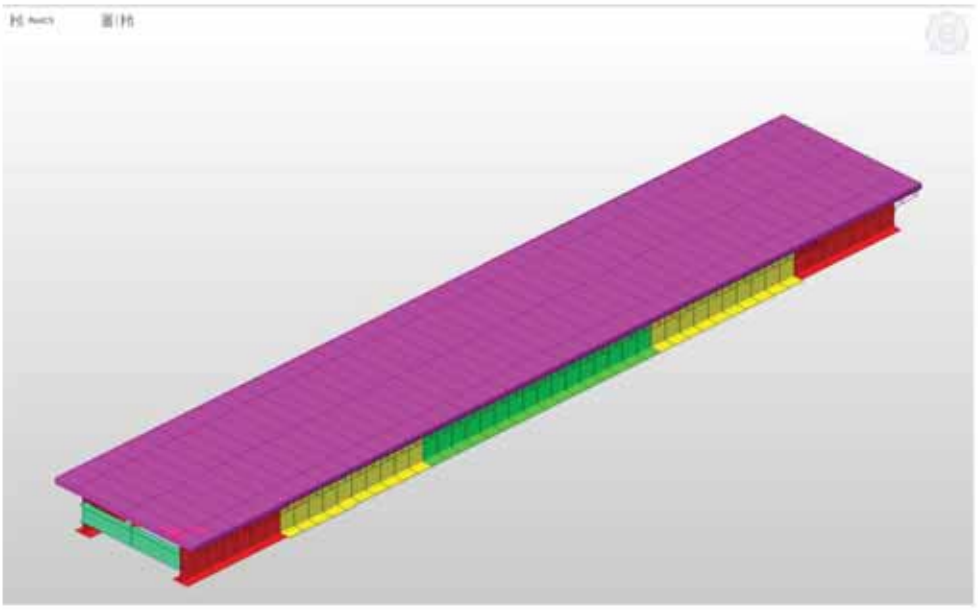


Figura 17 - Immagine modello 3D

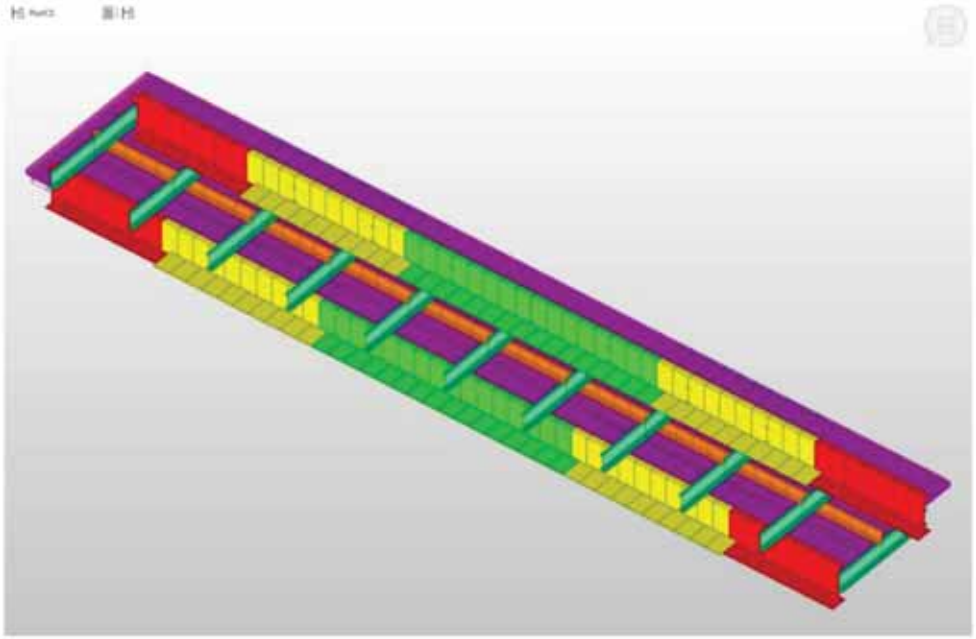


Figura 18 - Immagine modello 3D

Si riportano inoltre i diagrammi delle sollecitazioni M, N e T nelle varie fasi operative.

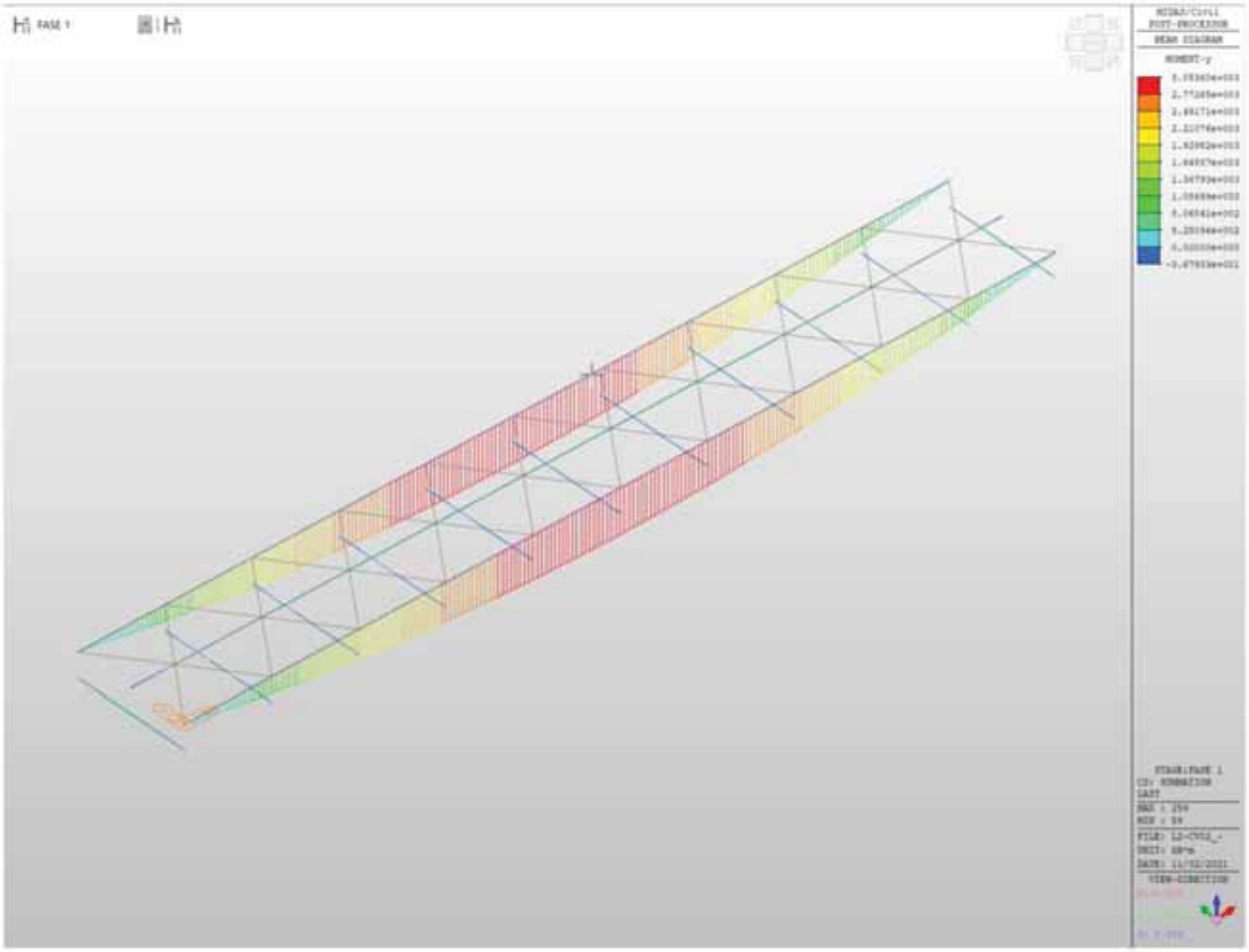


Figura 19 - Diagramma My - Fase 1

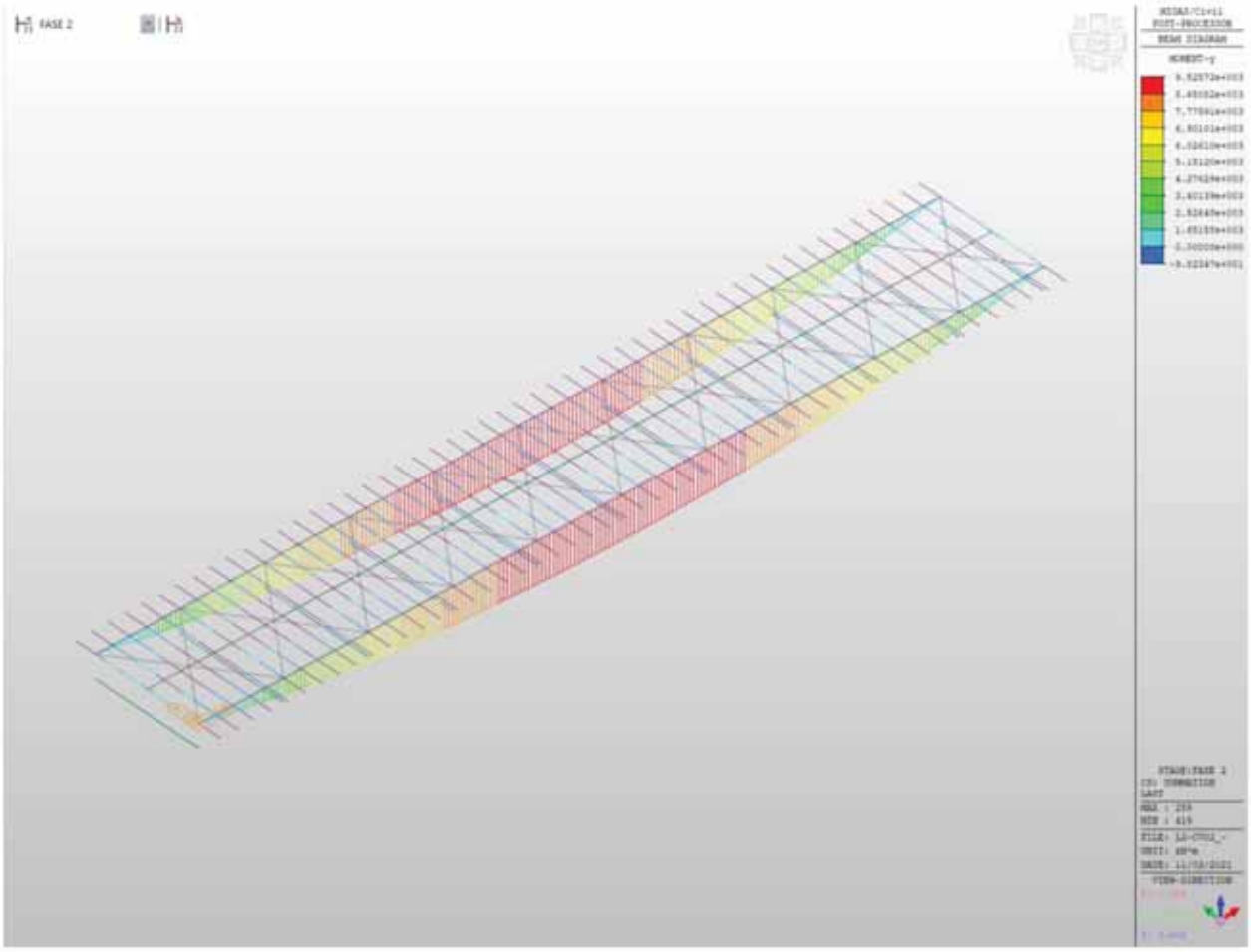


Figura 20 - Diagramma My - Fase 2

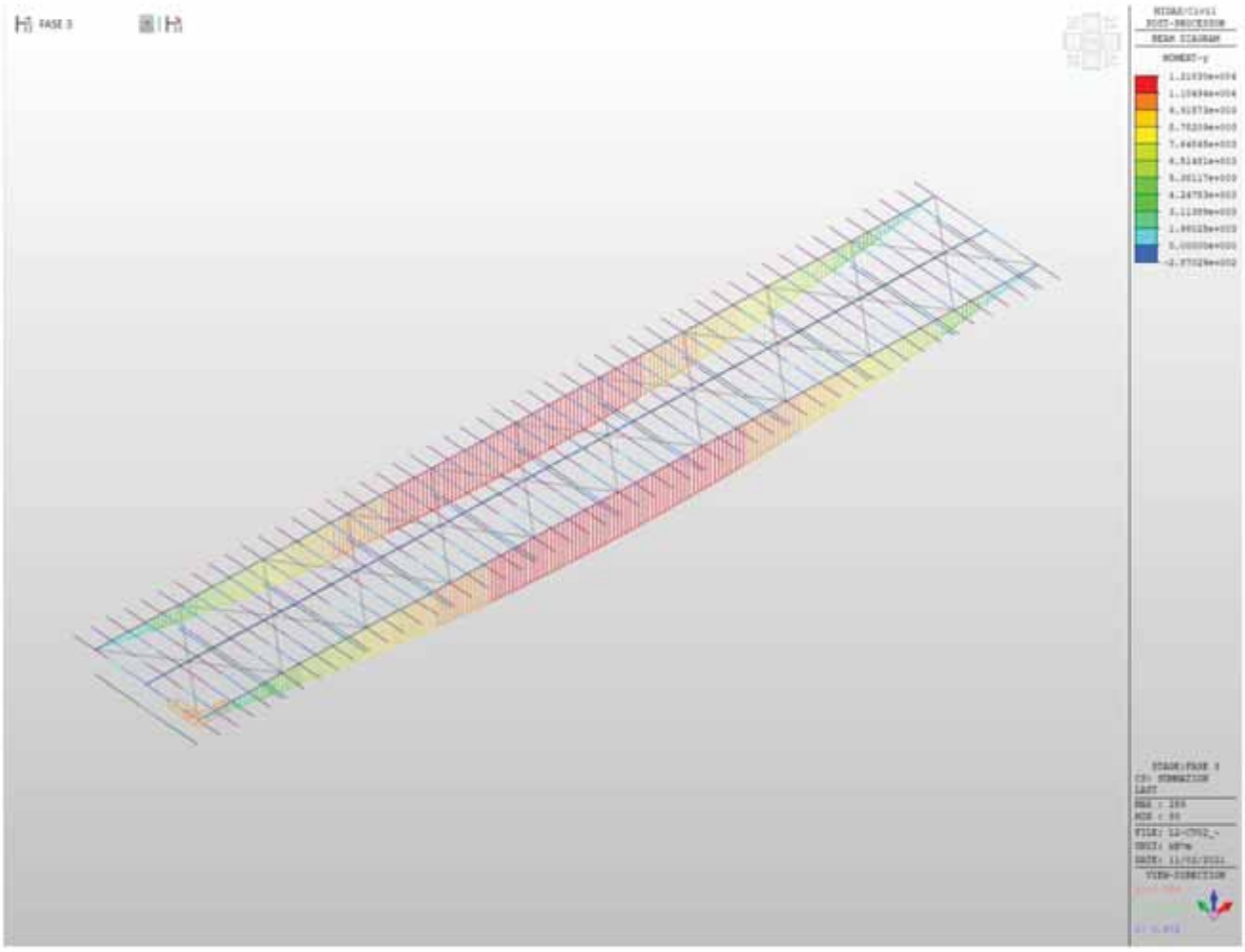


Figura 21 - Diagramma My - Fase 3

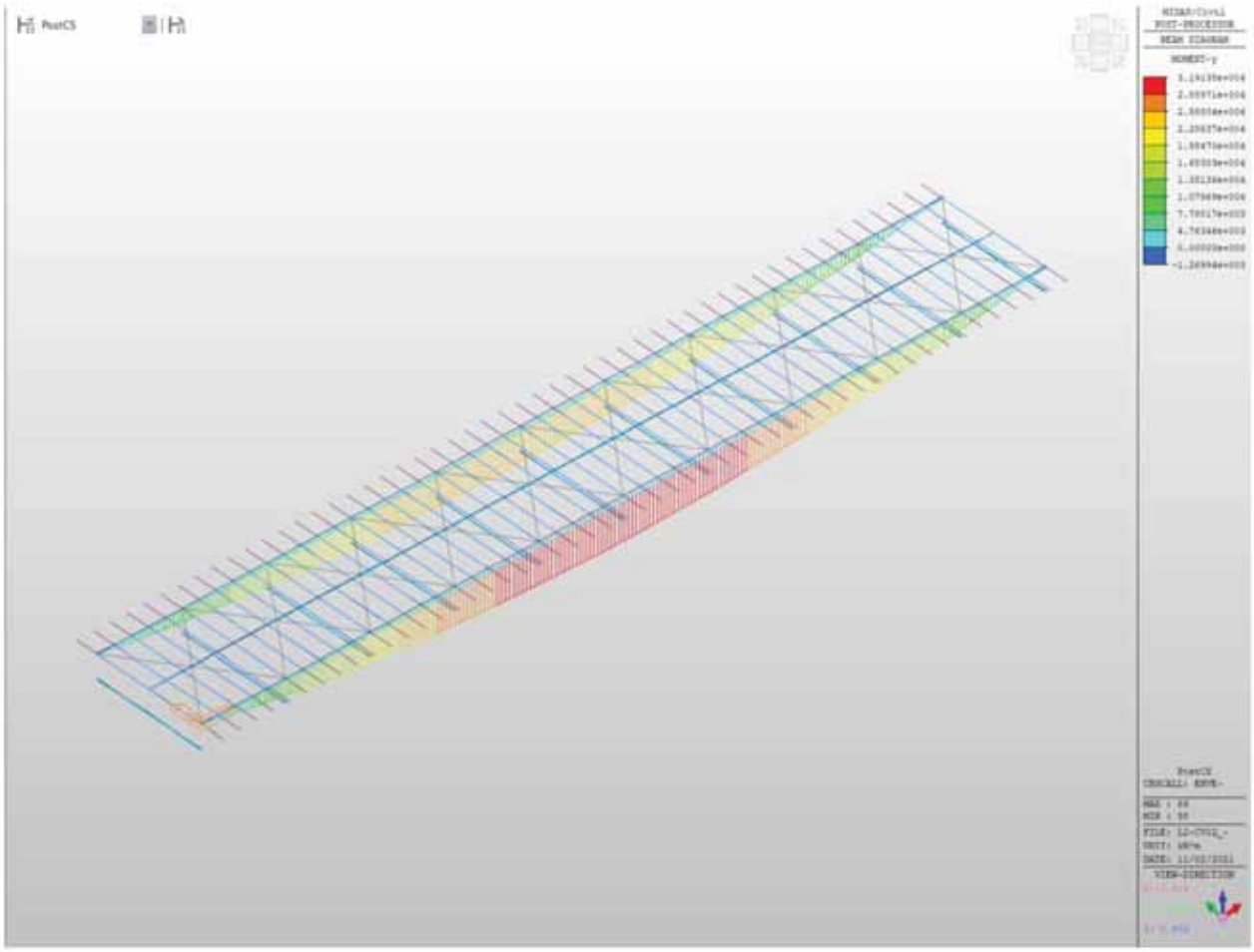


Figura 22 - Diagramma My – Inviluppo SLU-SLV

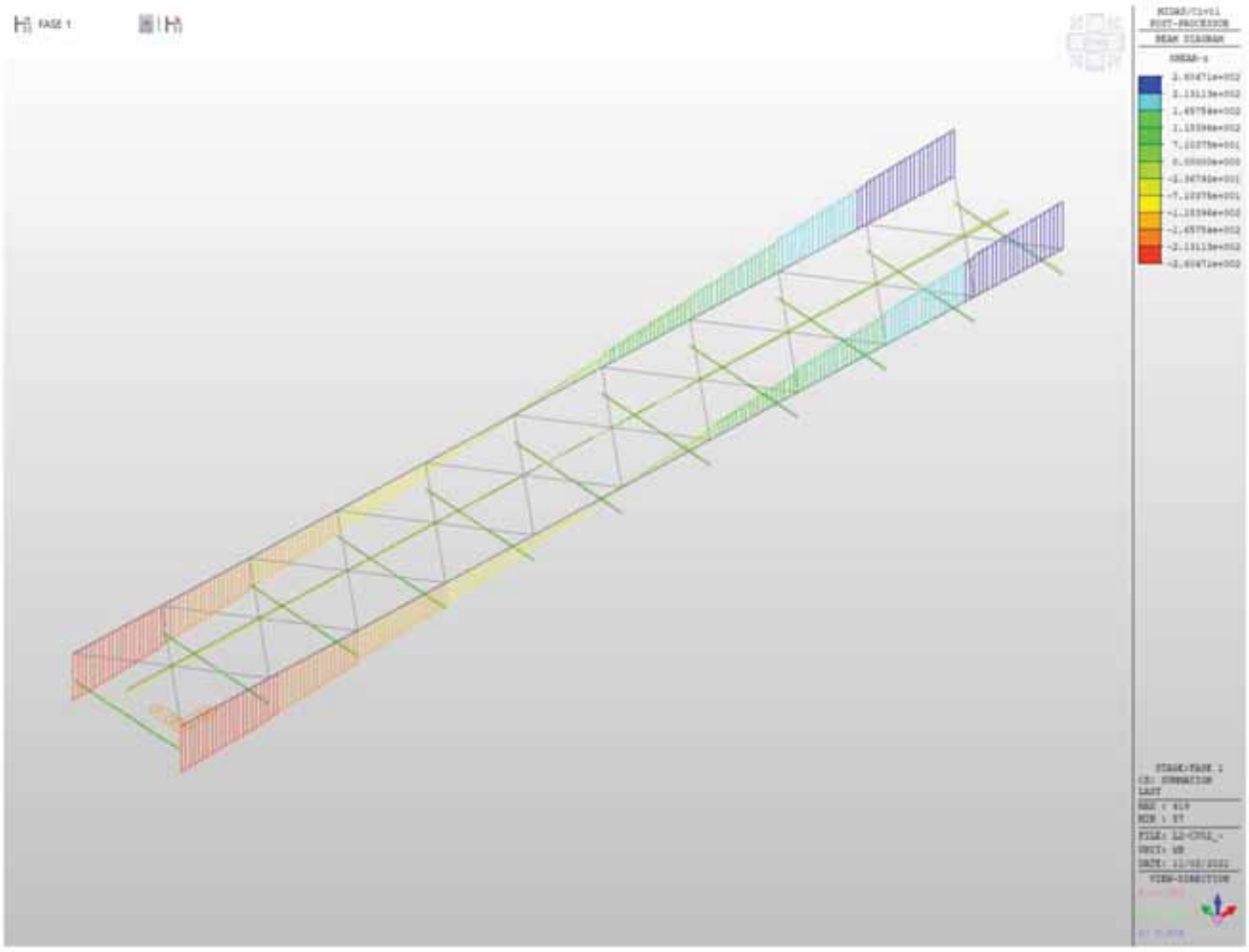


Figura 23 - Diagramma Tz - Fase 1

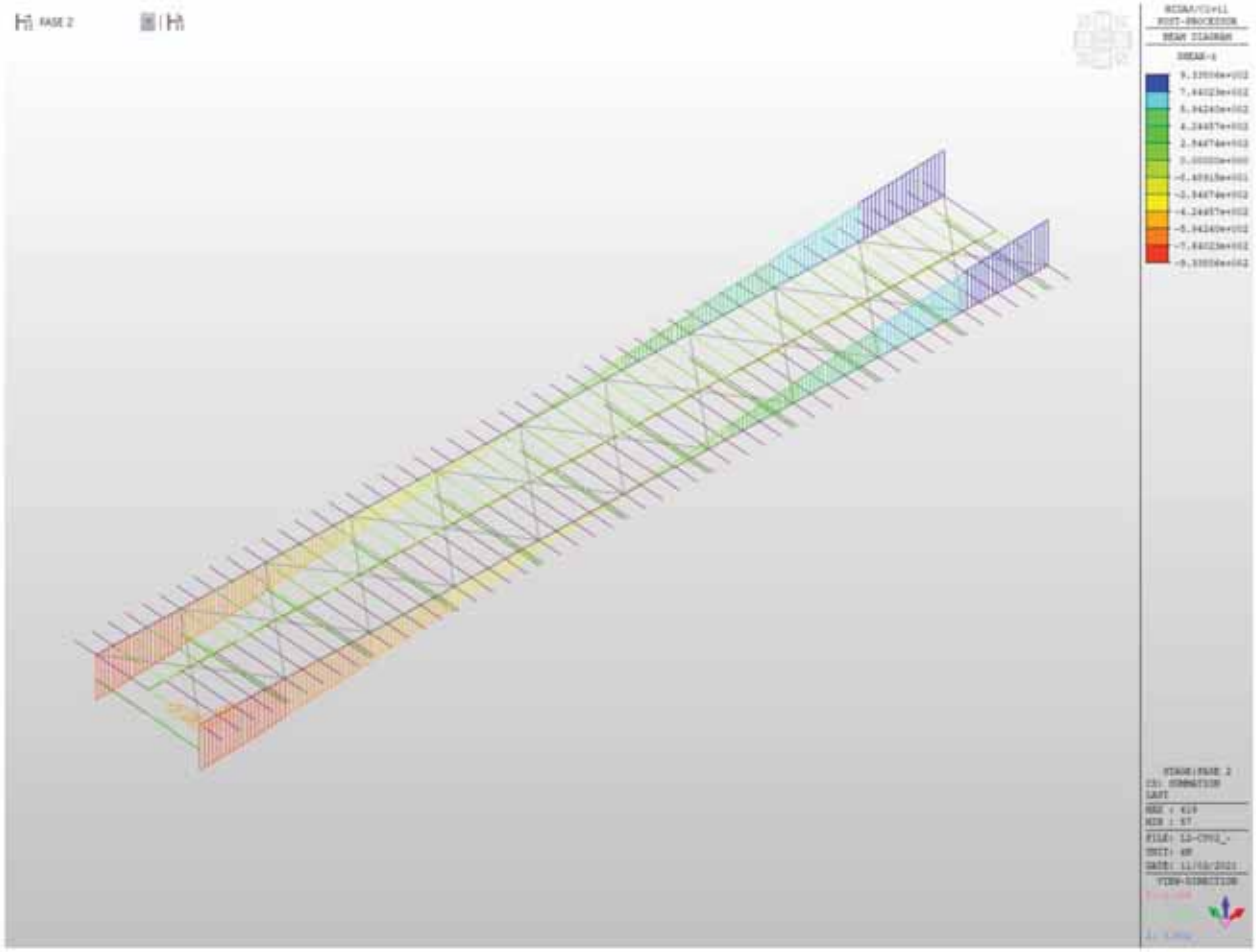


Figura 24 - Diagramma Tz - Fase 2

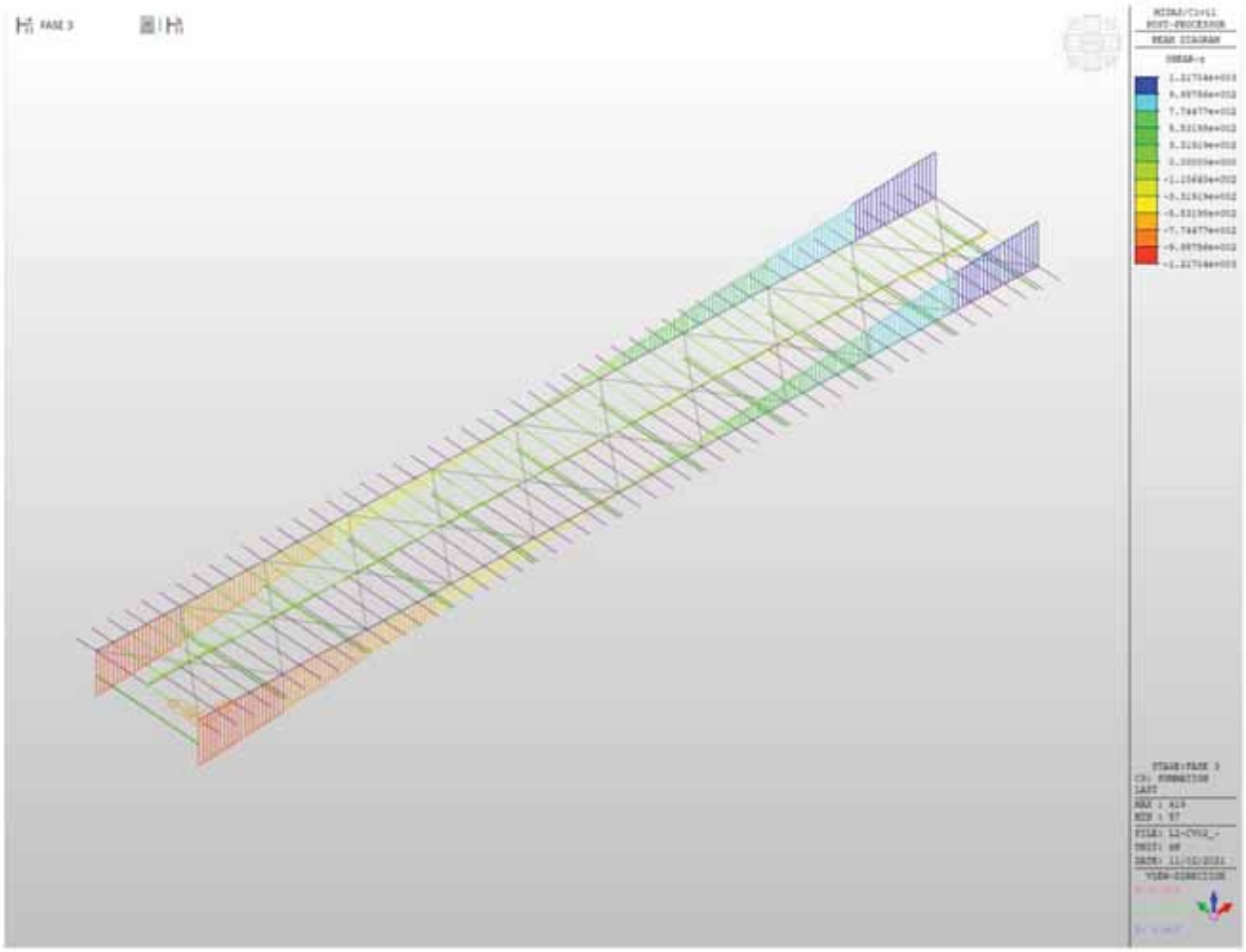


Figura 25 - Diagramma Tz - Fase 3

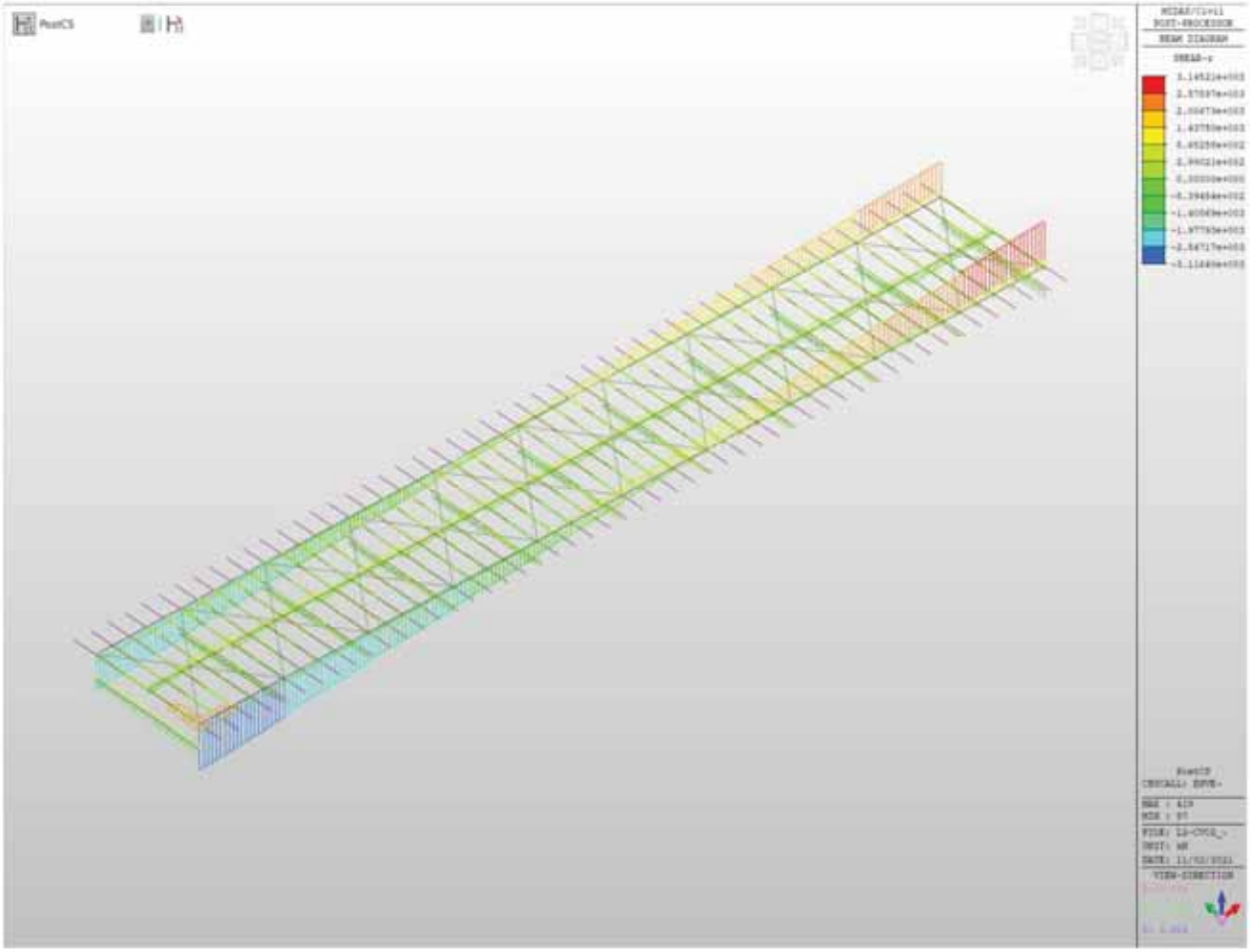


Figura 26 - Diagramma Tz - Inviluppo SLU-SLV

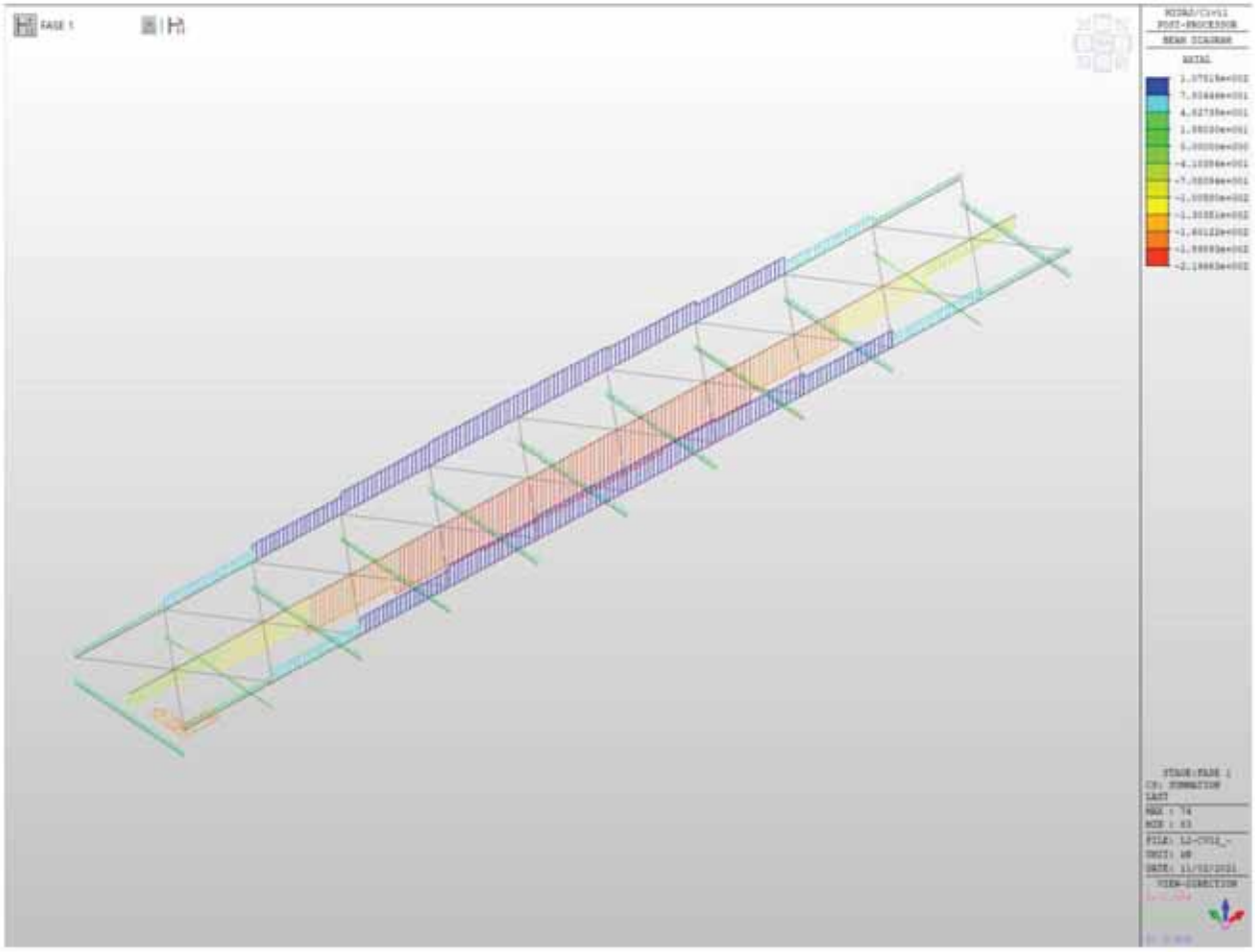


Figura 27 - Diagramma N - Fase 1

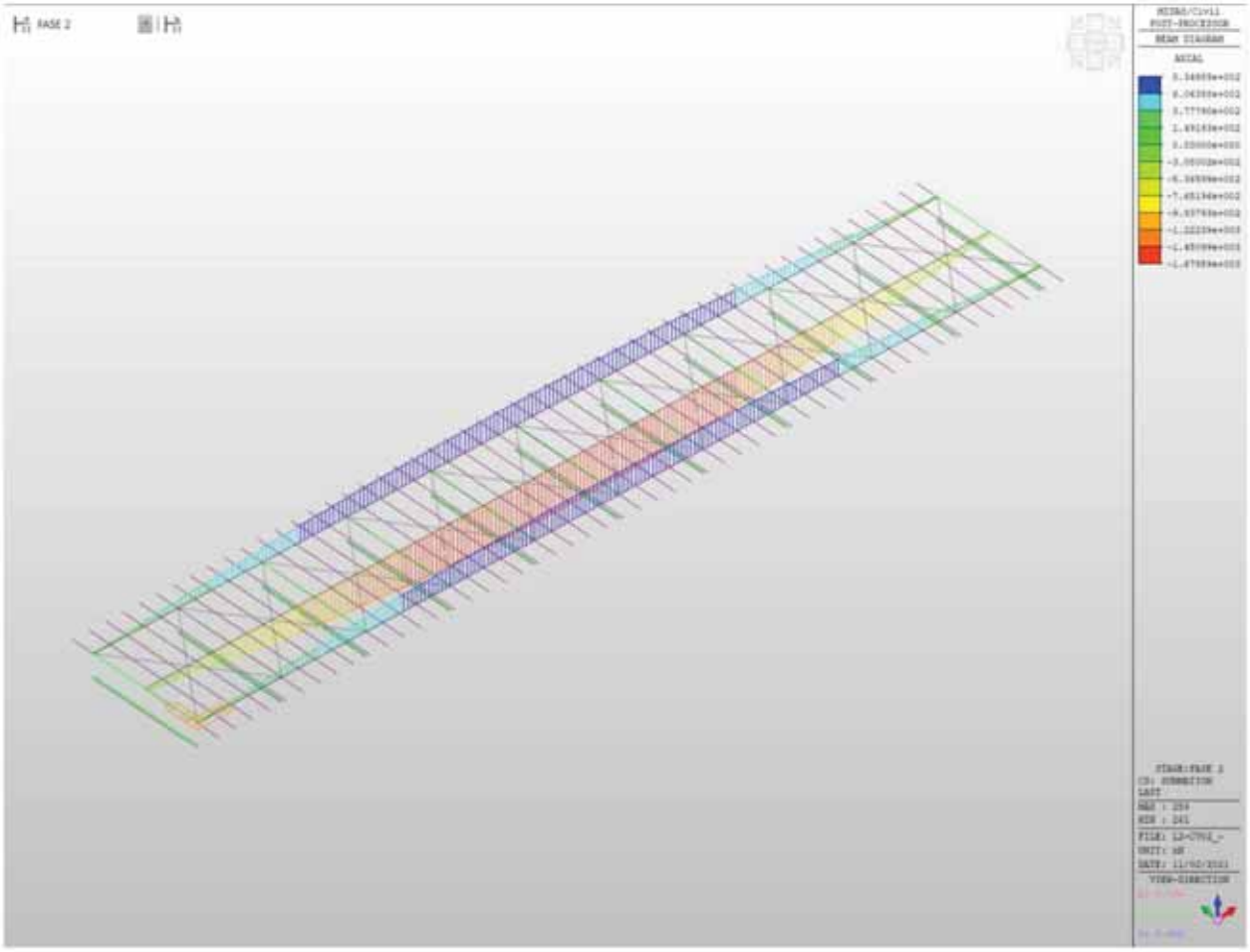


Figura 28 - Diagramma N - Fase 2

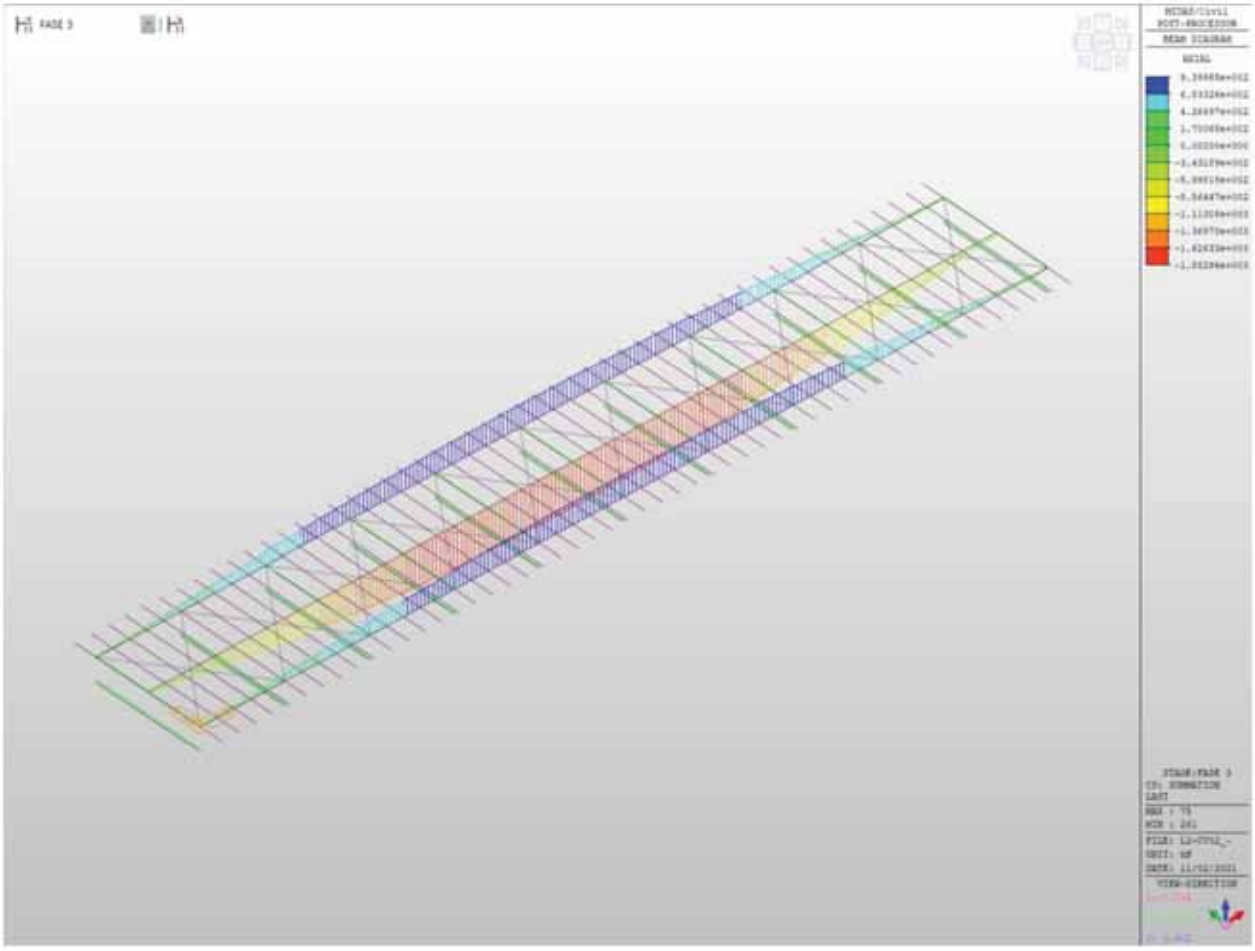


Figura 29 - Diagramma N - Fase 3

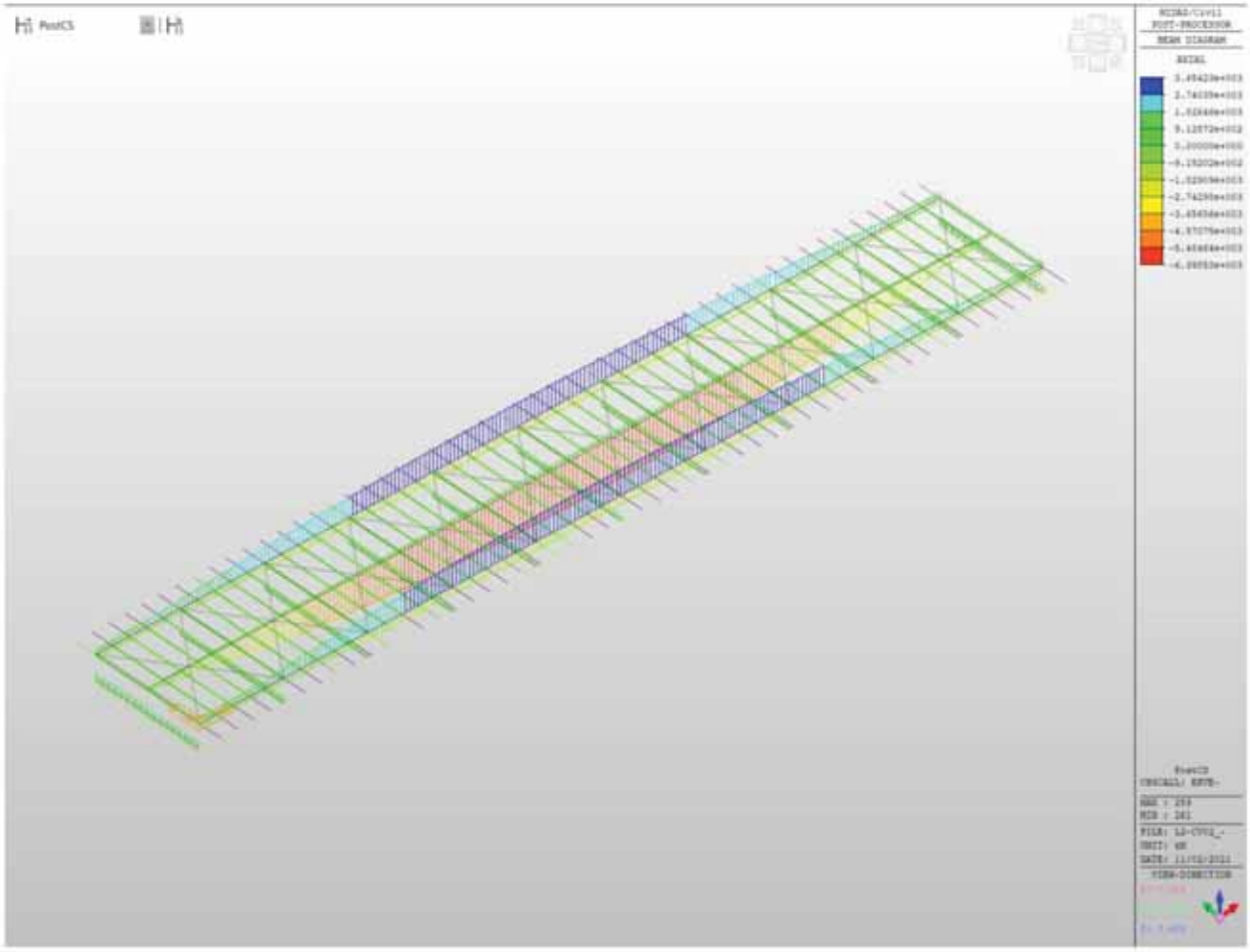


Figura 30 - Diagramma N - Inviluppo SLU-SLV

6.2.1.1 TRAVE PRINCIPALE CONCIO 1

Figura 31 - Concio 1 - Diagramma My - Fase 1

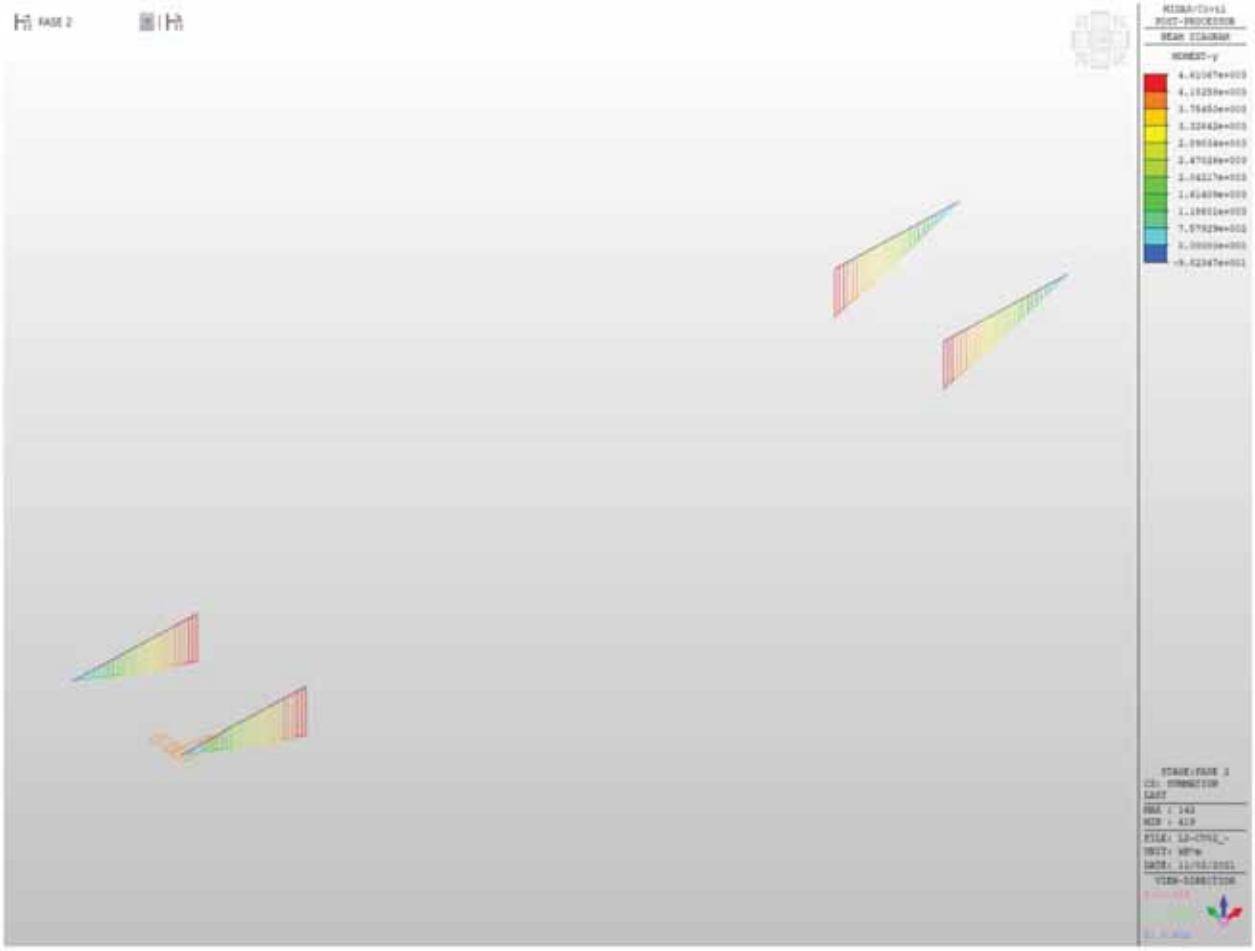


Figura 32 - Concio 1 - Diagramma My - Fase 2

Figura 33 - Concio 1 - Diagramma My - Fase 3

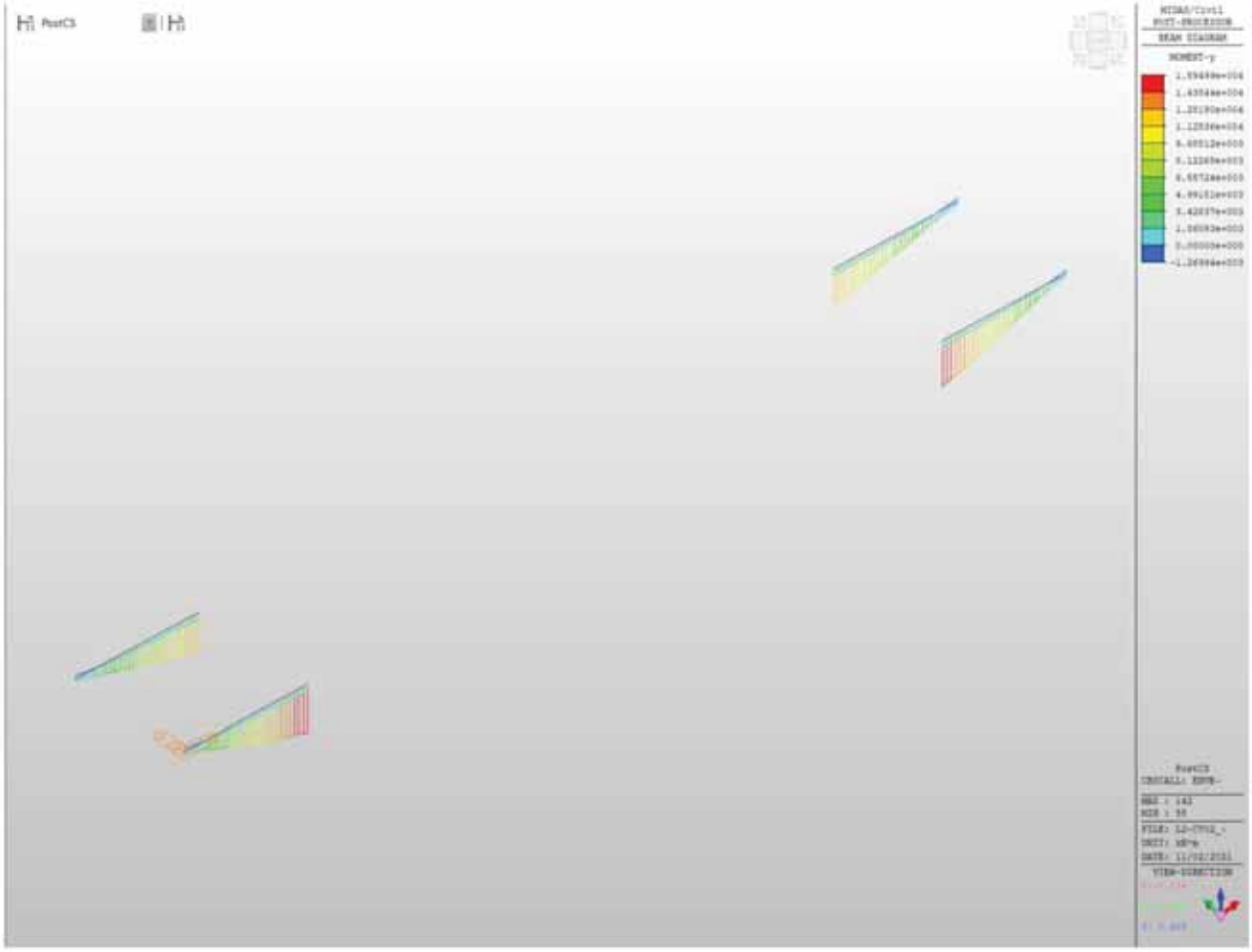


Figura 34 - Concio 1 - Diagramma My - Inviluppo SLU-SLV

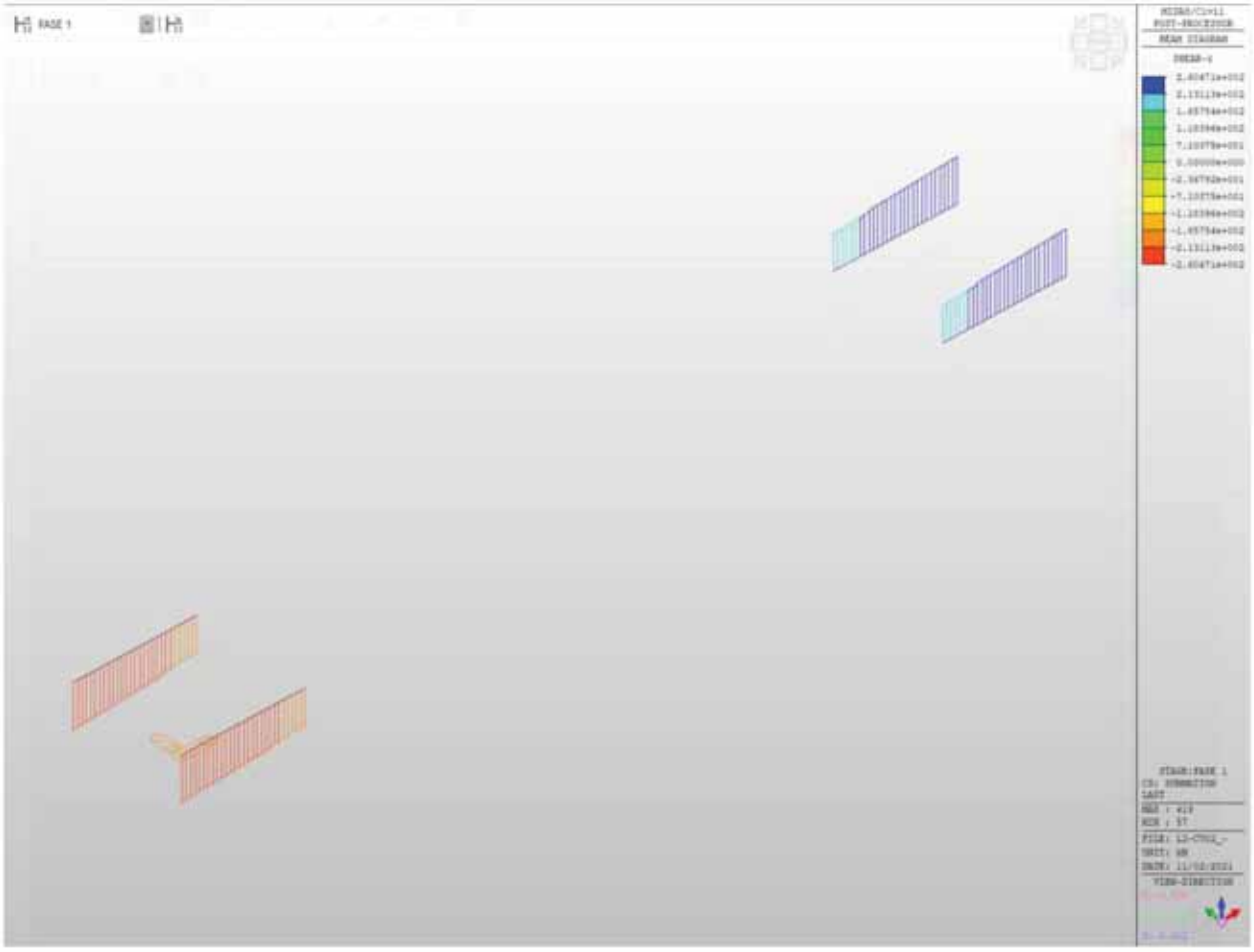


Figura 35 - Concio 1 - Diagramma Tz - Fase 1

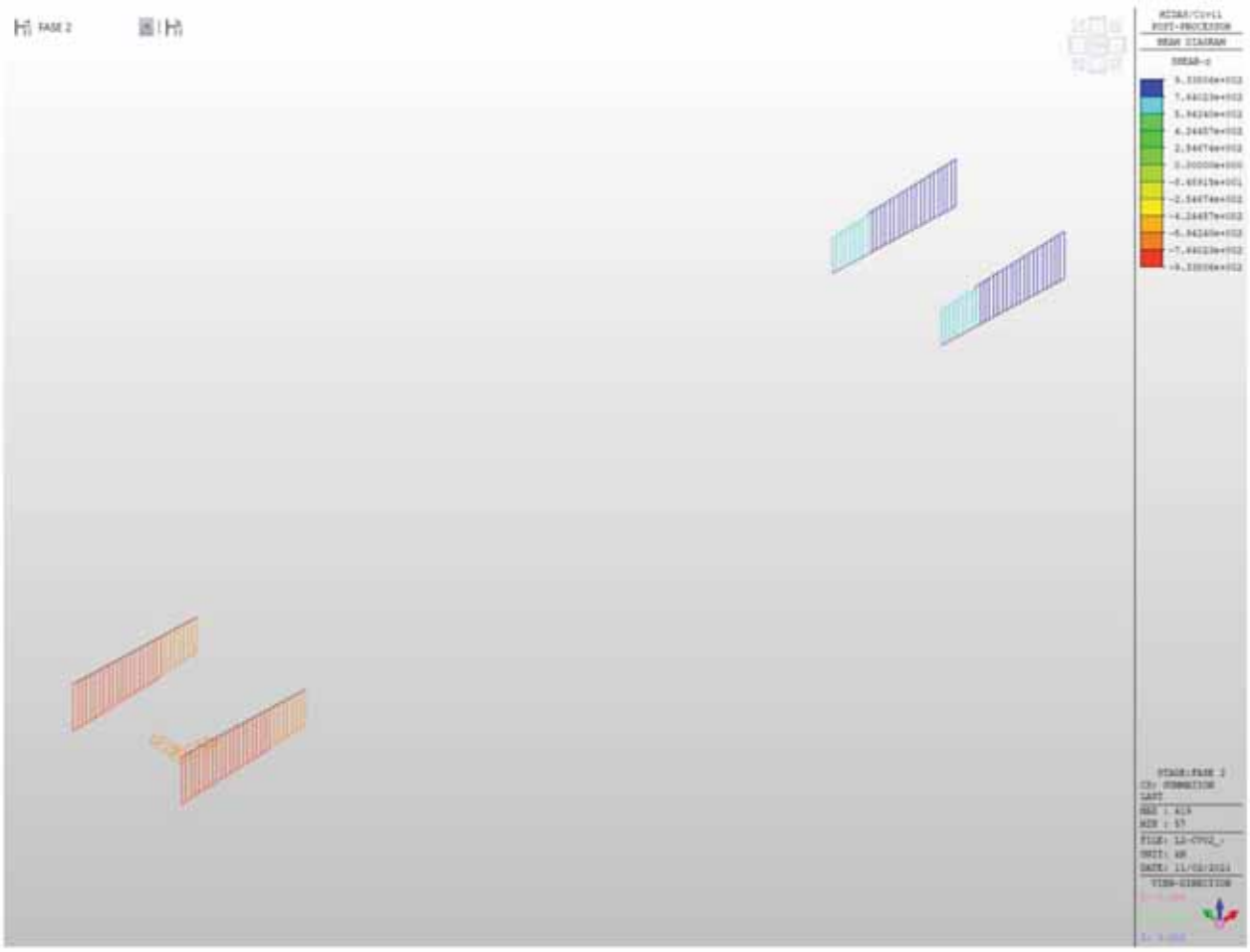


Figura 36 - Concio 1 - Diagramma Tz - Fase 2

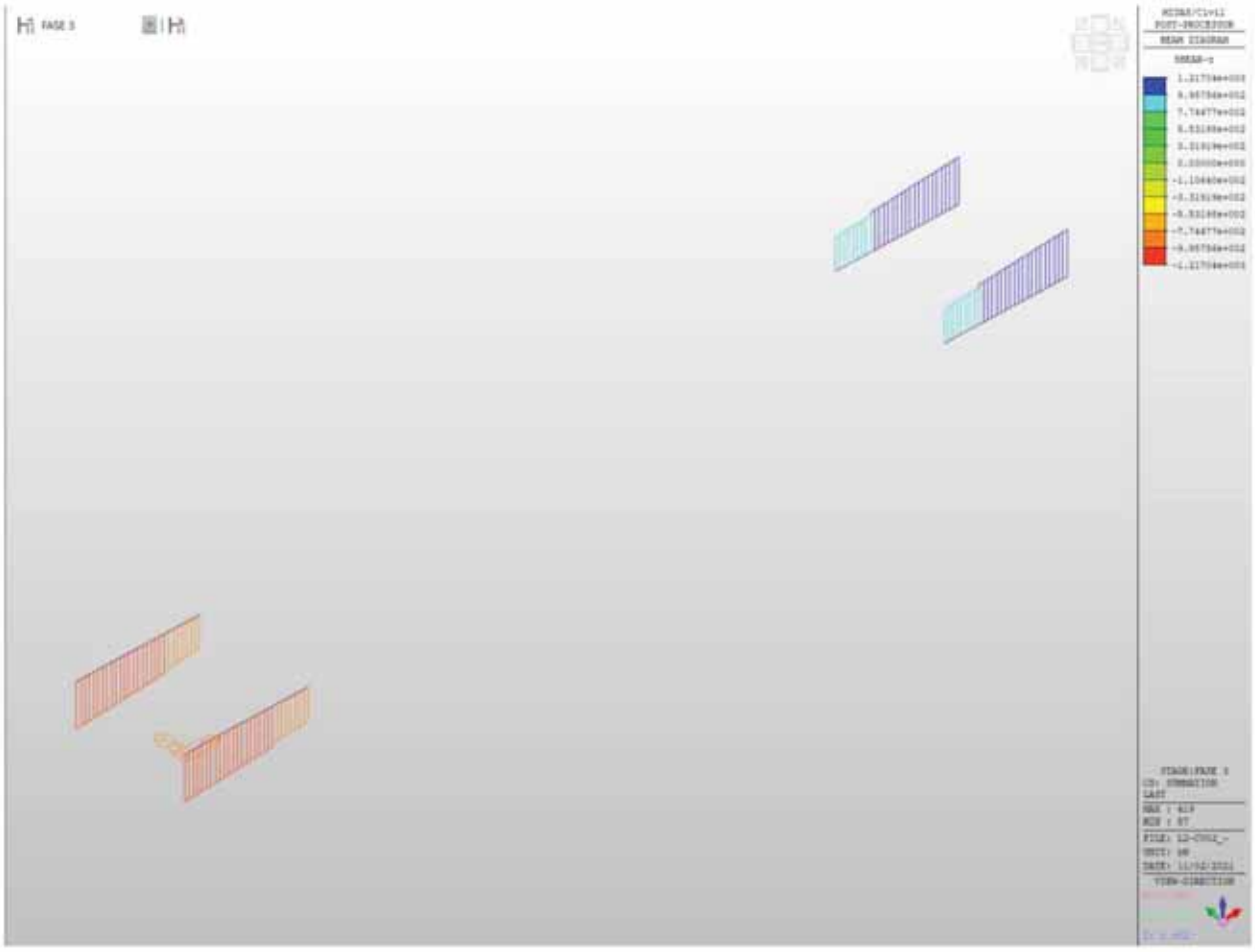


Figura 37 - Concio 1 - Diagramma Tz - Fase 3

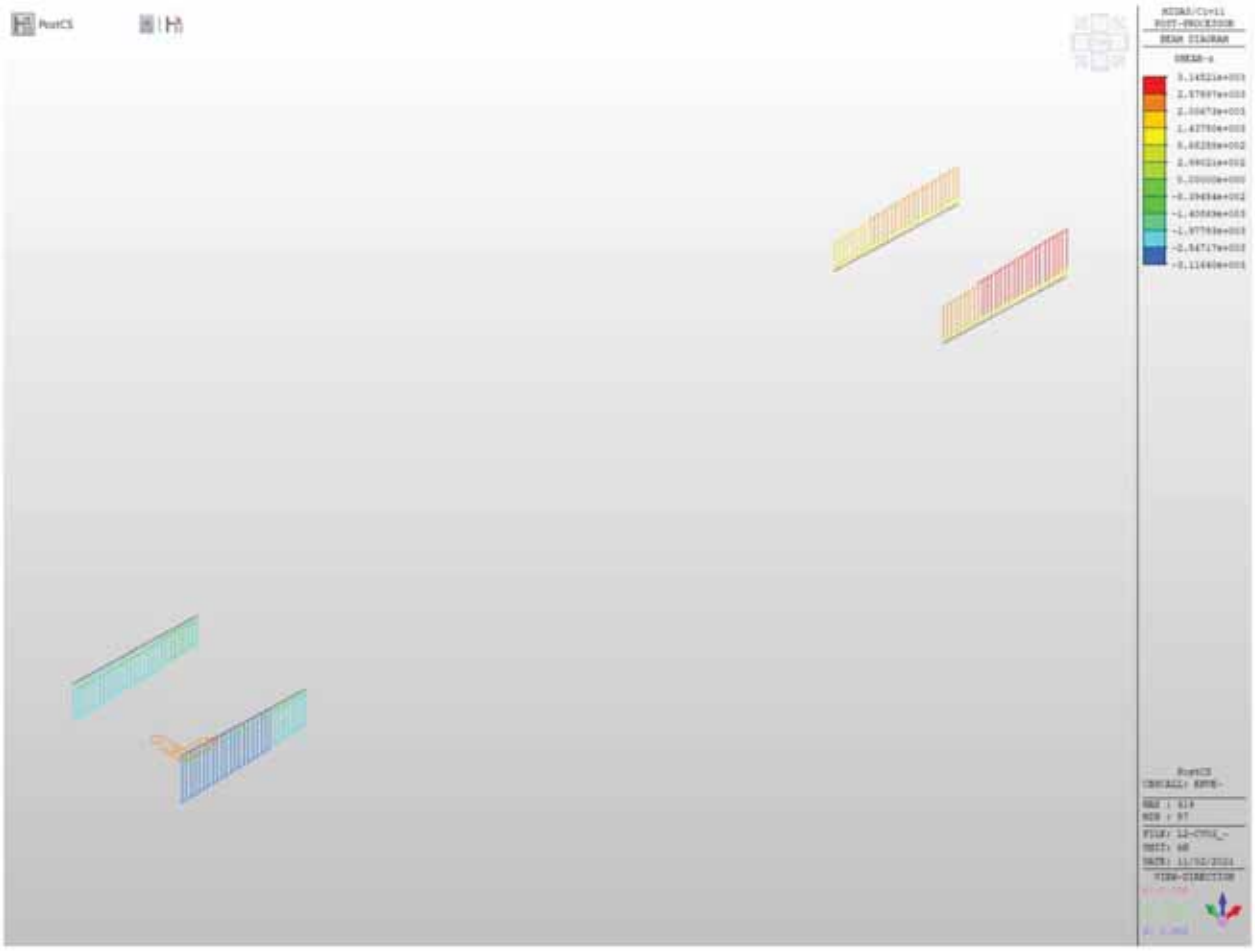


Figura 38 - Concio 1 - Diagramma Tz - Inviluppo SLU-SLV

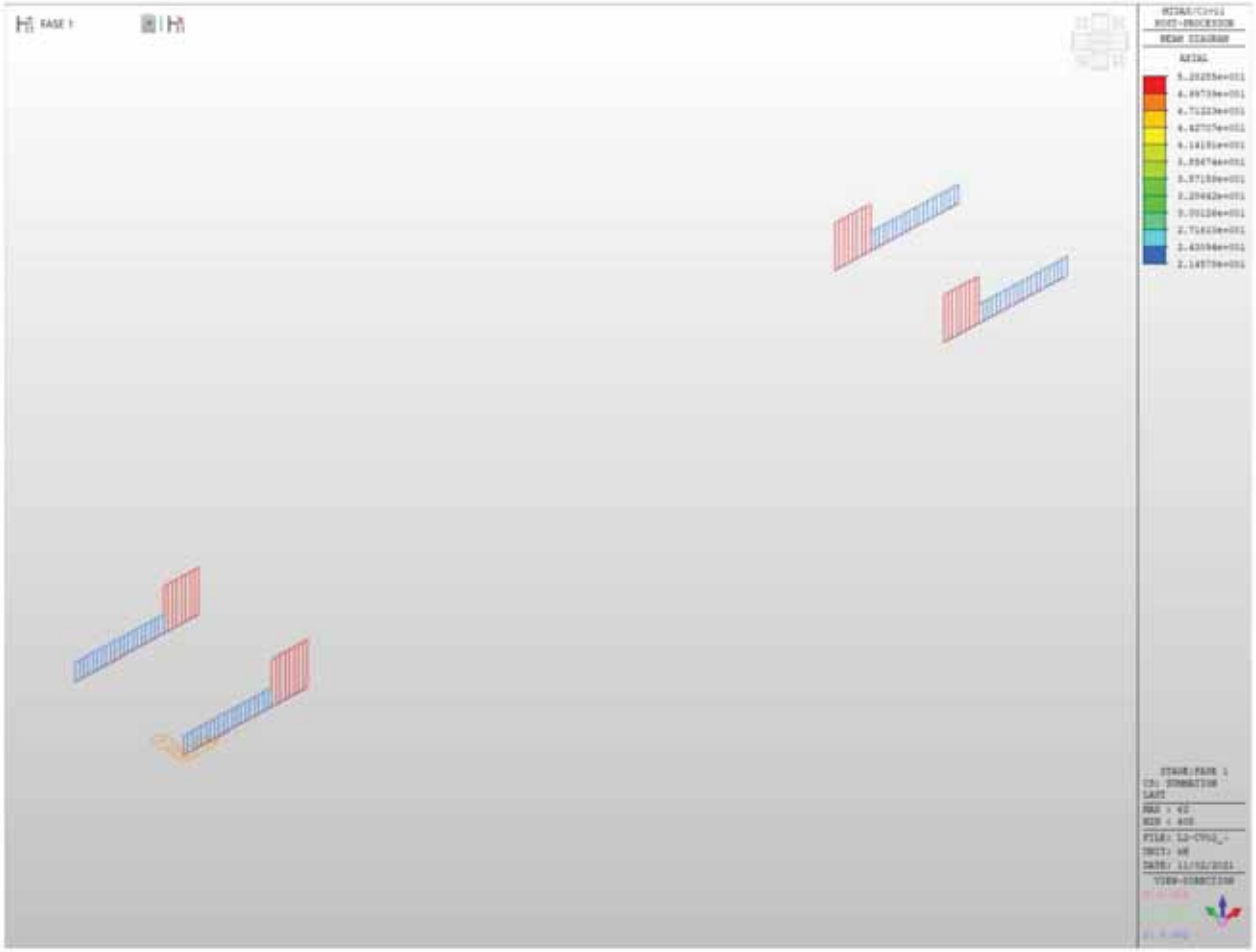


Figura 39 - Concio 1 - Diagramma N - Fase 1

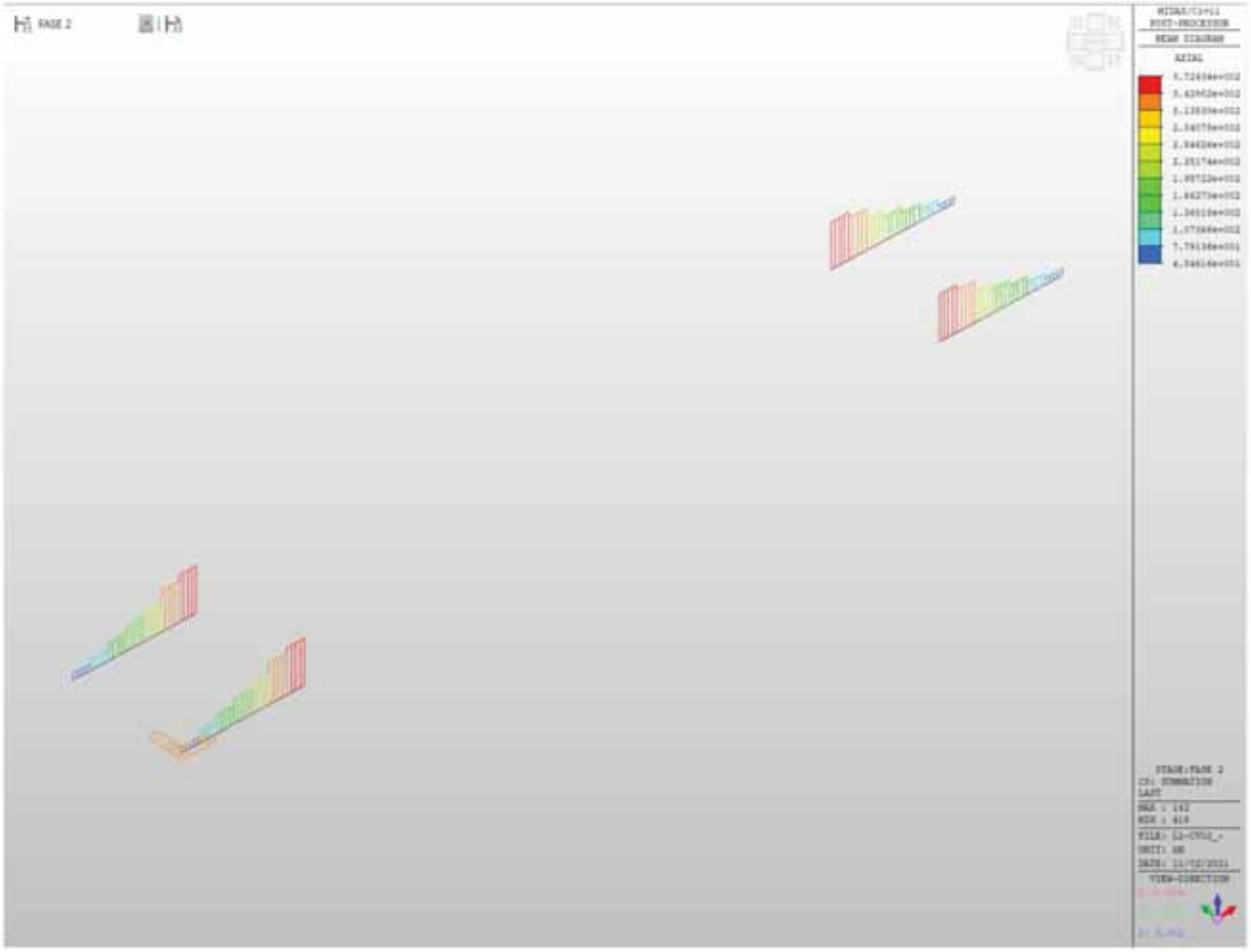


Figura 40 - Concio 1 - Diagramma N - Fase 2

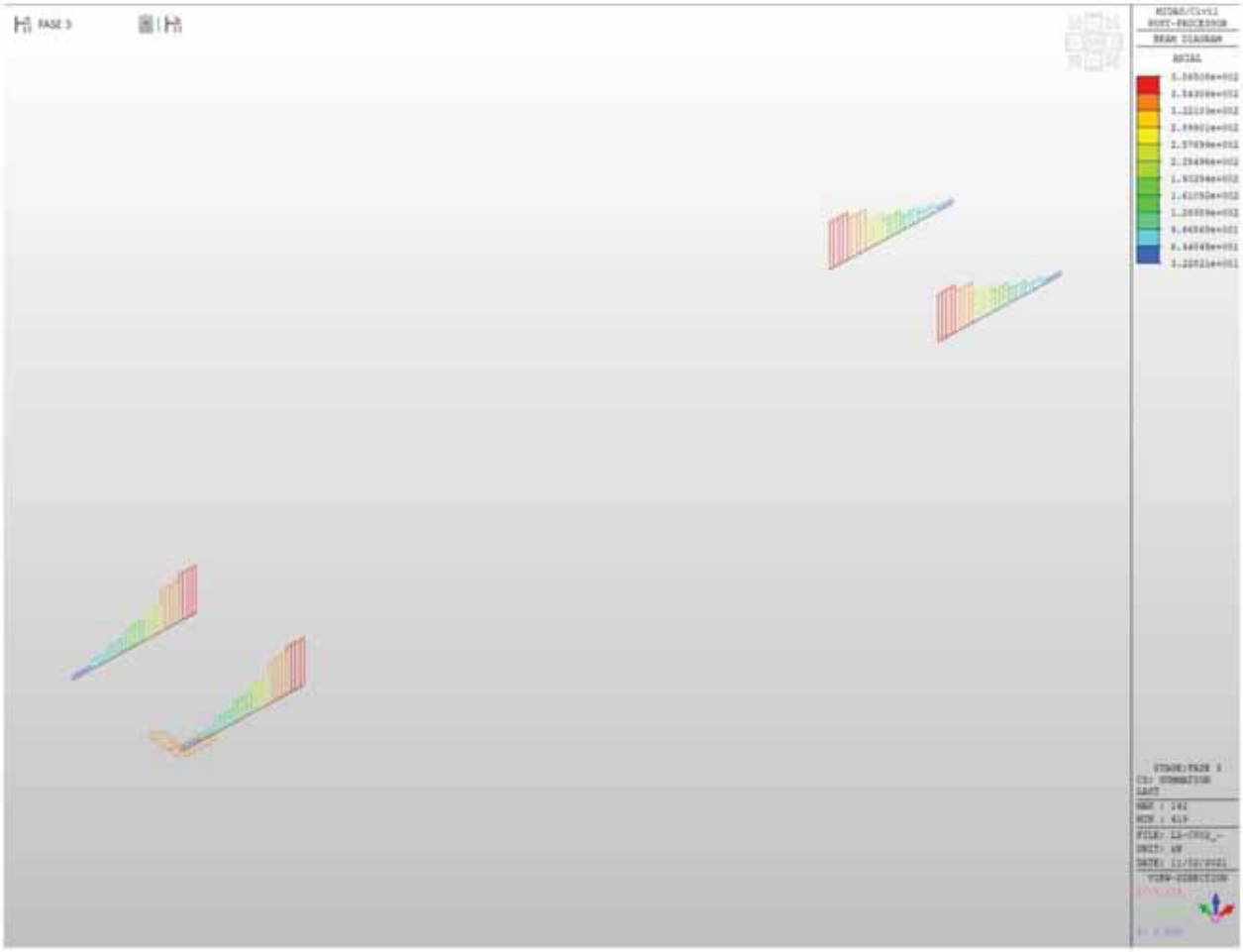


Figura 41 - Concio 1 - Diagramma N - Fase 3

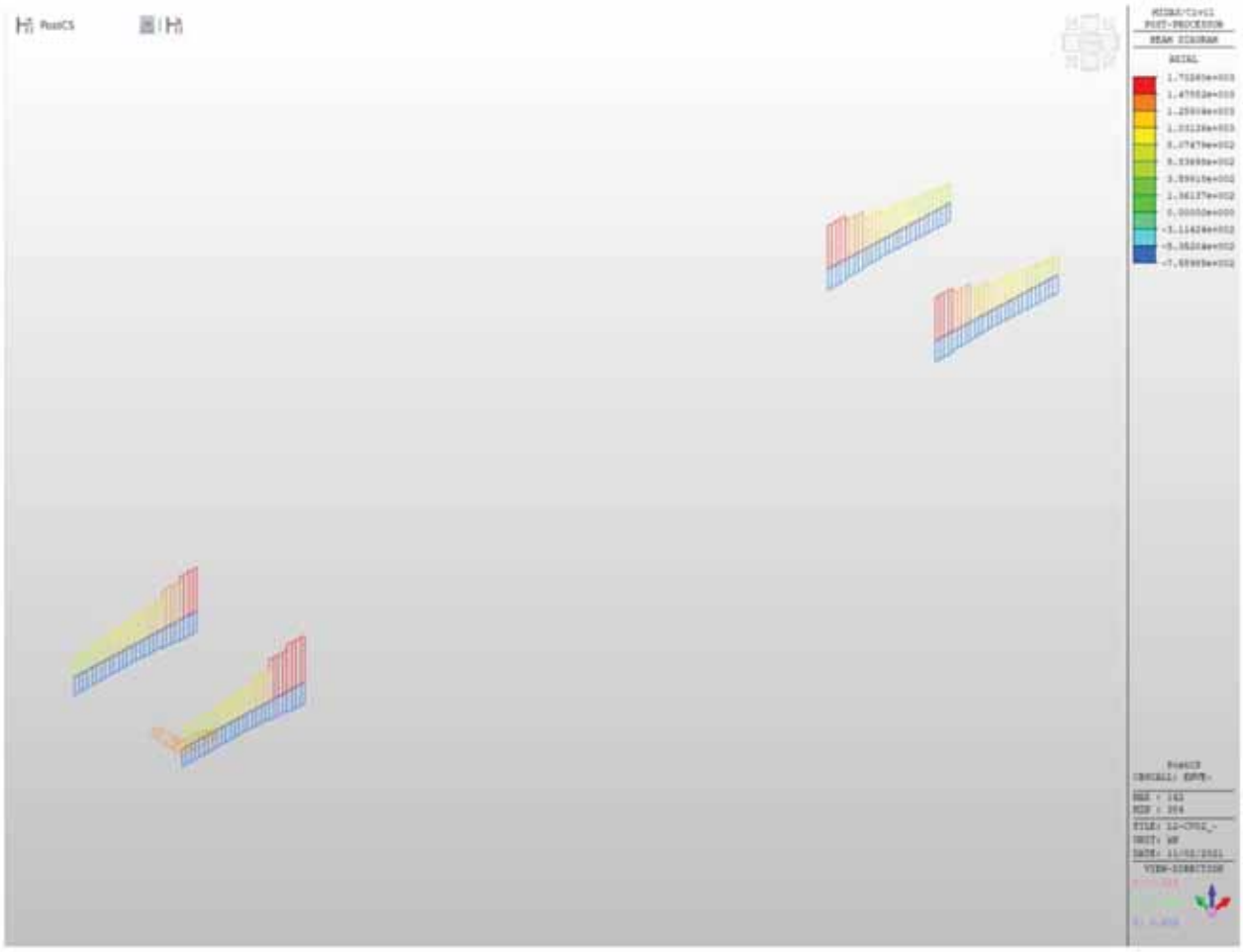
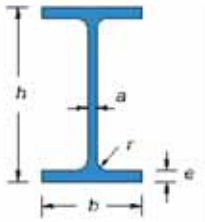


Figura 42 - Concio 1 - Diagramma N - Inviluppo SLU-SLV

VERIFICA SEZIONE IN ACCIAIO COMPOSTA

CARATTERISTICHE PROFILO:

Tipo: S355



B_{SUP} =	750	mm			
$t_{f,SUP}$ =	25.0	mm	$A_{f,sup}$ =	18750.00	mm²
B_{INF} =	900	mm			
$t_{f,INF}$ =	30.0	mm	$A_{f,INF}$ =	27000.00	mm²
H =	2100	mm			
t_w = a =	20.0	mm	A_w =	40900.00	mm²
L =	4500	mm	n. traversi:	1	
A_{TOT} =	86650.00	mm²			

$y_{G,inf}$ =	953.18	mm	$y_{G,sup}$ =	1146.82	mm
J_{yy} =	6.26E+10	mm⁴	J_t =	17459583	mm⁴
J_{zz} =	2702806250	mm⁴	J_ω =	1.069E+09	mm⁶
$W_{el,yy,inf}$ =	65622983	mm³	$W_{el,yy,sup}$ =	54542366	mm³
$W_{pl,yy}$ =	67706766	mm³			

$$W_{pl,xx} = 2\left[\frac{t_w H^2}{8} + t_f(b - t_w)\frac{H - t_f}{2} + 2r^2\left(\frac{H}{2} - t_f - \frac{r}{2}\right) - 2\frac{\pi r^2}{4}\left(\frac{H}{2} - t_f + r + \frac{4r}{3\pi}\right)\right]$$

ρ_{yy} =	849.63	mm	$\rho_{xx} = \sqrt{\frac{J_{xx}}{A}}$	
ρ_{zz} =	176.61	mm		
Peso =	680.20	kg/m		
E =	210000	N/mm²	modulo elastico	
ν =	0.3		coeff. poisson	
G =	80769	N/mm²	$G = \frac{E}{2(1+\nu)}$	modulo elasticità trasversale
α =	0.000012	°C⁻¹	coeff. espansione termica lineare	
f_{yk} =	355	N/mm²	tensione snervamento caratteristica	
f_{tk} =	510	N/mm²	tensione rottura caratteristica	
γ_{M0} =	1.05		per sezioni classe 1,2,3 e 4	
γ_{M1} =	1.05		per instabilità membrature	
γ_{M1} =	1.10		per instabilità membrature ponti stradali e ferroviari	
γ_{M2} =	1.25		per sezioni tese indebolite dai fori nei riguardi della frattura	

SOLLECITAZIONI:

$N_{t,sd}$ =	0	N	caso per trave tesa
$N_{c,sd}$ =	373000	N	caso per trave compressa
M_{sd} =	4611000000	Nmm	caso per trave inflessa in una direzione
V_{sd} =	934000	N	taglio

Caso per trave a flessione deviata (Momenti flettenti agenti alle estremità $|M_B| < |M_A|$):

M_B =	3688800000	Nmm	M_A =	4611000000	Nmm

Valori del momento massimo e minimo dell'asta:

$M_{max,y,sd}$ =	0	Nmm	$M_{min,y,sd}$ =	0	Nmm
$M_{max,z,sd}$ =	0	Nmm	$M_{min,z,sd}$ =	0	Nmm

CLASSE APPARTENENZA PROFILO (NTC2008, 4.2.3.1):

ALA SUPERIORE		ALA INFERIORE		ANIMA		
$C/t_{f,sup}$ =	14.60	$C/t_{f,inf}$ =	14.67	C/t_w =	102.25	3
ε =	0.81	ε =	0.81	ε =	0.81	

Curva di instabilità "b" (Asse yy):
Fattore di imperfezione α: 0.34
Curva di instabilità "c" (Asse zz):
Fattore di imperfezione a: 0.49

SOLLECITAZIONE DELL'ASTA A TAGLIO (NTC2008, 4.2.4.1.2):

$$\frac{V_{sd}}{V_{c,Rd}} \leq 1$$

Area taglio resistente: A_v = 41450 mm²

$$V_{c,Rd} = \frac{A_v f_{yk}}{\sqrt{3}\gamma_{M0}}$$ $V_{c,Rd}$ = 8091014 N => 0.12 *OK!(<1)*

Verifica in presenza di torsione uniforme:

$\tau_{t,sd}$ = 0 N/mm²

$$V_{c,Rd,red} = \left[1 - \frac{\tau_{t,sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}}\right] V_{c,Rd}$$

$V_{c,Rd,red}$ = 8091014 N => 0.12 *OK!(<1)*

Verifica in termini tensionali nel punto più sollecitato:

$$\frac{\tau_{sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}} \leq 1$$ => 0.00 *OK!(<1)*

SOLLECITAZIONE DELL'ASTA A COMPRESSIONE SEMPLICE (NTC2008, 4.2.4.1.2):

$$\frac{N_{sd}}{N_{c,Rd}} \leq 1 \qquad N_{cr} = \frac{\pi^2 EJ}{(\eta l)^2}$$ 276636147 N

$N_{c,sd}$ < **0,04 N_{cr}**
Instabilità trascurabile!

0.04 Ncr = 11065446 N *Instabilità trascurabile se λ < 0.2*

Calcolo snellezza membrana (< di 200 per le travature principali e < di 250 per le secondarie):

μ = 1.00 $l_0 = \mu l$ = 4500 mm

$\lambda = l_0 / \rho$ = 5

Calcolo resistenza per sezioni in classe 1,2 e 3:

$$N_{c,Rd} = \frac{A f_{yk}}{\gamma_{M0}}$$ $N_{c,Rd}$ = 29295952 N => 0.01 *OK!(<1)*

STABILITA' DELLE MEMBRATURE (NTC2008, 4.2.4.1.3):

Curva di instabilità "b" (Asse yy):
Fattore di imperfezione α: 0.49

Verifica per sezioni classe 1,2 e 3:

$$\bar{\lambda} = \sqrt{\frac{A f_{yk}}{N_{cr}}}$$ 0.33

$\bar{\lambda}$ > **0.2**
Serve verifica instabilità!

$$\Phi = 0.5\left[1 + \alpha(\bar{\lambda} - 0.2) + \bar{\lambda}^2\right]$$ 0.59

$$\chi = \frac{1}{\Phi + \sqrt{\Phi^2 - \bar{\lambda}^2}}$$ 0.93

$$N_{b,Rd} = \frac{\chi A f_{yk}}{\gamma_{M1}}$$ 26062867 N

$$\frac{N_{c,sd}}{N_{b,Rd}} \leq 1$$ => 0.01 *OK!(<1)*

SOLLECITAZIONE DELL'ASTA A FLESSIONE MONOASSIALE RETTA (NTC2008, 4.2.4.1.2):

$$\frac{M_{sd}}{M_{c,Rd}} \leq 1$$

$V_{sd} < 0{,}5\, V_{c,Rd}$ *Il taglio non influisce sulla verifica a flessione!*

$$\rho = \left[\frac{2V_{sd}}{V_{c,Rd}} - 1\right]^2$$ 0.59156

$f_{y,red} = (1-\rho) f_{yk}$ 145 N/mm²

f_{yk} = 355 N/mm²

Calcolo resistenza elastica sezione lorda, classe 3:

$$M_{el,Rd} = \frac{W_{el,min} f_{yk}}{\gamma_{M0}}$$ $M_{c,Rd}$ = 22186817978 Nmm => 0.21 *OK!(<1)*

n. fori = diametro = mm

$$\frac{0{,}9 A_{f,net} f_{tk}}{\gamma_{M2}} \geq \frac{A_f f_{yk}}{\gamma_{M0}}$$ *Non serve la verifica per la presenza dei fori!*

TRAVI INFLESSE (NTC2008, 4.2.4.1.3.2):

Calcolo snellezza membrana (< di 200 per le travature principali e < di 250 per le secondarie):

μ = 0.70 $L_{cr} = L/\mu$ = 3150 mm

W_{yy} = 65622983 mm³ W_{yy} = 54542366 mm³

$$\psi = 1.75 - 1.05\frac{M_B}{M_A} + 0.3\left(\frac{M_B}{M_A}\right)^2$$ 1.10

$$M_{cr} = \psi \frac{\pi}{L_{cr}} \sqrt{EJ_y GJ_T} \sqrt{1 + \left(\frac{\pi}{L_{cr}}\right)^2 \frac{EJ_\omega}{GJ_T}}$$ 1.496E+11 Nmm 0.031

M_{sd}/M_{cr} = 0.031 *Risulta < 0.16 Non serve la verifica instabilità*

$$\bar{\lambda}_{LT} = \sqrt{\frac{W_y f_{yk}}{M_{cr}}}$$ 0.36 *Risulta < 0.4 Non serve la verifica instabilità*

Stabilità dei pannelli soggetti a taglio (NTC2008, 4.2.4.1.3.4.1):

Se irrigiditori trasversali rigido o no,

I_{st} =	45000000	mm^4	0.75hwt3 =	5488000	mm^4	*Irrigiditore Trasversali rigidi*

Coefficiente minimo di instabiltà per taglio del panello (In assenza di irrigiditori longitudinali),

a/hw =	2.14	k_τ =	7.21

Coefficiente minimo di instabiltà per taglio del panello (irrigiditori longitudinali più di due o a/hw >3),

I_{sl} =	0	mm^4	k_{tl} =	0.00	
a/hw =	2.14		k_τ =	7.21	

Coefficiente minimo di instabiltà per taglio del panello (irrigiditori longitudinali più di due o a/hw < 3),

I_{sl} =	0	mm^4	a/hw =	2.14	k_τ =	5.47

k_τ =	7.21				
η =	1.2	hw/t =	102.25	*Serve la verifica di instailtà*	
σ_E =	17.23356009 MPa	τ_{cr} =	124.20	λ_w =	1.28
Montanti di appogio rigidi,		χ_w =	0.69		
Gli altri casi,		χ_w =	0.65		

$V_{bw,Rd}$ = 5295814 N

Momento resistente sole piattabande,

$y_{G,inf}$ =	864.39 mm		$y_{G,sup}$ =	1235.61 mm	
J_{yy} =	47532476460 mm^4				
$W_{el,yy,inf}$ =	54989921 mm^3		$W_{el,yy,sup}$ =	38468686 mm^3	
$M_{f,red}$ =	12692444270 Nmm				
bf =	303.75 mm		$V_{bf,Rd}$ =	35833 N	
$V_{b,Rd}$ =	5331648 N	0.175	*OK!(<1)*		

Stabilità dei pannelli soggetti a Compressione (NTC2008, 4.2.4.1.3.4.1):

Stress,

σ_{sup} =	84.54	MPa
σ_{inf} =	-70.27	MPa
σ_{int} =	46.94	MPa

Irrigidati su entrambi lati (Anima),

b =	2045.0	mm	(Web bw)		a =	4500	mm
σ1 =	84.5	(Max)			σ2 =	-70.27	(Min)
ψ =	-0.8				kσ =	19.79	
λp =	1.0				ρ =	1.00	
σcr,p =	359.7	MPa			σcr,c =	3.749	MPa
ζ =	1.0				λc =	9.731	
α =	0.34				Φ =	153.918	
χc =	0.003						
ρc =	1.00						
beff =	1116.79	mm	be1 =	446.71	mm	be2 =	670.07 mm
bt =	928.21	mm					

Irrigidati a un lato (Piattebande),
Piattabanda Superiore,

b =	365	mm	(Flange Sup)				
σ (Irri.) =	84.5				σ (Lib.) =	84.54	
kσ =	0.43						
λp =	1.2				ρ =	0.70	
beff =	254.81	mm			bt =	0	mm

Effective Section Properties,

Ac,eff (Piattabanda Sup) =	12740.7	mm2			
Ac,eff (Piattabanda Inf) =	27000.0	mm2			
Ac,eff (Anima) =	22335.7	mm2			
Ac (Anima tensione) =	18564.3	mm2			
Ac,eff (Total) =	80640.7	mm2			
$y_{g,inf}$ =	868.6	mm	$y_{g,sup}$ =	1231.4	mm
Ieff =	5.62E+10	mm4			
W_{eff} (inf) =	64663484	mm3	W_{eff} (sup) =	45616407	mm3
e =	84.53	mm			
η =	0.30				

Fase 2

Soletta c.a.collaborante

b_{eff} =	2.84	m
Altezza soletta:	0.26	m
Area soletta:	0.74	m^2
J_{yy} =	0.00416	m^4
Peso =	18.46	kN/m

Trave acciaio

Area trave acciaio:	0.08665	m^2
H trave acciaio:	2.10	m
y_G =	0.953	m
J_{yy} =	0.062550	m^4
Peso =	6.80	kN/m

Barre armatura soletta

1° strato barre (superiore)			2° strato barre (inferiore)		
n. Barre:	14		n. Barre:	14	
Interasse:	0.20	m	Interasse:	0.20	m
Diametro:	0.02	m	Diametro:	0.02	m
Area:	0.004398	m^2	Area:	0.004398	m
y_1 =	0.05	m	y_2 =	0.21	m

n = 18.0 Coeff. omogeneizzazione con viscosità in atto

Materiali

cls			Barre armature			Acciaio		
R_{ck} =	40	MPa	f_{yk} =	450	MPa	f_{yk} =	355	MPa
f_{ck} =	33.20	MPa	γ_M =	1.15		γ_{M0} =	1.05	
f_{cd} =	18.81	MPa	$f_{yd,s}$ =	391.30	MPa	$f_{yd,a}$ =	338.10	MPa
f_{cm} =	41.2	MPa						
f_{ctm} =	3.10	MPa						
E_{cm} =	33643	MPa						

Caratteristiche geometriche

A_{id} =	0.1365	m^2	Area sezione omogeneizzata in area di acciaio
A_v =	41450	mm^2	Area taglio sezione di acciaio
$y_{G,inf,id}$ =	1.42	m	Asse neutro rispetto lembo inferiore:
$y_{G,sup,id}$ =	0.94	m	Asse neutro rispetto lembo superiore
$J_{xx,id}$ =	0.114407	m^4	Momento d'inerzia sezione omogeneizzata ad acciaio
$W_{inf,id}$ =	0.080608	m^3	Modulo elastico sezione omogeneizzata ad acciaio
$W_{sup,id}$ =	0.121617	m^3	Modulo elastico sezione omogeneizzata ad acciaio

Sollecitazioni

M_{sd} =	5984.00	kNm	(SLU)		
M_{rd} =	27253.34	kNm	=>	0.22	ok!
T_{sd} =	1217.00	kN	(SLU)		
T_{rd} =	7705.73	kN	=>	0.16	ok!

Tensioni

σ_c =	2.73	MPa	=>	0.15	ok!(<1)	Tensione al lembo superiore soletta
$\sigma_{s,sup}$ =	46.59	MPa	=>	0.12	ok!(<1)	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	38.22	MPa	=>	0.10	ok!(<1)	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	35.60	MPa	=>	0.11	ok!(<1)	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	74.24	MPa	=>	0.22	ok!(<1)	Tensione acciaio lembo inferiore

Fase 3

Soletta c.a.collaborante

b_{eff} =	2.84	m
Altezza soletta:	0.26	m
Area soletta:	0.74	m^2
J_{xx} =	0.00416	m^4
Peso =	18.46	kN/m

Trave acciaio

Area trave acciaio:	0.08665	m^2
H trave acciaio:	2.10	m
y_G =	0.953	m
J_{xx} =	0.062550	m^4
Peso =	6.80	kN/m

Barre armatura soletta

1° strato barre (superiore)			2° strato barre (inferiore)		
n. Barre:	14		n. Barre:	14	
Interasse:	0.20	m	Interasse:	0.20	m
Diametro:	0.02	m	Diametro:	0.02	m
Area:	0.00439823	m^2	Area:	0.004398	m
y_1 =	0.05	m	y_2 =	0.21	m

n = 6.2 Coeff. omogeneizzazione a tempo infinito

Materiali

cls			Barre armature			Acciaio		
R_{ck} =	40	MPa	f_{yk} =	450	MPa	f_{yk} =	355	MPa
f_{ck} =	33.20	MPa	γ_M =	1.15		γ_{M0} =	1.05	
f_{cd} =	18.81	MPa	$f_{yd,s}$ =	391.30	MPa	$f_{yd,a}$ =	338.10	MPa
f_{cm} =	41.2	MPa						
f_{ctm} =	3.10	MPa						
E_{cm} =	33643	MPa						

Caratteristiche geometriche

A_{id} =	0.2145	m^2	Area sezione omogeneizzata in area di acciaio
A_v =	41450	mm^2	Area taglio sezione di acciaio
$y_{G,inf,id}$ =	1.71	m	Asse neutro rispetto lembo inferiore:
$y_{G,sup,id}$ =	0.65	m	Asse neutro rispetto lembo superiore
$J_{xx,id}$ =	0.147487274	m^4	Momento d'inerzia sezione omogeneizzata ad acciaio
$W_{inf,id}$ =	0.086032749	m^3	Modulo elastico sezione omogeneizzata ad acciaio
$W_{sup,id}$ =	0.228420023	m^3	Modulo elastico sezione omogeneizzata ad acciaio

Sollecitazioni

M_{sd} =	15950.00	kNm	(SLU)		
M_{rd} =	29087.26	kNm	=>	*0.55*	***ok!***
T_{sd} =	3145.00	kN	(SLU)		
T_{rd} =	7705.73	kN	=>	*0.41*	***ok!***

Tensioni

σ_c =	11.26	MPa	=>	*0.60*	*ok!(<1)*	Tensione al lembo superiore soletta
$\sigma_{s,sup}$ =	64.42	MPa	=>	*0.16*	*ok!(<1)*	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	47.12	MPa	=>	*0.12*	*ok!(<1)*	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	41.71	MPa	=>	*0.12*	*ok!(<1)*	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	185.39	MPa	=>	*0.55*	*ok!(<1)*	Tensione acciaio lembo inferiore

6.2.1.2 TRAVE PRINCIPALE CONCIO 2

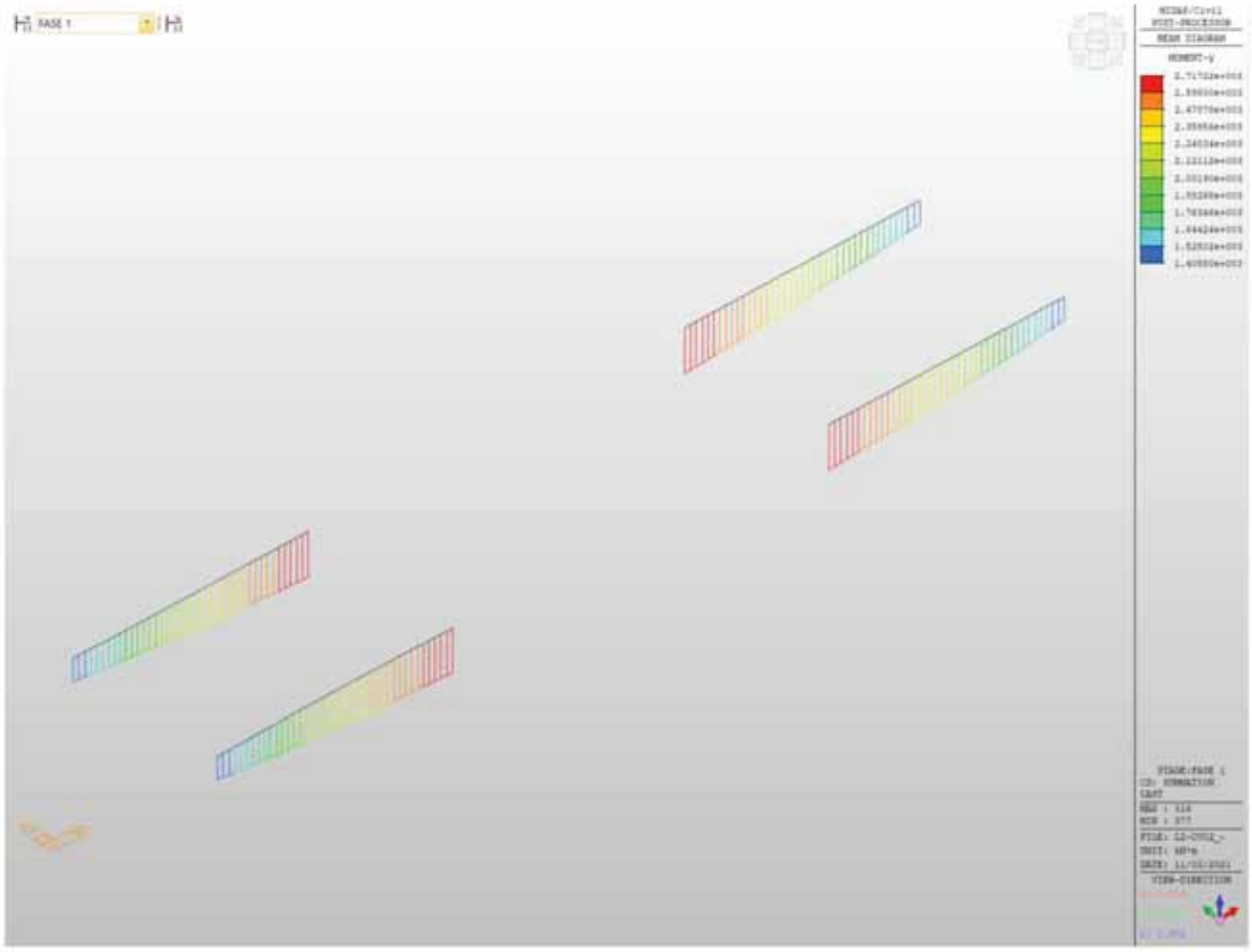


Figura 43 - Concio 2 - Diagramma My - Fase 1

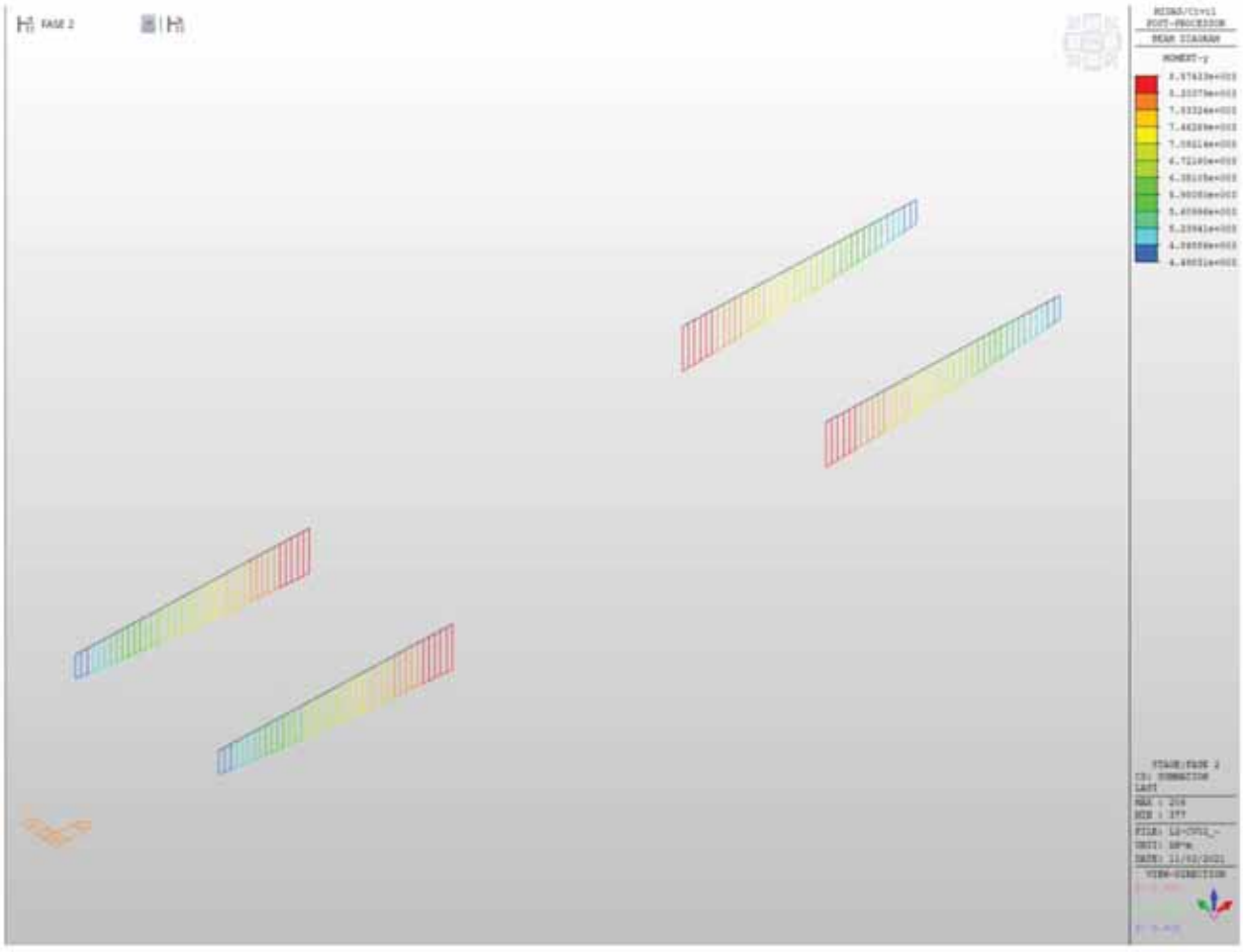


Figura 44 - Concio 2 - Diagramma My - Fase 2

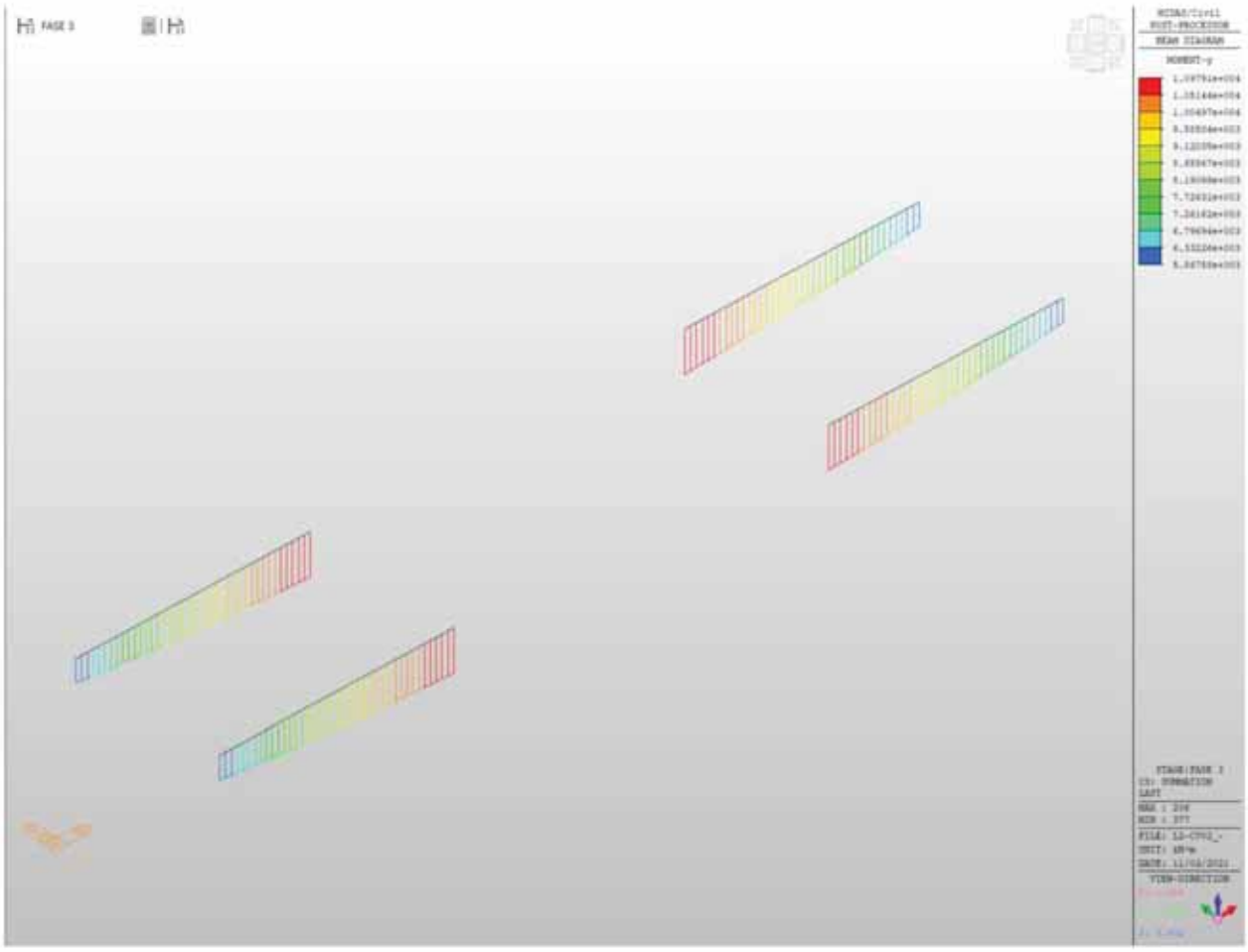


Figura 45 - Concio 2 - Diagramma My - Fase 3

Figura 46 - Concio 2 - Diagramma My - Inviluppo SLU-SLV

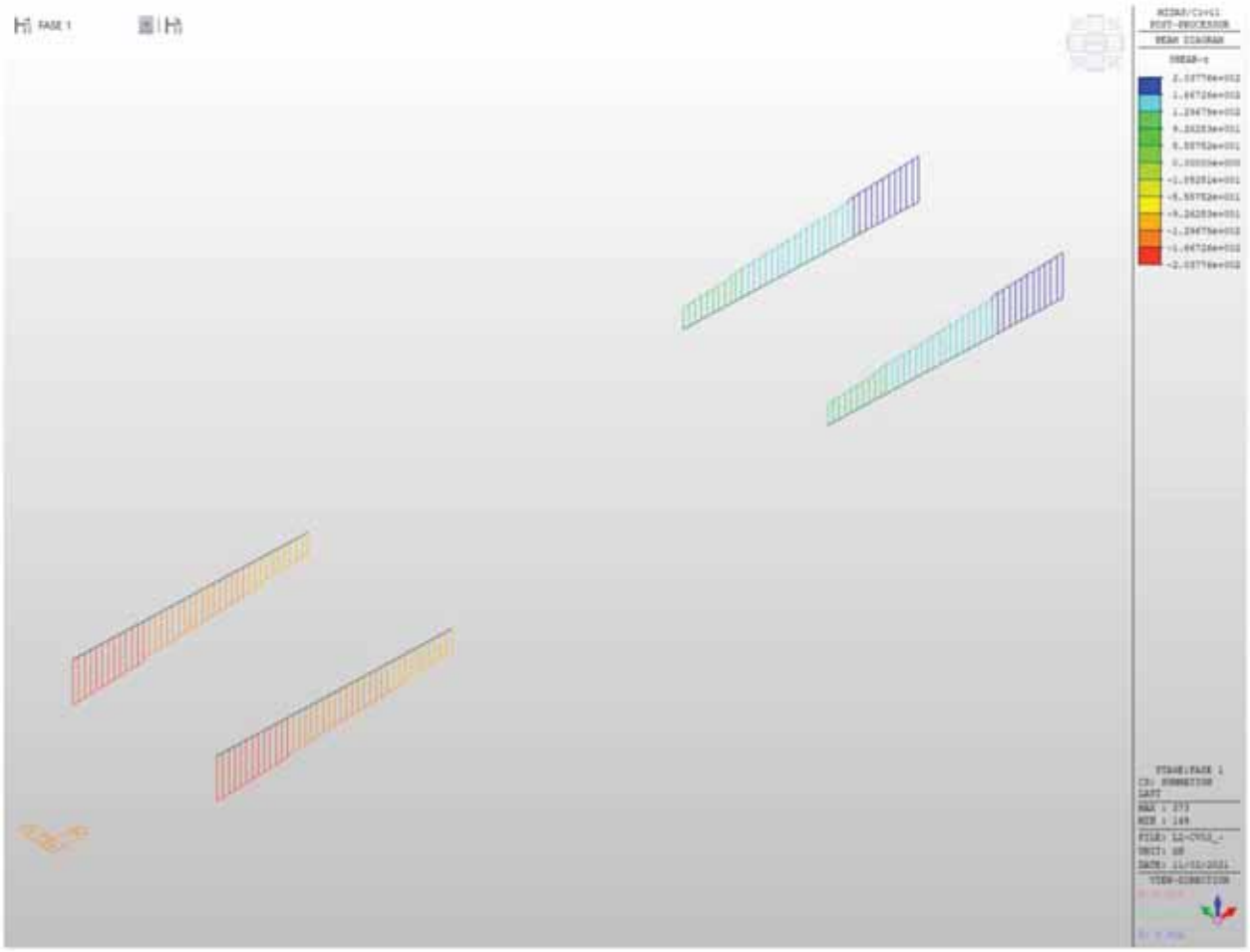


Figura 47 - Concio 2 - Diagramma Tz - Fase 1

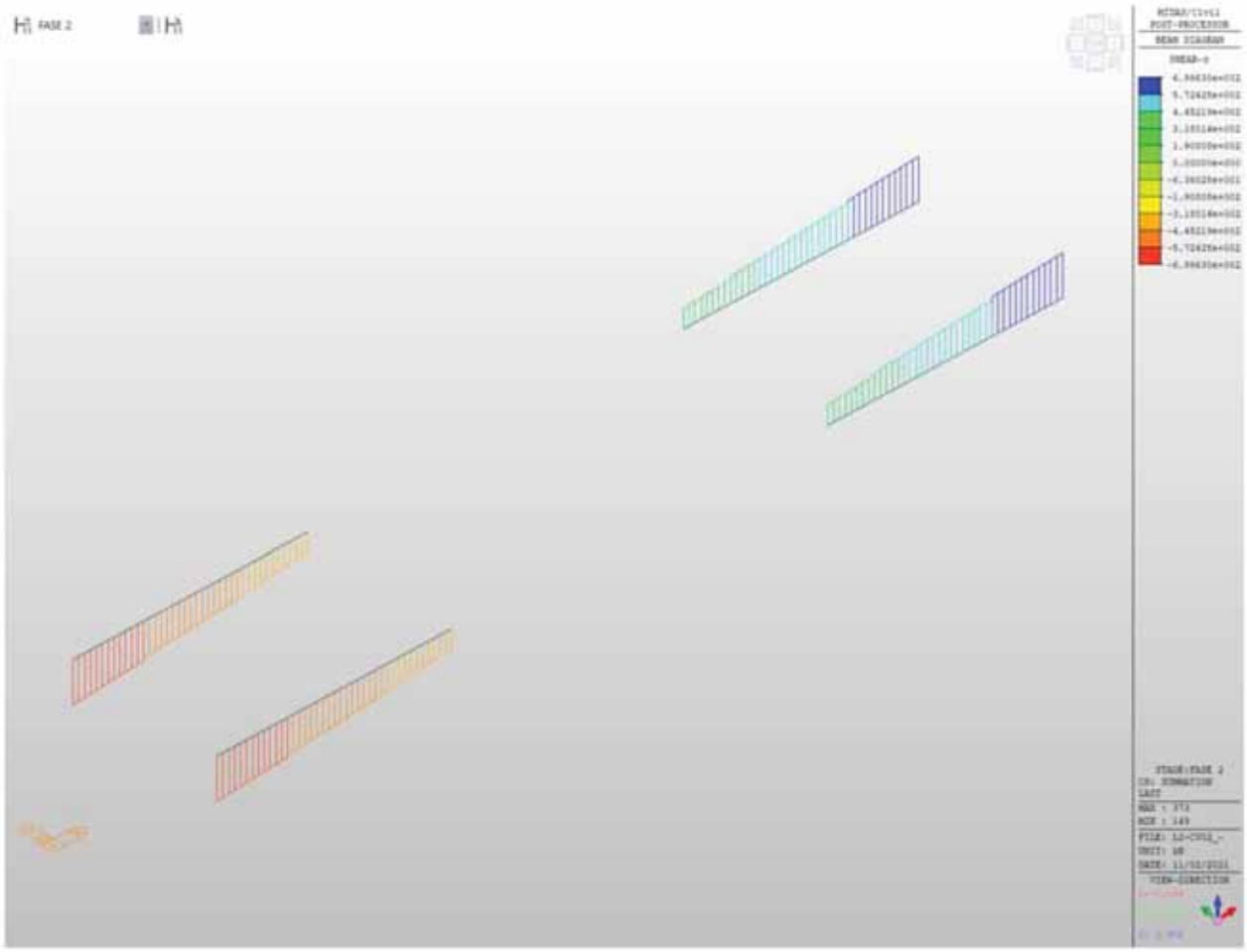


Figura 48 - Concio 2 - Diagramma Tz - Fase 2

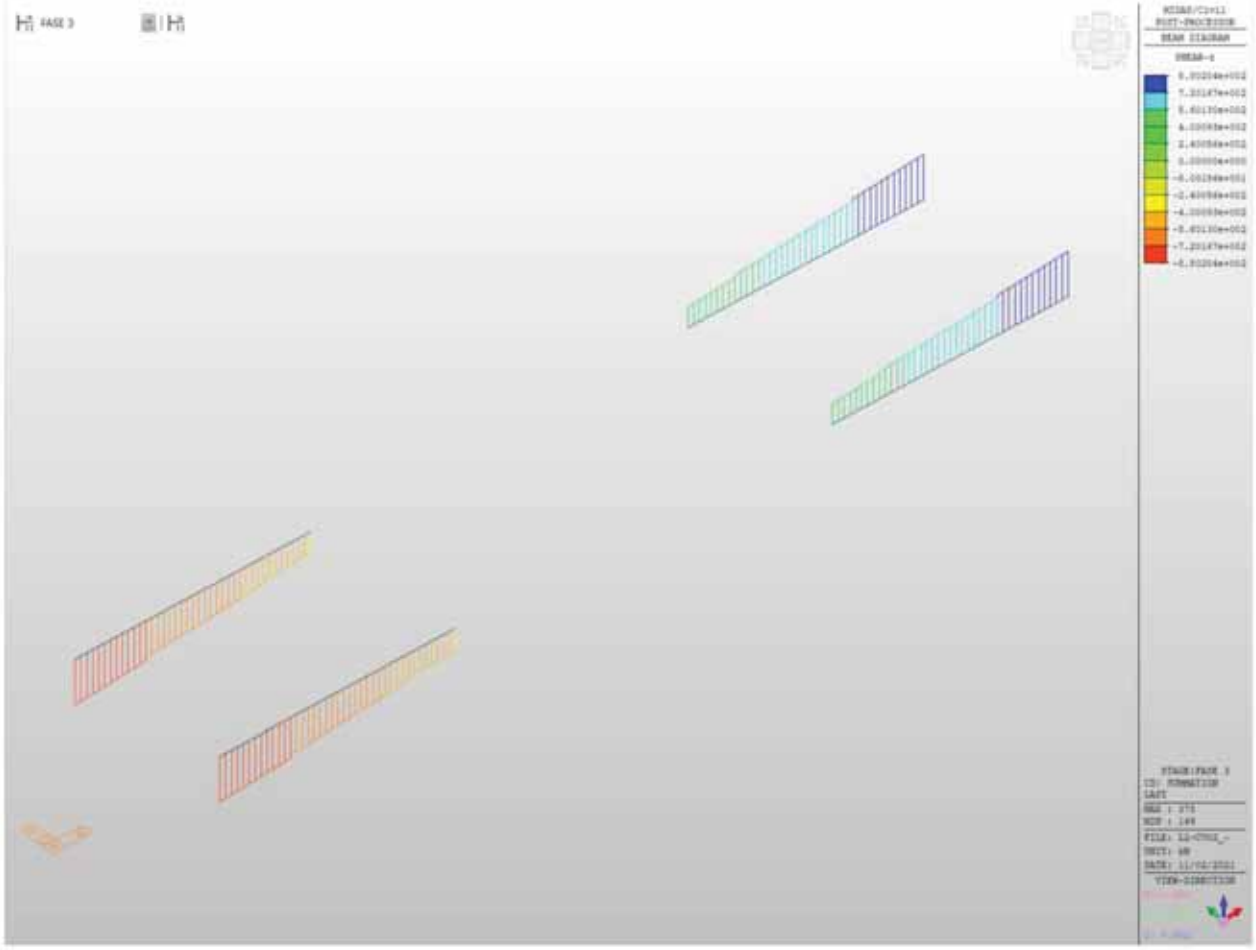


Figura 49 - Concio 2 - Diagramma Tz - Fase 3

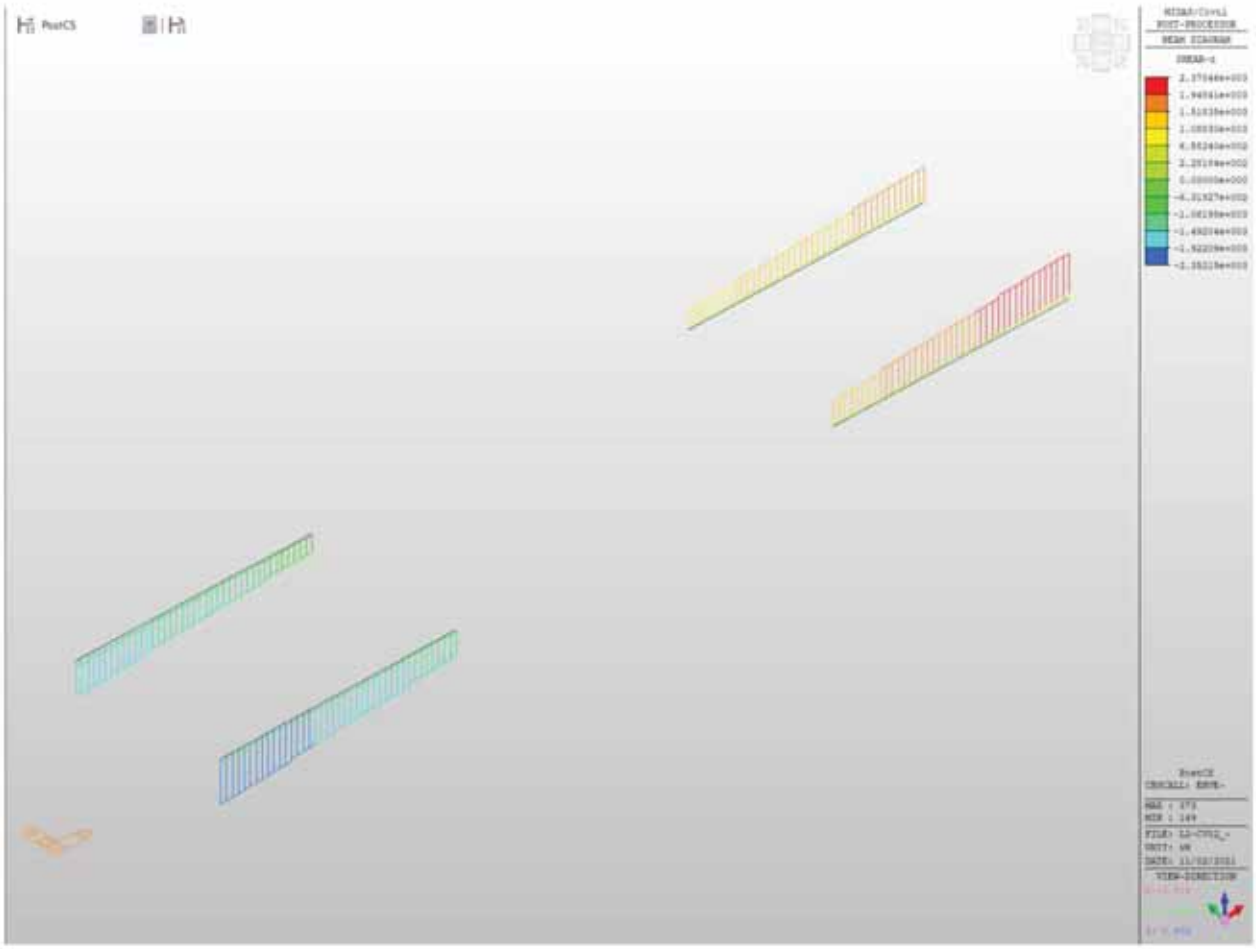


Figura 50 - Concio 2 - Diagramma Tz - Inviluppo SLU-SLV

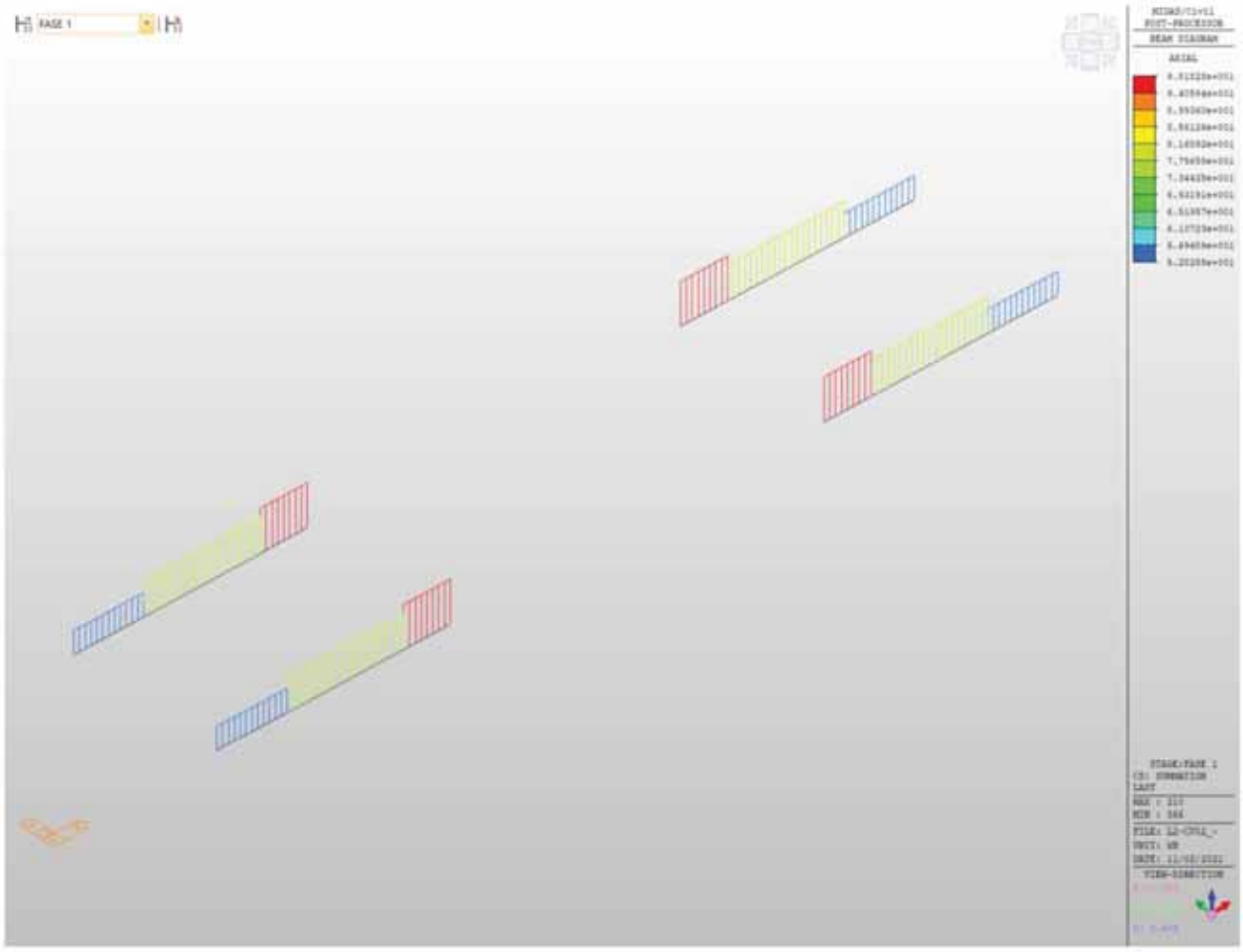


Figura 51 - Concio 2 - Diagramma N - Fase 1

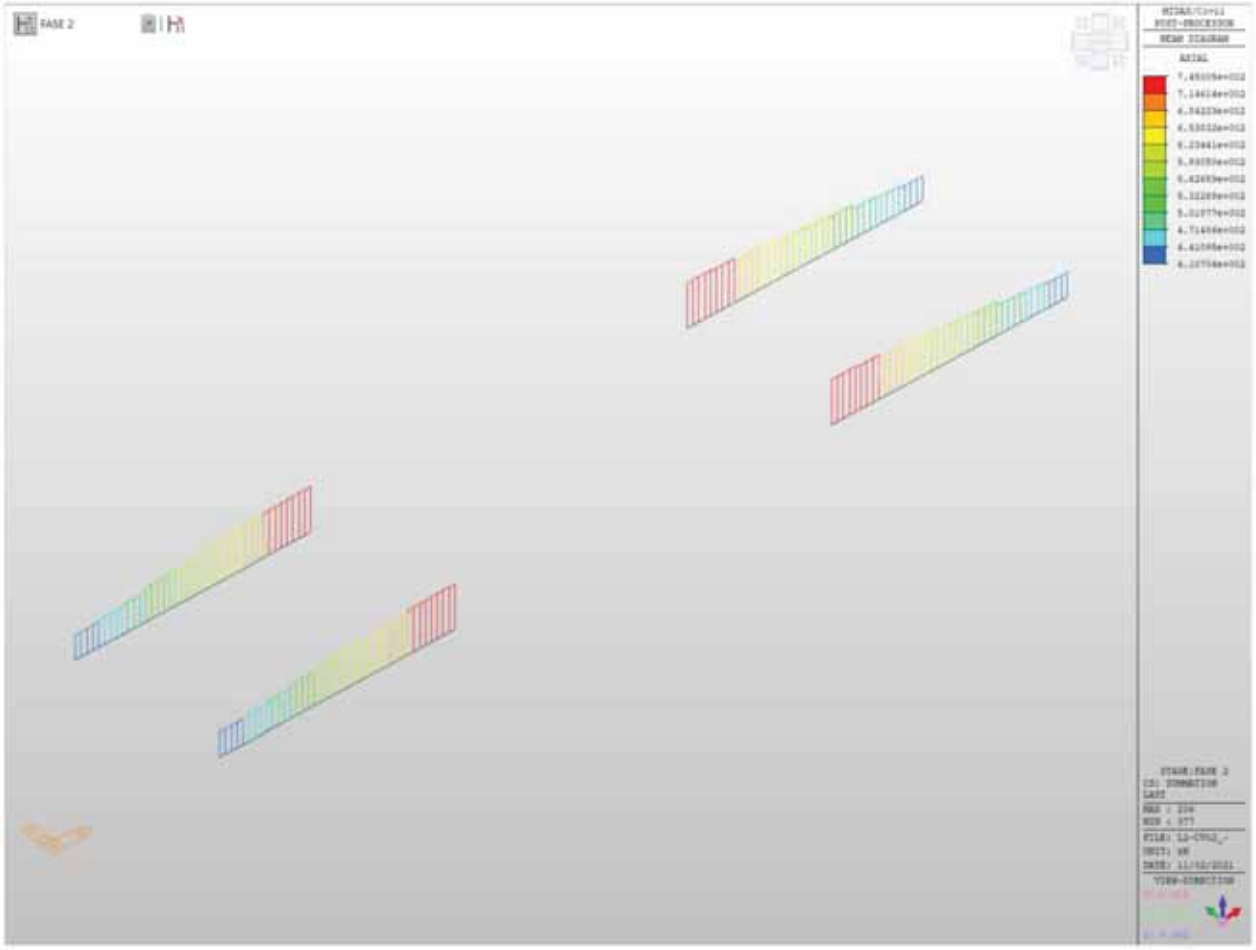


Figura 52 - Concio 2 - Diagramma N - Fase 2

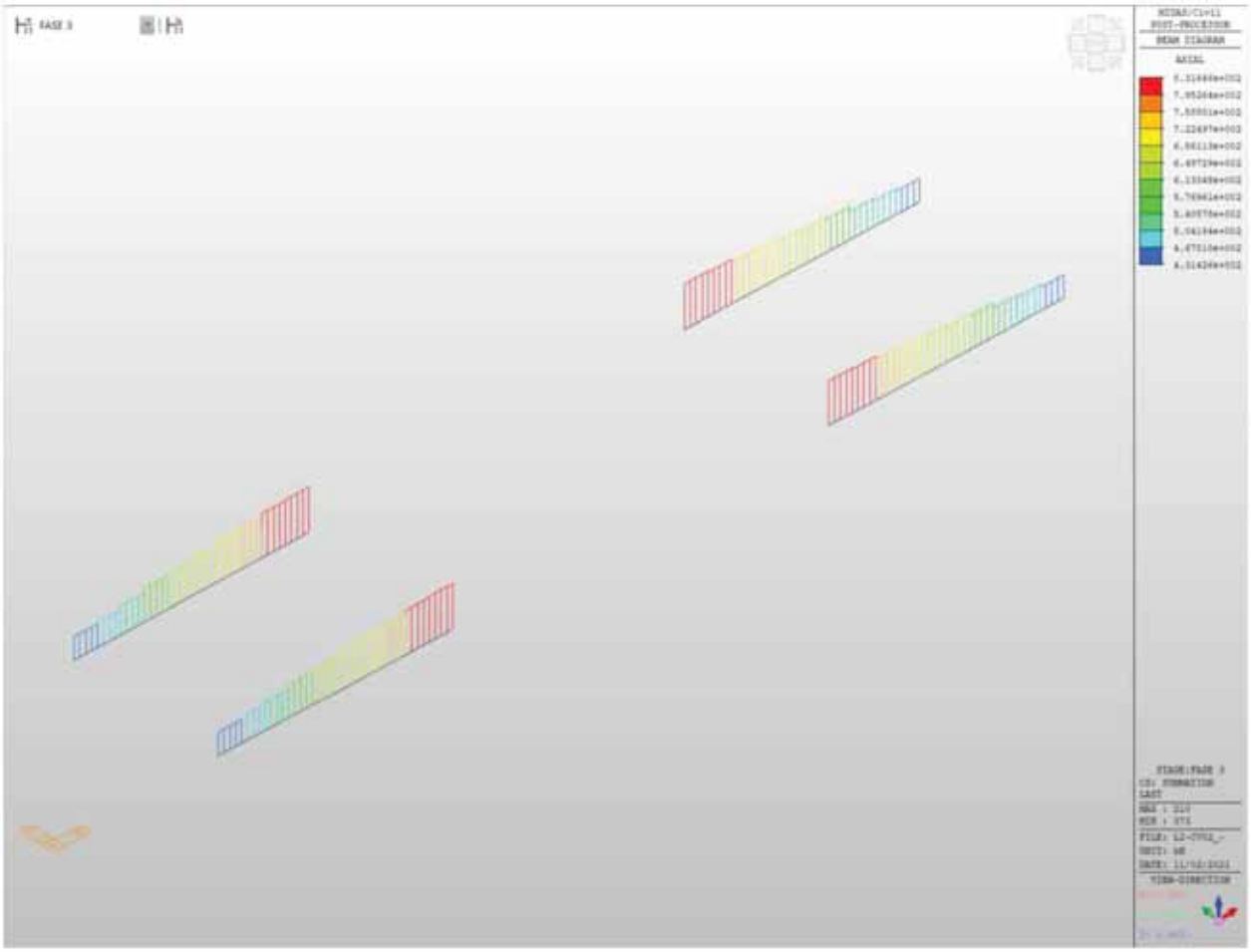


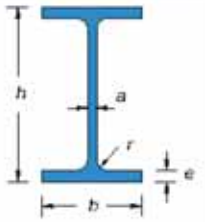
Figura 53 - Concio 2 - Diagramma N - Fase 3

Figura 54 - Concio 2 - Diagramma N - Inviluppo SLU-SLV

VERIFICA SEZIONE IN ACCIAIO COMPOSTA

CARATTERISTICHE PROFILO:

Tipo: S355



B_{SUP} =	750	mm			
$t_{f,SUP}$ =	28.0	mm	$A_{f,sup}$ =	21000.00	mm²
B_{INF} =	1200	mm			
$t_{f,INF}$ =	40.0	mm	$A_{f,INF}$ =	48000.00	mm²
H =	2100	mm			
t_w = a =	20.0	mm	A_w =	40640.00	mm²
L =	4400	mm	n. traversi:	1	
A_{TOT} =	109640.00	mm²			

$y_{G,inf}$ =	799.72	mm	$y_{G,sup}$ =	1300.28	mm
J_{yy} =	8.06E+10	mm⁴	J_t =	36506667	mm⁴
J_{zz} =	6745775000	mm⁴	J_ω =	1.069E+09	mm⁶
$W_{el,yy,inf}$ =	100769263	mm³	$W_{el,yy,sup}$ =	61977417	mm³
$W_{pl,yy}$ =	86397231	mm³			

$$W_{pl,xx} = 2\left[\frac{t_w H^2}{8} + t_f(b - t_w)\frac{H - t_f}{2} + 2r^2\left(\frac{H}{2} - t_f - \frac{r}{2}\right) - 2\frac{\pi r^2}{4}\left(\frac{H}{2} - t_f + r + \frac{4r}{3\pi}\right)\right]$$

ρ_{yy} =	857.33	mm	$\rho_{xx} = \sqrt{\frac{J_{xx}}{A}}$	
ρ_{zz} =	248.05	mm		
Peso =	860.67	kg/m		
E =	210000	N/mm²	modulo elastico	
ν =	0.3		coeff. poisson	
G =	80769	N/mm²	$G = \frac{E}{2(1+\nu)}$	modulo elasticità trasversale
α =	0.000012	°C⁻¹	coeff. espansione termica lineare	
f_{yk} =	355	N/mm²	tensione snervamento caratteristica	
f_{tk} =	510	N/mm²	tensione rottura caratteristica	
γ_{M0} =	1.05		per sezioni classe 1,2,3 e 4	
γ_{M1} =	1.05		per instabilità membrature	
γ_{M1} =	1.10		per instabilità membrature ponti stradali e ferroviari	
γ_{M2} =	1.25		per sezioni tese indebolite dai fori nei riguardi della frattura	

SOLLECITAZIONI:

$N_{t,sd}$ =	0	N	caso per trave tesa
$N_{c,sd}$ =	745000	N	caso per trave compressa
M_{sd} =	8574300000	Nmm	caso per trave inflessa in una direzione
V_{sd} =	699630	N	taglio

Caso per trave a flessione deviata (Momenti flettenti agenti alle estremità $|M_B| < |M_A|$):

M_B =	6859440000	Nmm	M_A =	8574300000	Nmm

Valori del momento massimo e minimo dell'asta:

$M_{max,y,sd}$ =	0	Nmm	$M_{min,y,sd}$ =	0	Nmm
$M_{max,z,sd}$ =	0	Nmm	$M_{min,z,sd}$ =	0	Nmm

CLASSE APPARTENENZA PROFILO (NTC2008, 4.2.3.1):

ALA SUPERIORE		ALA INFERIORE		ANIMA		
$C/t_{f,sup}$ =	13.04	$C/t_{f,inf}$ =	14.75	C/t_w =	101.60	3
ε =	0.81	ε =	0.81	ε =	0.81	

Curva di instabilità "b" (Asse yy):
Fattore di imperfezione α: 0.34
Curva di instabilità "c" (Asse zz):
Fattore di imperfezione a: 0.49

SOLLECITAZIONE DELL'ASTA A TAGLIO (NTC2008, 4.2.4.1.2):

$$\frac{V_{sd}}{V_{c,Rd}} \leq 1$$

Area taglio resistente: A_v = 41320 mm²

$$V_{c,Rd} = \frac{A_v f_{yk}}{\sqrt{3}\gamma_{M0}}$$ $V_{c,Rd}$ = 8065638 N => 0.09 *OK!(<1)*

Verifica in presenza di torsione uniforme:

$\tau_{t,sd}$ = 0 N/mm²

$$V_{c,Rd,red} = \left[1 - \frac{\tau_{t,sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}}\right] V_{c,Rd}$$

$V_{c,Rd,red}$ = 8065638 N => 0.09 *OK!(<1)*

Verifica in termini tensionali nel punto più sollecitato:

$$\frac{\tau_{sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}} \leq 1$$ => 0.00 *OK!(<1)*

SOLLECITAZIONE DELL'ASTA A COMPRESSIONE SEMPLICE (NTC2008, 4.2.4.1.2):

$$\frac{N_{sd}}{N_{c,Rd}} \leq 1$$ $$N_{cr} = \frac{\pi^2 EJ}{(\eta l)^2}$$ 722180136 N

$N_{c,sd}$ < **0,04 N_{cr}**
Instabilità trascurabile!

0.04 Ncr = 28887205 N *Instabilità trascurabile se λ < 0.2*

Calcolo snellezza membrana (< di 200 per le travature principali e < di 250 per le secondarie):

μ = 1.00 $l_0 = \mu l$ = 4400 mm

$\lambda = l_0 / \rho$ = 5

Calcolo resistenza per sezioni in classe 1,2 e 3:

$$N_{c,Rd} = \frac{A f_{yk}}{\gamma_{M0}}$$ $N_{c,Rd}$ = 37068762 N => 0.02 *OK!(<1)*

STABILITA' DELLE MEMBRATURE (NTC2008, 4.2.4.1.3):

Curva di instabilità "b" (Asse yy):
Fattore di imperfezione α: 0.49

Verifica per sezioni classe 1,2 e 3:

$$\bar{\lambda} = \sqrt{\frac{A f_{yk}}{N_{cr}}}$$ 0.23

$\bar{\lambda}$ > **0.2**
Serve verifica instabilità!

$$\Phi = 0.5\left[1 + \alpha(\bar{\lambda} - 0.2) + \bar{\lambda}^2\right]$$ 0.53

$$\chi = \frac{1}{\Phi + \sqrt{\Phi^2 - \bar{\lambda}^2}}$$ 0.98

$$N_{b,Rd} = \frac{\chi A f_{yk}}{\gamma_{M1}}$$ 34804758 N

$$\frac{N_{c,sd}}{N_{b,Rd}} \leq 1$$ => 0.02 *OK!(<1)*

SOLLECITAZIONE DELL'ASTA A FLESSIONE MONOASSIALE RETTA (NTC2008, 4.2.4.1.2):

$$\frac{M_{sd}}{M_{c,Rd}} \leq 1$$

$V_{sd} < 0{,}5\, V_{c,Rd}$ *Il taglio non influisce sulla verifica a flessione!*

$$\rho = \left[\frac{2V_{sd}}{V_{c,Rd}} - 1\right]^2$$ 0.68313

$f_{y,red} = (1-\rho) f_{yk}$ 112 N/mm²

f_{yk} = 355 N/mm²

Calcolo resistenza elastica sezione lorda, classe 3:

$$M_{el,Rd} = \frac{W_{el,min} f_{yk}}{\gamma_{M0}}$$ $M_{c,Rd}$ = 34069608013 Nmm => 0.25 *OK!(<1)*

n. fori = diametro = mm

$$\frac{0{,}9 A_{f,net} f_{tk}}{\gamma_{M2}} \geq \frac{A_f f_{yk}}{\gamma_{M0}}$$ *Non serve la verifica per la presenza dei fori!*

TRAVI INFLESSE (NTC2008, 4.2.4.1.3.2):

Calcolo snellezza membrana (< di 200 per le travature principali e < di 250 per le secondarie):

μ = 0.70 $L_{cr} = L/\mu$ = 3080 mm

W_{yy} = 100769263 mm³ W_{yy} = 61977417 mm³

$$\psi = 1.75 - 1.05\frac{M_B}{M_A} + 0.3\left(\frac{M_B}{M_A}\right)^2$$ 1.10

$$M_{cr} = \psi \frac{\pi}{L_{cr}} \sqrt{EJ_y GJ_T} \sqrt{1 + \left(\frac{\pi}{L_{cr}}\right)^2 \frac{EJ_\omega}{GJ_T}}$$ 2.511E+11 Nmm 0.034

M_{sd}/M_{cr} = 0.034 *Risulta < 0.16 Non serve la verifica instabilità*

$$\bar{\lambda}_{LT} = \sqrt{\frac{W_y f_{yk}}{M_{cr}}}$$ 0.30 *Risulta < 0.4 Non serve la verifica instabilità*

Stabilità dei pannelli soggetti a taglio (NTC2008, 4.2.4.1.3.4.1):

Se irrigiditori trasversali rigido o no,

I_{st} =	45000000	mm^4	0.75hwt3 =	5740289	mm^4	*Irrigiditore Trasversali rigidi*

Coefficiente minimo di instabiltà per taglio del panello (In assenza di irrigiditori longitudinali),

a/hw =	2.10	k_τ =	7.25

Coefficiente minimo di instabiltà per taglio del panello (irrigiditori longitudinali più di due o a/hw >3),

I_{sl} =	0	mm^4	k_{tl} =	0.00	
a/hw =	2.10		k_τ =	7.25	

Coefficiente minimo di instabiltà per taglio del panello (irrigiditori longitudinali più di due o a/hw < 3),

I_{sl} =	0	mm^4	a/hw =	2.10	k_τ =	5.54

k_τ =	7.25					
η =	1.2		hw/t =	101.60	*Serve la verifica di instailtà*	
σ_E =	17.23356009	MPa	τ_{cr} =	124.93	λ_w =	1.28

Montanti di appogio rigidi,		χ_w =	0.69
Gli altri casi,		χ_w =	0.65

$V_{bw,Rd}$ =	5311379	N

Momento resistente sole piattabande,

$y_{G,inf}$ =	648.78	mm	$y_{G,sup}$ =	1451.22	mm
J_{yy} =	62362885739	mm^4			
$W_{el,yy,inf}$ =	96122931	mm^3	$W_{el,yy,sup}$ =	42972808	mm^3
$M_{f,red}$ =	14064919853	Nmm			

bf =	340.2	mm	$V_{bf,Rd}$ =	31395	N

$V_{b,Rd}$ =	5342774	N	0.131	*OK!(<1)*

Stabilità dei pannelli soggetti a Compressione (NTC2008, 4.2.4.1.3.4.1):

Stress,

σ_{sup} =	138.35	MPa
σ_{inf} =	-85.09	MPa
$\sigma_{irr.}$ =	84.08	MPa

Irrigidati su entrambi lati (Anima),

b =	2032.0	mm	(Web bw)		a =	4400	mm
σ1 =	138.3	(Max)			σ2 =	-85.09	(Min)
ψ =	-0.6				kσ =	15.38	
λp =	1.1				ρ =	0.89	
σcr,p =	283.1	MPa			σcr,c =	3.921	MPa
ζ =	1.0				λc =	9.515	
α =	0.34				Φ =	143.847	
χc =	0.003						
ρc =	0.89						
beff =	1117.12	mm	be1 =	446.85	mm	be2 =	670.27 mm
bt =	773.83	mm					

Irrigidati a un lato (Piattebande),
Piattabanda Superiore,

b =	365	mm	(Flange Sup)				
σ (Irri.) =	138.3				σ (Lib.) =	138.35	
kσ =	0.43						
λp =	1.2				ρ =	0.70	
beff =	254.81	mm			bt =	0	mm

Effective Section Properties,

Ac,eff (Piattabanda Sup) =	14269.5	mm2			
Ac,eff (Piattabanda Inf) =	48000.0	mm2			
Ac,eff (Anima) =	22342.5	mm2			
Ac (Anima tensione) =	15476.6	mm2			
Ac,eff (Total) =	100088.6	mm2			
$y_{g,inf}$ =	692.0	mm	$y_{g,sup}$ =	1408.0	mm
Ieff =	7.04E+10	mm4			
W_{eff} (inf) =	101748797	mm3	W_{eff} (sup) =	50002161	mm3
e =	107.77	mm			
η =	0.51				

Fase 2

Soletta c.a.collaborante

b_{eff} =	2.84	m
Altezza soletta:	0.26	m
Area soletta:	0.74	m^2
J_{yy} =	0.00416	m^4
Peso =	18.46	kN/m

Trave acciaio

Area trave acciaio:	0.10964	m^2
H trave acciaio:	2.10	m
y_G =	0.800	m
J_{yy} =	0.080588	m^4
Peso =	8.61	kN/m

Barre armatura soletta

1° strato barre (superiore)			2° strato barre (inferiore)		
n. Barre:	14		n. Barre:	14	
Interasse:	0.20	m	Interasse:	0.20	m
Diametro:	0.024	m	Diametro:	0.024	m
Area:	0.006333	m^2	Area:	0.006333	m
y_1 =	0.05	m	y_2 =	0.21	m

n = 18.0 Coeff. omogeneizzazione con viscosità in atto

Materiali

cls			Barre armature			Acciaio		
R_{ck} =	40	MPa	f_{yk} =	450	MPa	f_{yk} =	355	MPa
f_{ck} =	33.20	MPa	γ_M =	1.15		γ_{M0} =	1.05	
f_{cd} =	18.81	MPa	$f_{yd,s}$ =	391.30	MPa	$f_{yd,a}$ =	338.10	MPa
f_{cm} =	41.2	MPa						
f_{ctm} =	3.10	MPa						
E_{cm} =	33643	MPa						

Caratteristiche geometriche

A_{id} =	0.1633	m^2	Area sezione omogeneizzata in area di acciaio
A_v =	41320	mm^2	Area taglio sezione di acciaio
$y_{G,inf,id}$ =	1.27	m	Asse neutro rispetto lembo inferiore:
$y_{G,sup,id}$ =	1.09	m	Asse neutro rispetto lembo superiore
$J_{xx,id}$ =	0.154628	m^4	Momento d'inerzia sezione omogeneizzata ad acciaio
$W_{inf,id}$ =	0.121765	m^3	Modulo elastico sezione omogeneizzata ad acciaio
$W_{sup,id}$ =	0.141845	m^3	Modulo elastico sezione omogeneizzata ad acciaio

Sollecitazioni

M_{sd} =	10979.10	kNm	(SLU)		
M_{rd} =	41168.30	kNm	=>	0.27	ok!
T_{sd} =	880.21	kN	(SLU)		
T_{rd} =	7681.56	kN	=>	0.11	ok!

Tensioni

σ_c =	4.30	MPa	=>	0.23	ok!(<1)	Tensione al lembo superiore soletta
$\sigma_{s,sup}$ =	73.85	MPa	=>	0.19	ok!(<1)	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	62.49	MPa	=>	0.16	ok!(<1)	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	58.94	MPa	=>	0.17	ok!(<1)	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	90.17	MPa	=>	0.27	ok!(<1)	Tensione acciaio lembo inferiore

Fase 3

Soletta c.a.collaborante

b_{eff} =	2.84	m
Altezza soletta:	0.26	m
Area soletta:	0.74	m^2
J_{xx} =	0.00416	m^4
Peso =	18.46	kN/m

Trave acciaio

Area trave acciaio:	0.10964	m^2
H trave acciaio:	2.10	m
y_G =	0.800	m
J_{xx} =	0.080588	m^4
Peso =	8.61	kN/m

Barre armatura soletta

1° strato barre (superiore)			2° strato barre (inferiore)		
n. Barre:	14		n. Barre:	14	
Interasse:	0.20	m	Interasse:	0.20	m
Diametro:	0.024	m	Diametro:	0.024	m
Area:	0.006333	m^2	Area:	0.006333	m
y_1 =	0.05	m	y_2 =	0.21	m

n = 6.2 Coeff. omogeneizzazione a tempo infinito

Materiali

cls			Barre armature			Acciaio		
R_{ck} =	40	MPa	f_{yk} =	450	MPa	f_{yk} =	355	MPa
f_{ck} =	33.20	MPa	γ_M =	1.15		γ_{M0} =	1.05	
f_{cd} =	18.81	MPa	$f_{yd,s}$ =	391.30	MPa	$f_{yd,a}$ =	338.10	MPa
f_{cm} =	41.2	MPa						
f_{ctm} =	3.10	MPa						
E_{cm} =	33643	MPa						

Caratteristiche geometriche

A_{id} =	0.2414	m^2	Area sezione omogeneizzata in area di acciaio
A_v =	41320	mm^2	Area taglio sezione di acciaio
$y_{G,inf,id}$ =	1.58	m	Asse neutro rispetto lembo inferiore:
$y_{G,sup,id}$ =	0.78	m	Asse neutro rispetto lembo superiore
$J_{xx,id}$ =	0.203762	m^4	Momento d'inerzia sezione omogeneizzata ad acciaio
$W_{inf,id}$ =	0.12893	m^3	Modulo elastico sezione omogeneizzata ad acciaio
$W_{sup,id}$ =	0.261368	m^3	Modulo elastico sezione omogeneizzata ad acciaio

Sollecitazioni

M_{sd} =	28882.30	kNm	(SLU)		
M_{rd} =	43590.75	kNm	=>	0.66	ok!
T_{sd} =	2378.50	kN	(SLU)		
T_{rd} =	7681.56	kN	=>	0.31	ok!

Tensioni

σ_c =	17.82	MPa	=>	0.95	ok!(<1)	Tensione al lembo superiore soletta
$\sigma_{s,sup}$ =	103.42	MPa	=>	0.26	ok!(<1)	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	80.74	MPa	=>	0.21	ok!(<1)	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	73.65	MPa	=>	0.22	ok!(<1)	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	224.01	MPa	=>	0.66	ok!(<1)	Tensione acciaio lembo inferiore

6.2.1.3 TRAVE PRINCIPALE CONCIO 3

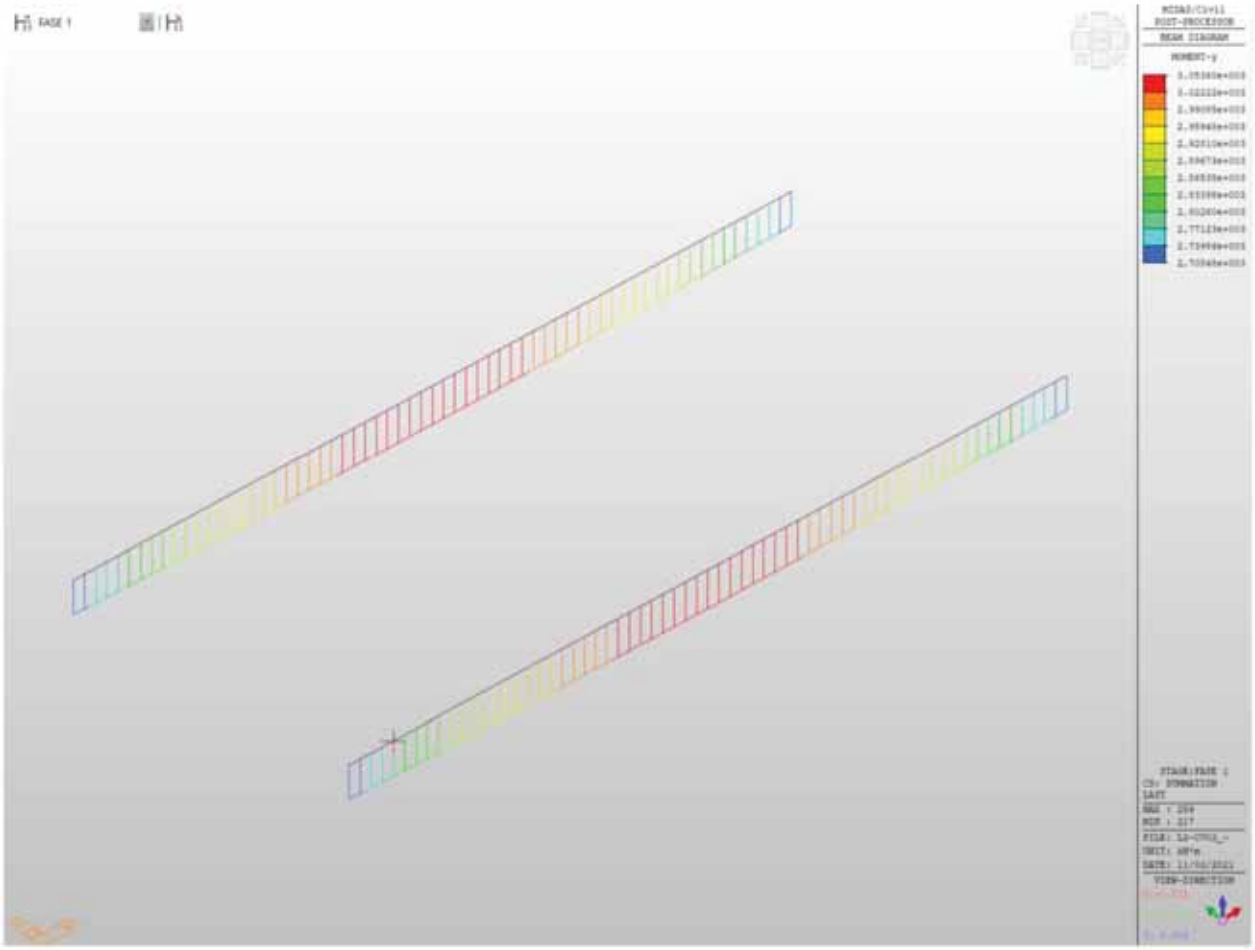


Figura 55 - Concio 3 - Diagramma My - Fase 1

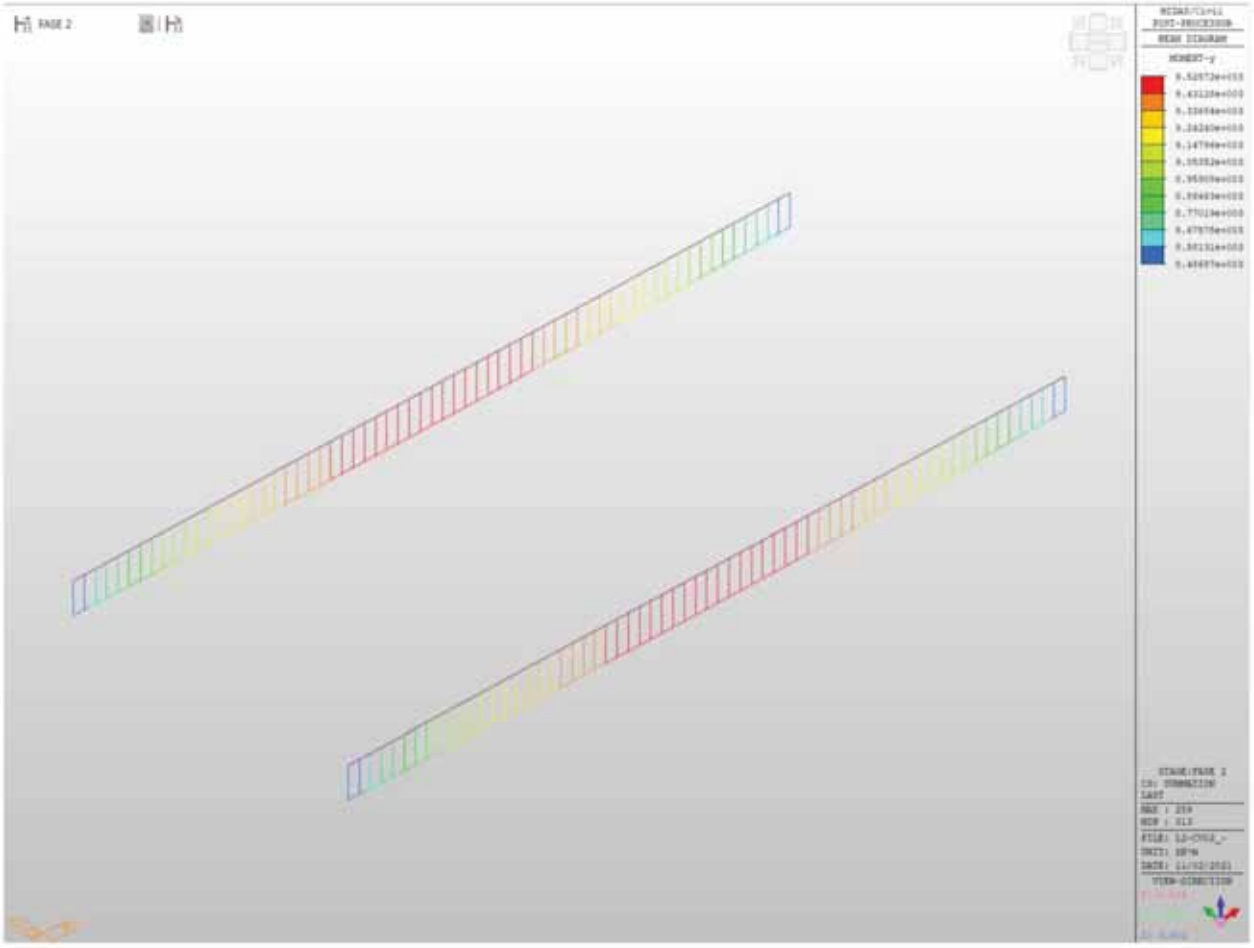


Figura 56 - Concio 3 - Diagramma My - Fase 2

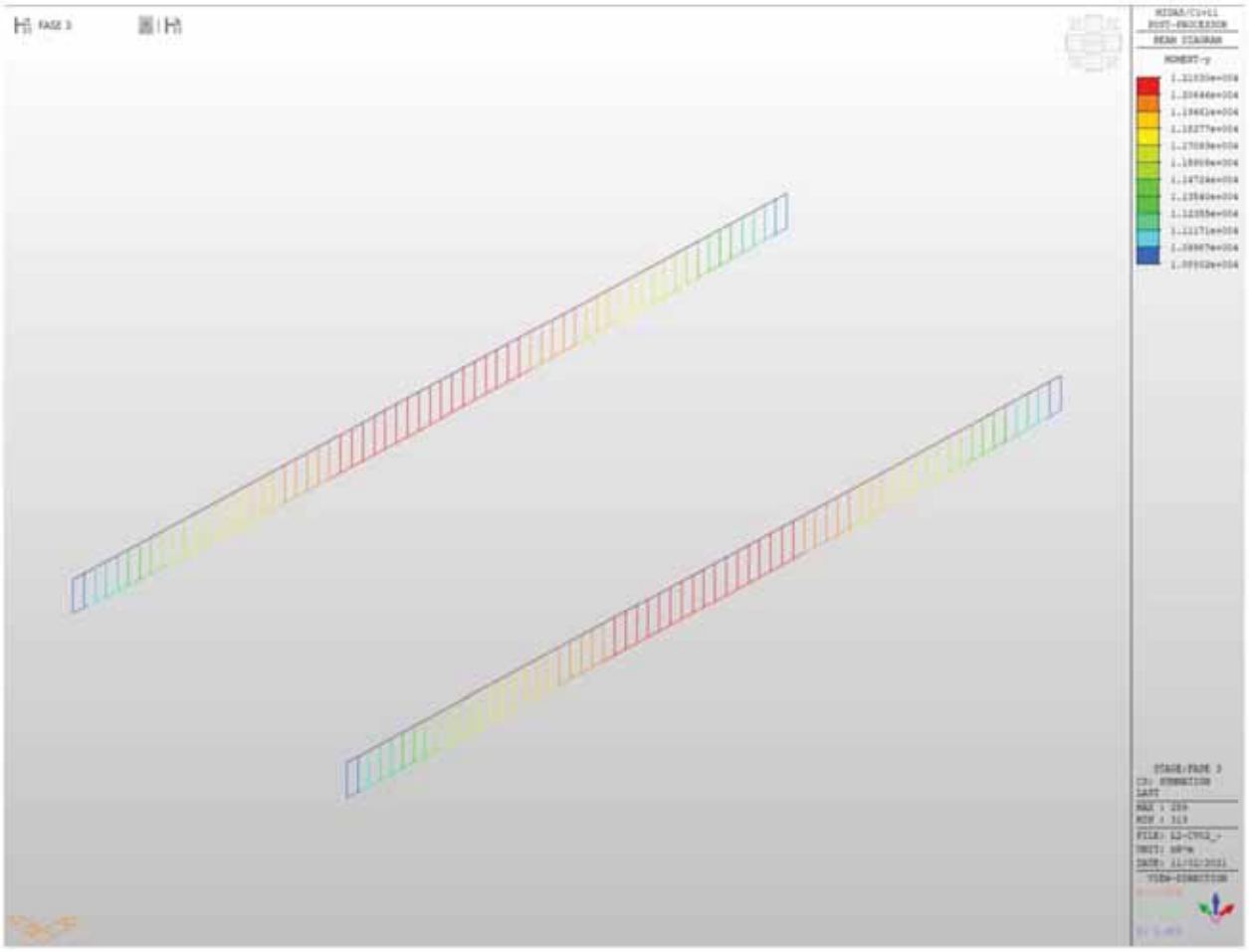


Figura 57 - Concio 3 - Diagramma My - Fase 3

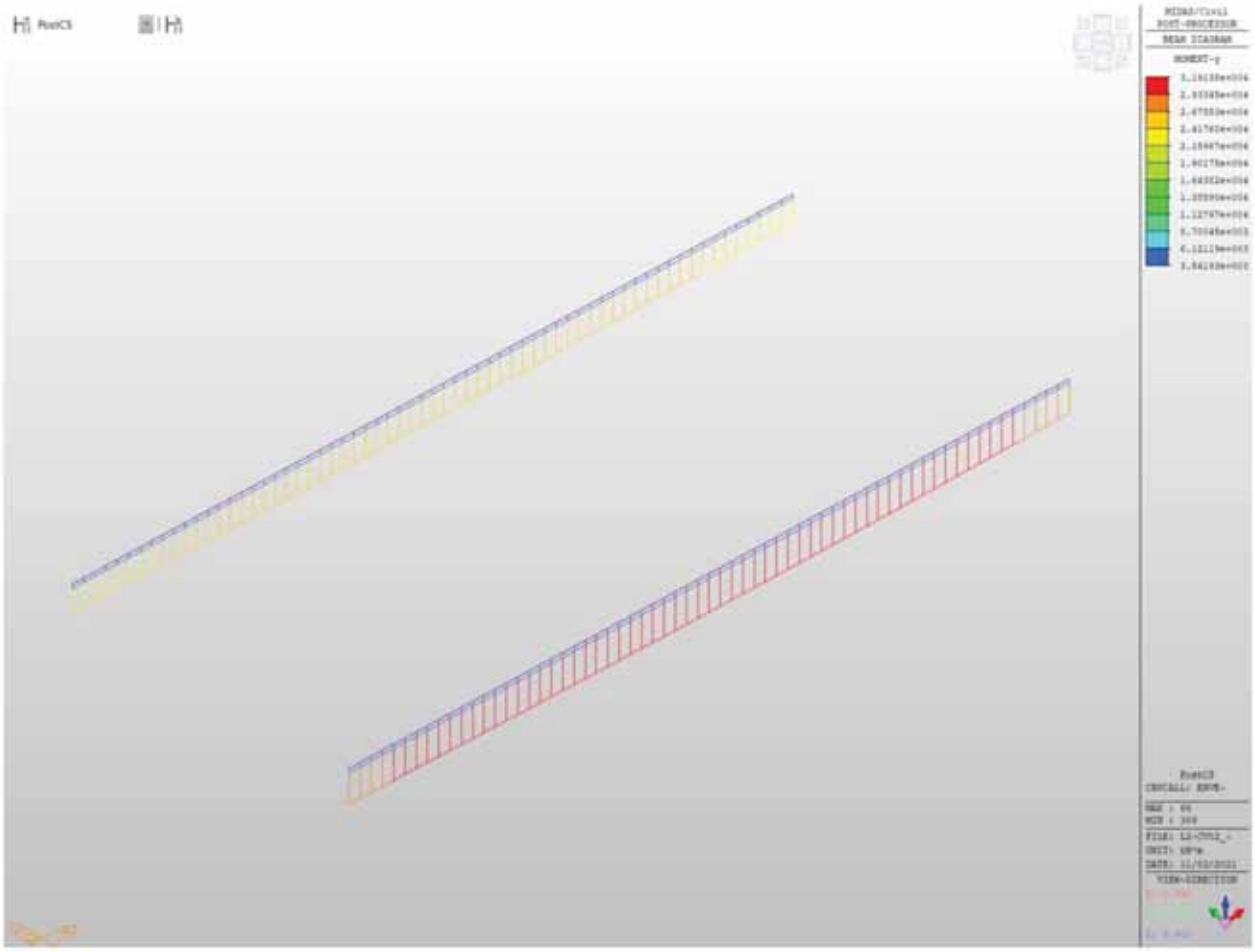


Figura 58 - Concio 3 - Diagramma My - Inviluppo SLU-SLV

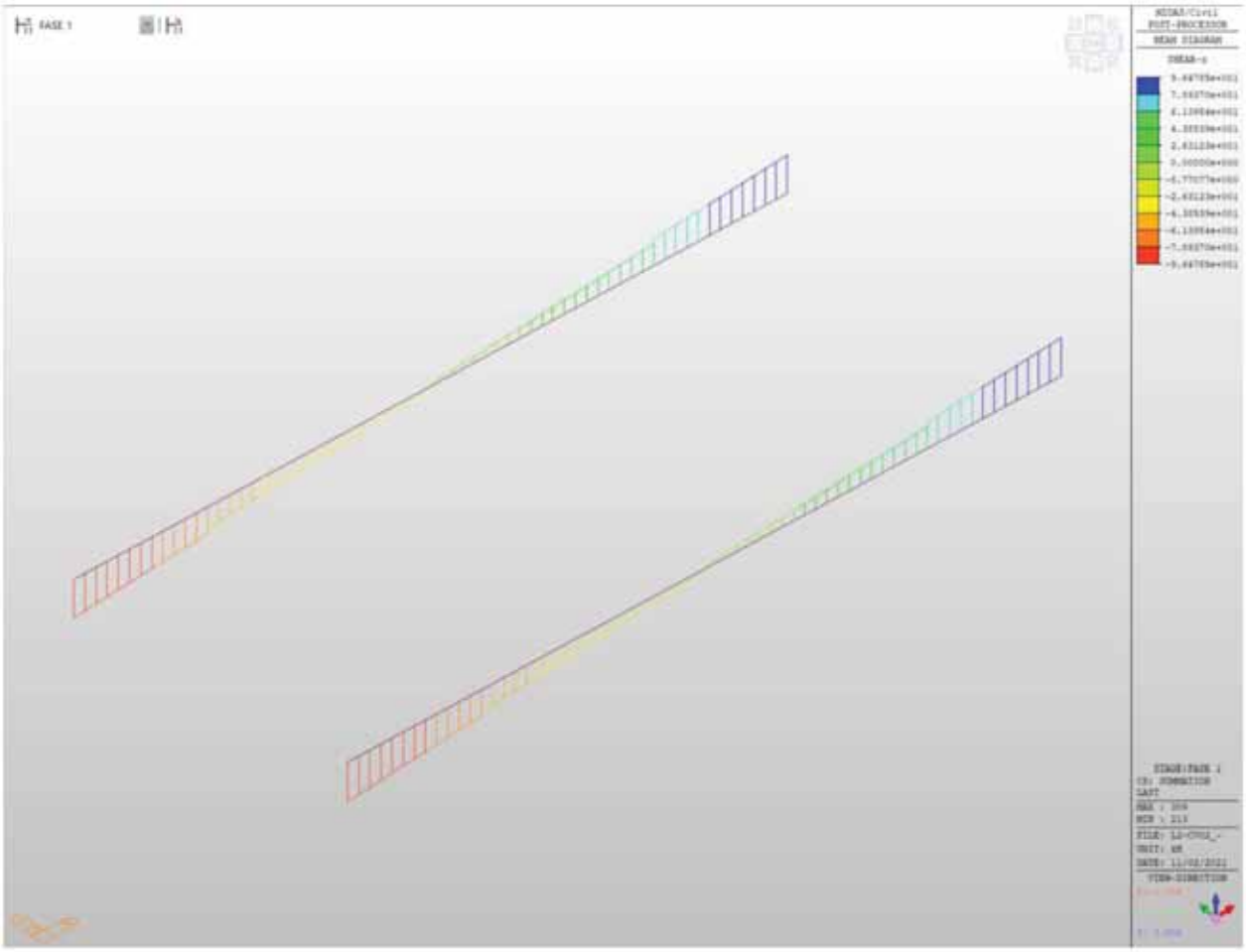


Figura 59 - Concio 3 - Diagramma Tz - Fase 1

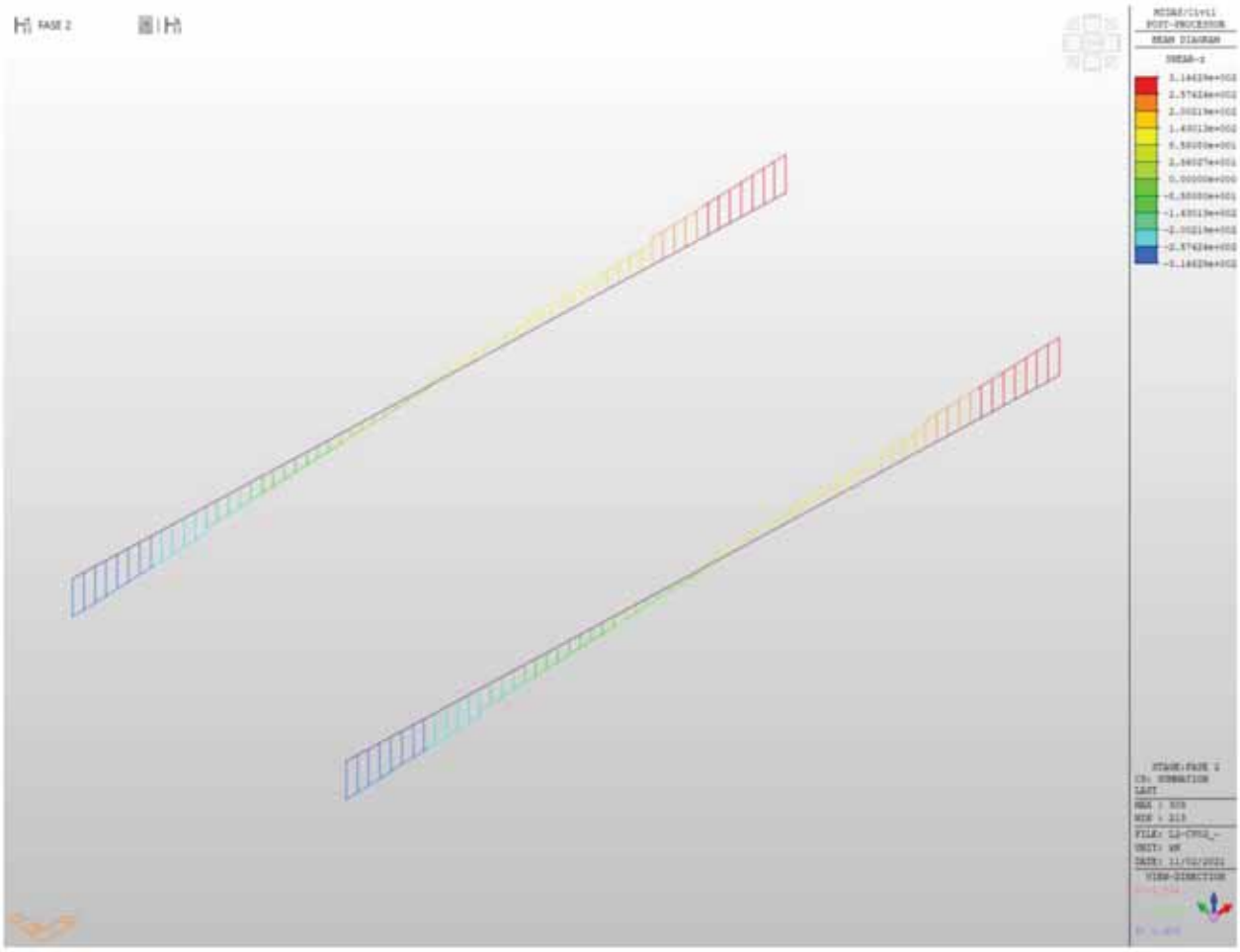


Figura 60 - Concio 3 - Diagramma Tz - Fase 2

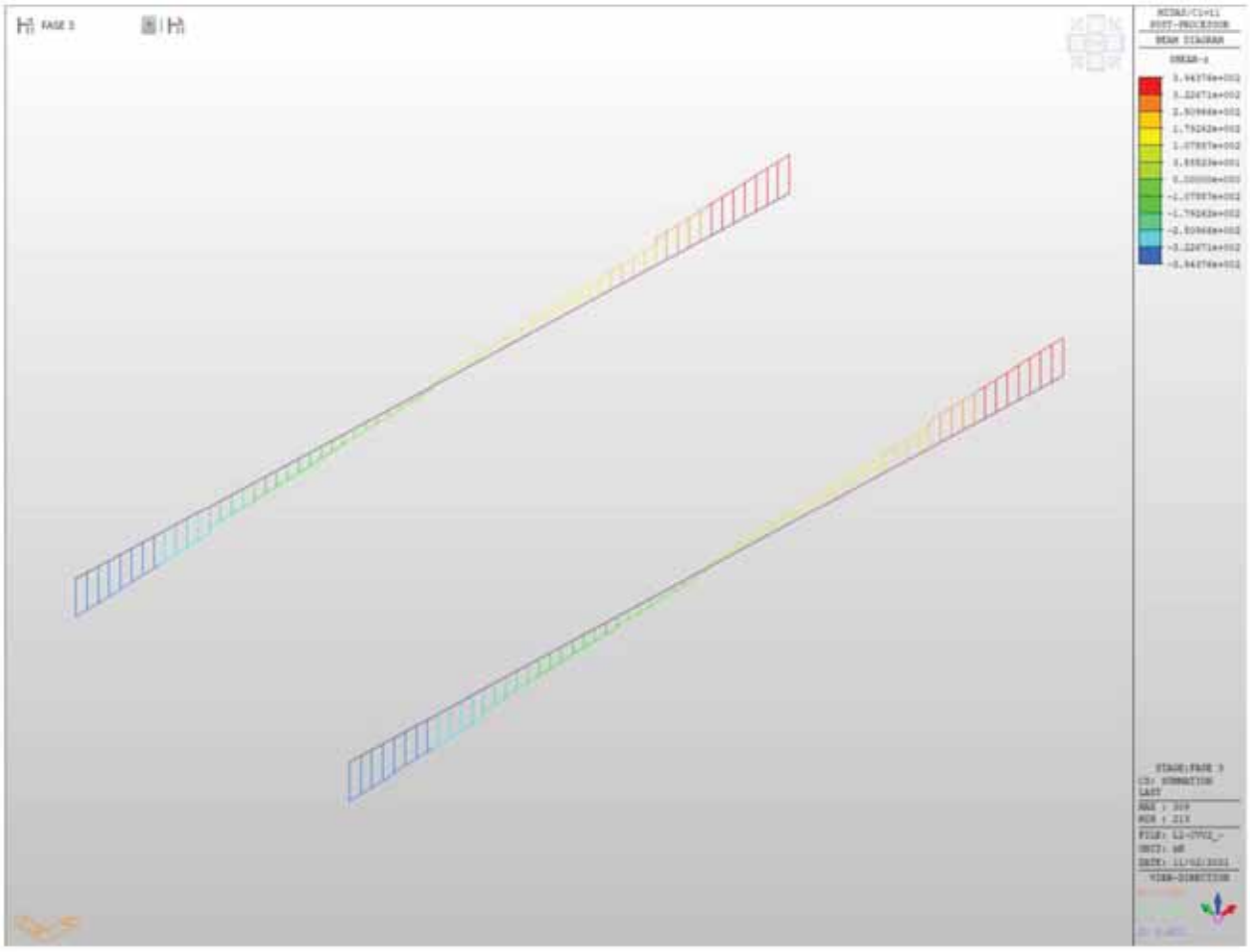


Figura 61 - Concio 3 - Diagramma Tz - Fase 3

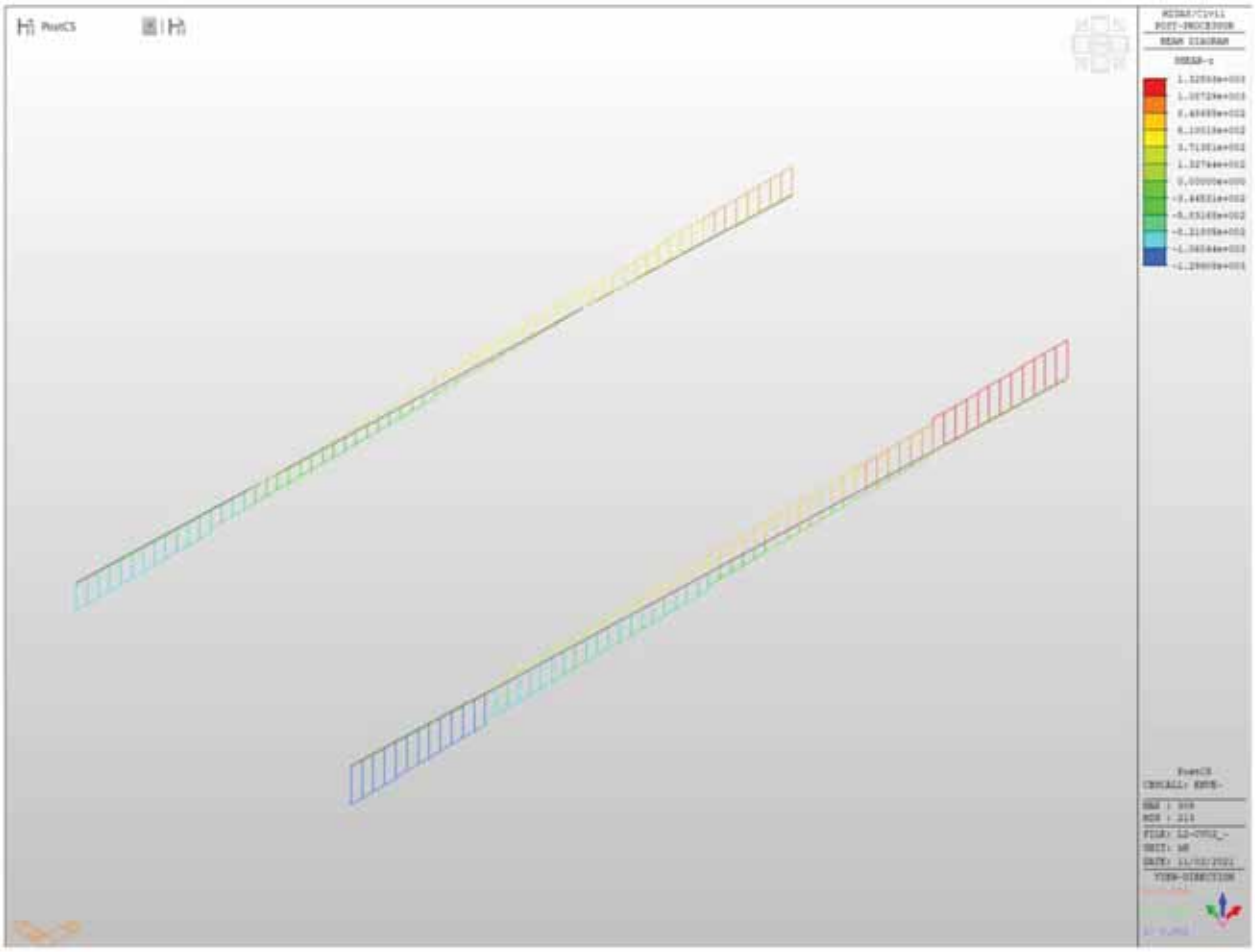


Figura 62 - Concio 3 - Diagramma Tz - Inviluppo SLU-SLV

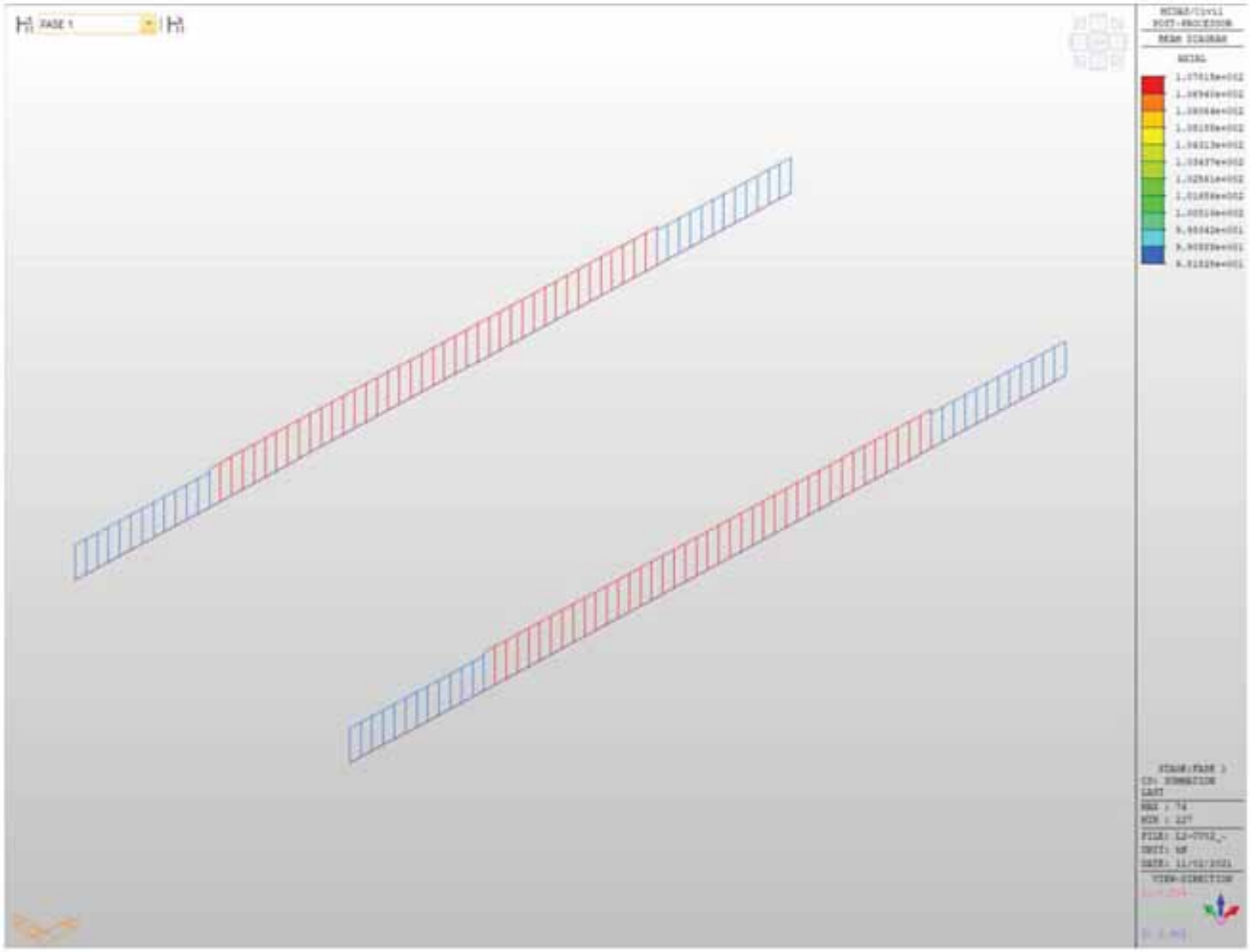


Figura 63 - Concio 3 - Diagramma N - Fase 1

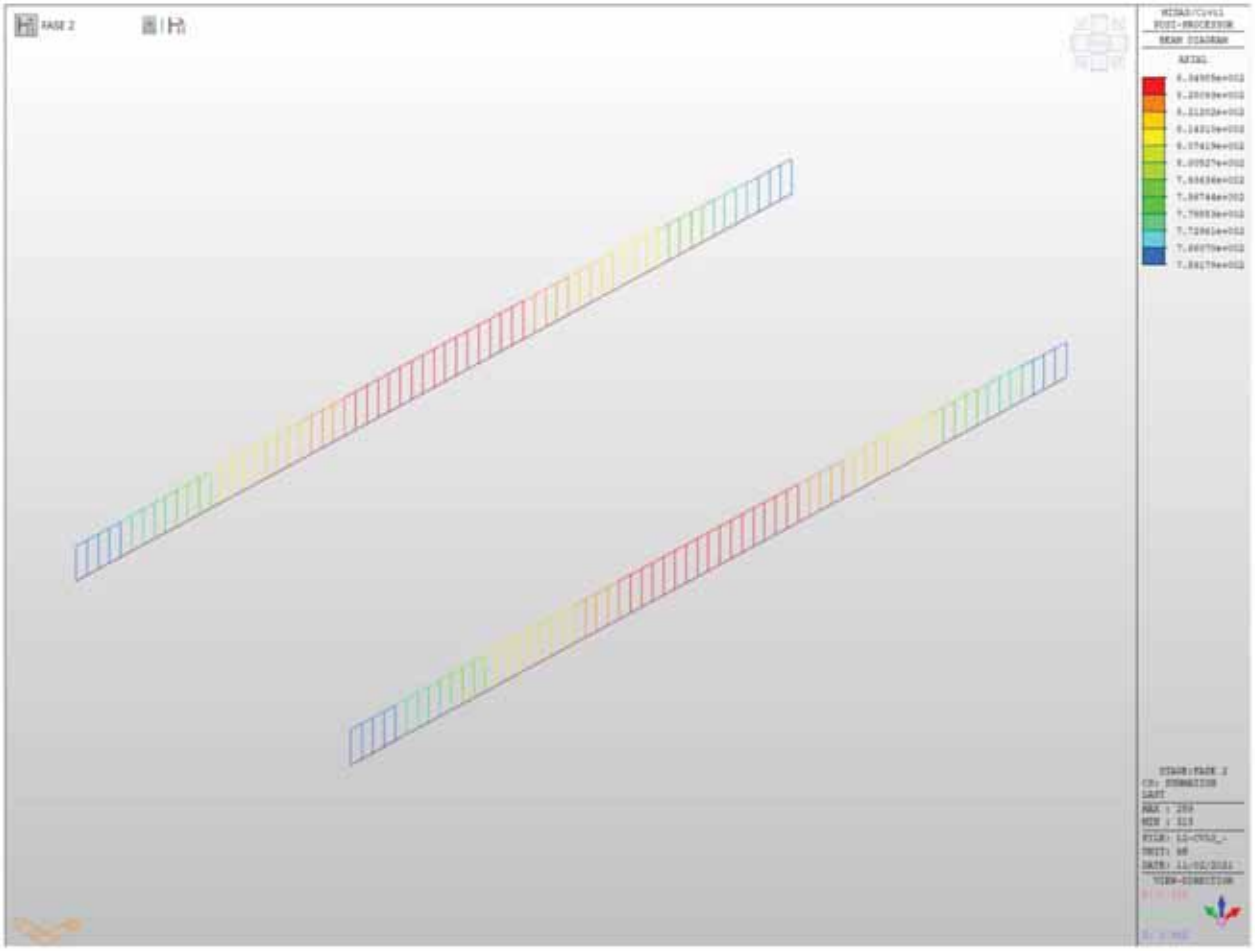


Figura 64 - Concio 3 - Diagramma N - Fase 2

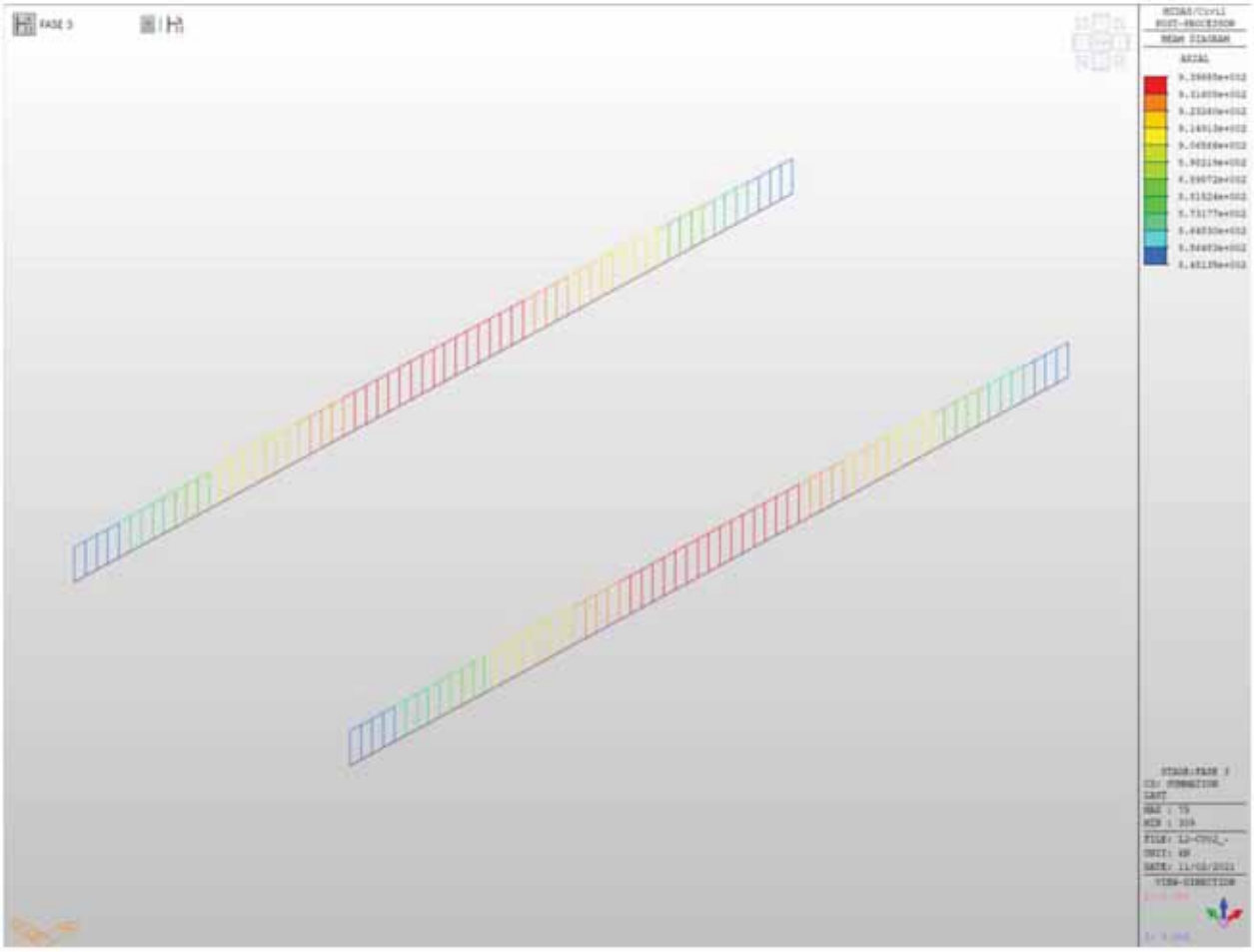


Figura 65 - Concio 3 - Diagramma N - Fase 3

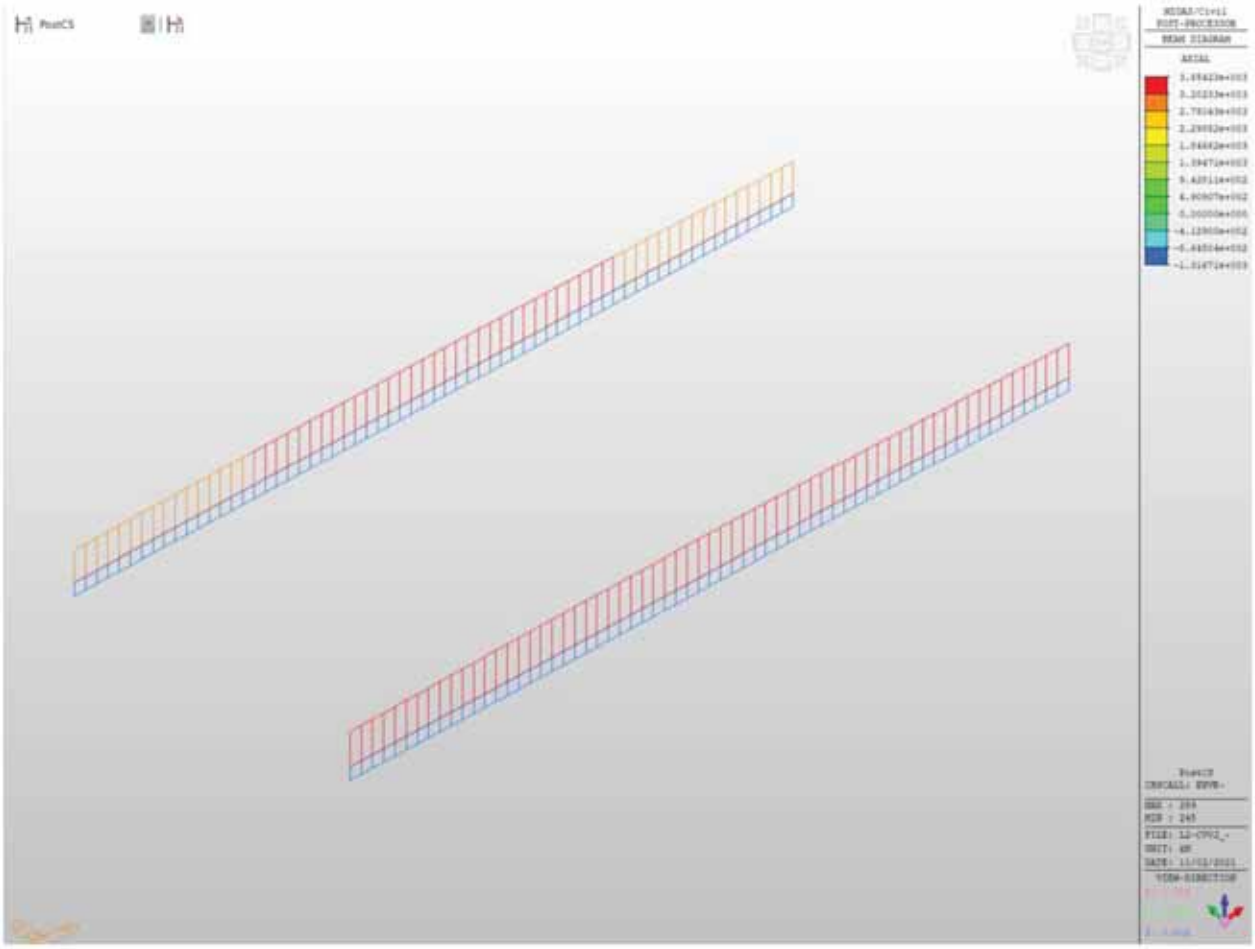
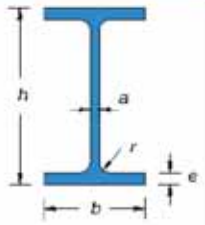


Figura 66 - Concio 3 - Diagramma N - Inviluppo SLU-SLV

VERIFICA SEZIONE IN ACCIAIO COMPOSTA

CARATTERISTICHE PROFILO:

Tipo: 5355



$B_{s,sup}$ =	750	mm				
$t_{f,sup}$ =	30.0	mm	$A_{f,sup}$ =	22500.00	mm²	
$B_{f,inf}$ =	1200	mm				
$t_{f,inf}$ =	55.0	mm	$A_{f,inf}$ =	66000.00	mm²	
H =	2100	mm				
t_w = a =	20.0	mm	A_w =	40300.00	mm²	
L =	4400	mm	n. traversi:	1		
A_{TOT} =	128800.00	mm²				
$y_{G,inf}$ =	710.76	mm	$y_{G,sup}$ =	1389.24	mm	
J_{yy} =	9.19E+10	mm⁴	J_t =	78673333	mm⁴	
J_{zz} =	8976087500	mm⁴	J_w =	1.069E+09	mm⁶	
$W_{el,yy,inf}$ =	129359105	mm³	$W_{el,yy,sup}$ =	66182824	mm³	
$W_{pl,yy}$ =	98791188	mm³				

$$W_{pl,yy} = 2\left[\frac{t_w H^2}{8} + t_f(b - t_w)\frac{H - t_f}{2} + 2r^2\left(\frac{H}{2} - t_f - \frac{r}{2}\right) - 2\frac{\pi r^2}{4}\left(\frac{H}{2} - t_f + r + \frac{4r}{3\pi}\right)\right]$$

ρ_{yy} =	844.90	mm	$\rho_{xx} = \sqrt{\frac{J_{xx}}{A}}$	
ρ_{zz} =	263.99	mm		
Peso =	1011.08	kg/m		
E =	210000	N/mm²	modulo elastico	
ν =	0.3		coeff. poisson	
G =	80769	N/mm²	$G = \frac{E}{2(1+\nu)}$	modulo elasticità trasversale
α =	0.000012	°C⁻¹	coeff. espansione termica lineare	
f_{yk} =	355	N/mm²	tensione snervamento caratteristica	
f_{tk} =	510	N/mm²	tensione rottura caratteristica	
γ_{M0} =	1.05		per sezioni classe 1,2,3 e 4	
γ_{M1} =	1.05		per instabilità membrature	
γ_{M1} =	1.10		per instabilità membrature ponti stradali e ferroviari	
γ_{M2} =	1.25		per sezioni tese indebolite dai fori nei riguardi della frattura	

SOLLECITAZIONI:

$N_{t,sd}$ =	0	N	caso per trave tesa
$N_{c,sd}$ =	835000	N	caso per trave compressa
M_{sd} =	9525700000	Nmm	caso per trave inflessa in una direzione
V_{sd} =	314630	N	taglio

Caso per trave a flessione deviata (Momenti flettenti agenti alle estremità $|M_B| < |M_A|$):

M_B =	7620560000	Nmm	M_A =	9525700000	Nmm

Valori del momento massimo e minimo dell'asta:

$M_{max,y,sd}$ =	0	Nmm	$M_{min,y,sd}$ =	0	Nmm
$M_{max,z,sd}$ =	0	Nmm	$M_{min,z,sd}$ =	0	Nmm

CLASSE APPARTENENZA PROFILO (NTC2008, 4.2.3.1):

ALA SUPERIORE		ALA INFERIORE		ANIMA		
$C/t_{f,sup}$ =	12.17	$C/t_{f,inf}$ =	10.73	C/t_w =	100.75	3
ε =	0.81	ε =	0.81	ε =	0.81	

Curva di instabilità "b" (Asse yy):
Fattore di imperfezione α: 0.34
Curva di instabilità "c" (Asse zz):
Fattore di imperfezione a: 0.49

SOLLECITAZIONE DELL'ASTA A TAGLIO (NTC2008, 4.2.4.1.2):

$$\frac{V_{sd}}{V_{c,Rd}} \le 1$$

Area taglio resistente: A_v = 41150 mm²

$$V_{c,Rd} = \frac{A_v f_{yk}}{\sqrt{3}\gamma_{M0}}$$ $V_{c,Rd}$ = 8032454 N => 0.04 OK!(<1)

Verifica in presenza di torsione uniforme:

$\tau_{t,sd}$ = 0 N/mm²

$$V_{c,Rd,red} = \left[1 - \frac{\tau_{t,sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}}\right] V_{c,Rd}$$

$V_{c,Rd,red}$ = 8032454 N => 0.04 OK!(<1)

Verifica in termini tensionali nel punto più sollecitato:

$$\frac{\tau_{sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}} \le 1$$ => 0.00 OK!(<1)

SOLLECITAZIONE DELL'ASTA A COMPRESSIONE SEMPLICE (NTC2008, 4.2.4.1.2):

$$\frac{N_{sd}}{N_{c,Rd}} \le 1 \qquad N_{cr} = \frac{\pi^2 EJ}{(\eta l)^2}$$ 960949941 N

$N_{c,sd}$ < 0,04 N_{cr}
Instabilità trascurabile!

0.04 Ncr = 38437998 N *Instabilità trascurabile se $\bar{\lambda}$ < 0.2*

Calcolo snellezza membrana (< di 200 per le travature principali e < di 250 per le secondarie):

μ = 1.00 $l_0 = \mu\, l$ = 4400 mm

$\lambda = l_0 / \rho$ = 5

Calcolo resistenza per sezioni in classe 1,2 e 3:

$$N_{c,Rd} = \frac{A f_{yk}}{\gamma_{M0}}$$ $N_{c,Rd}$ = 43546667 N => 0.02 OK!(<1)

STABILITA' DELLE MEMBRATURE (NTC2008, 4.2.4.1.3):

Curva di instabilità "b" (Asse yy):
Fattore di imperfezione α: 0.49

Verifica per sezioni classe 1,2 e 3:

$$\bar{\lambda} = \sqrt{\frac{A f_{yk}}{N_{cr}}}$$ 0.22

$\bar{\lambda}$ > 0.2
Serve verifica instabilità!

$$\Phi = 0.5\left[1 + \alpha(\bar{\lambda} - 0.2) + \bar{\lambda}^2\right]$$ 0.53

$$\chi = \frac{1}{\Phi + \sqrt{\Phi^2 - \bar{\lambda}^2}}$$ 0.99

$$N_{b,Rd} = \frac{\chi A f_{yk}}{\gamma_{M1}}$$ 41183245 N

$$\frac{N_{c,sd}}{N_{b,Rd}} \le 1$$ => 0.02 OK!(<1)

SOLLECITAZIONE DELL'ASTA A FLESSIONE MONOASSIALE RETTA (NTC2008, 4.2.4.1.2):

$$\frac{M_{sd}}{M_{c,Rd}} \leq 1$$

$V_{sd} < 0{,}5\, V_{c,Rd}$ *Il taglio non influisce sulla verifica a flessione!*

$$\rho = \left[\frac{2V_{sd}}{V_{c,Rd}} - 1\right]^2$$ 0.84946

$f_{y,red} = (1-\rho) f_{yk}$ 53 N/mm²

f_{yk} = 355 N/mm²

Calcolo resistenza elastica sezione lorda, classe 3:

$$M_{el,Rd} = \frac{W_{el,min} f_{yk}}{\gamma_{M0}}$$ $M_{c,Rd}$ = 43735697332 Nmm => 0.22 *OK!(<1)*

n. fori = diametro = mm

$$\frac{0{,}9 A_{f,net} f_{tk}}{\gamma_{M2}} \geq \frac{A_f f_{yk}}{\gamma_{M0}}$$ *Non serve la verifica per la presenza dei fori!*

TRAVI INFLESSE (NTC2008, 4.2.4.1.3.2):

Calcolo snellezza membrana (< di 200 per le travature principali e < di 250 per le secondarie):

μ = 0.70 $L_{cr} = L / \mu$ = 3080 mm

W_{yy} = 129359105 mm³ W_{yy} = 66182824 mm³

$$\psi = 1.75 - 1.05\frac{M_B}{M_A} + 0.3\left(\frac{M_B}{M_A}\right)^2$$ 1.10

$$M_{cr} = \psi \frac{\pi}{L_{cr}} \sqrt{EJ_y GJ_T} \sqrt{1 + \left(\frac{\pi}{L_{cr}}\right)^2 \frac{EJ_\omega}{GJ_T}}$$ 3.937E+11 Nmm 0.024

M_{sd}/M_{cr} = 0.024 *Risulta < 0.16 Non serve la verifica instabilità*

$$\bar{\lambda}_{LT} = \sqrt{\frac{W_y f_{yk}}{M_{cr}}}$$ 0.24 *Risulta < 0.4 Non serve la verifica instabilità*

Stabilità dei pannelli soggetti a taglio (NTC2008, 4.2.4.1.3.4.1):

Se irrigiditori trasversali rigido o no,

I_{st} =	45000000	mm^4	0.75hwt3 =	5740289	mm^4	*Irrigiditore Trasversali rigidi*

Coefficiente minimo di instabiltà per taglio del panello (In assenza di irrigiditori longitudinali),

a/hw =	2.10	k_τ =	7.25

Coefficiente minimo di instabiltà per taglio del panello (irrigiditori longitudinali più di due o a/hw >3),

I_{sl} =	0	mm^4	k_{tl} =	0.00	
a/hw =	2.10		k_τ =	7.25	

Coefficiente minimo di instabiltà per taglio del panello (irrigiditori longitudinali più di due o a/hw < 3),

I_{sl} =	0	mm^4	a/hw =	2.10	k_τ =	5.54

k_τ =	7.25					
η =	1.2		hw/t =	100.75	*Serve la verifica di instailtà*	
σ_E =	17.23356009	MPa	τ_{cr} =	124.93	λ_w =	1.28
Montanti di appogio rigidi,			χ_w =	0.69		
Gli altri casi,			χ_w =	0.65		
$V_{bw,Rd}$ =	5311379	N				

Momento resistente sole piattabande,

$y_{G,inf}$ =	550.59	mm	$y_{G,sup}$ =	1549.41	mm
J_{yy} =	71051768856	mm^4			
$W_{el,yy,inf}$ =	129045848	mm^3	$W_{el,yy,sup}$ =	45857402	mm^3
$M_{f,red}$ =	15071503216	Nmm			
bf =	364.5	mm	$V_{bf,Rd}$ =	36239	N
$V_{b,Rd}$ =	5347618	N	0.059	*OK!(<1)*	

Stabilità dei pannelli soggetti a Compressione (NTC2008, 4.2.4.1.3.4.1):

Stress,

σ_{sup} =	143.93	MPa
σ_{inf} =	-73.64	MPa
$\sigma_{int.}$ =	91.09	MPa

Irrigidati su entrambi lati (Anima),

b =	2015.0	mm	(Web bw)		a =	4400	mm
σ1 =	143.9	(Max)			σ2 =	-73.64	(Min)
ψ =	-0.5				kσ =	13.59	
λp =	1.2				ρ =	0.84	
σcr,p =	254.3	MPa			σcr,c =	3.921	MPa
ζ =	1.0				λc =	9.515	
α =	0.34				Φ =	143.847	
χc =	0.003						
ρc =	0.84						
beff =	1121.94	mm	be1 =	448.78	mm	be2 =	673.16 mm
bt =	681.99	mm					

Irrigidati a un lato (Piattebande),
Piattabanda Superiore,

b =	365	mm	(Flange Sup)				
σ (Irri.) =	143.9				σ (Lib.) =	143.93	
kσ =	0.43						
λp =	1.2				ρ =	0.70	
beff =	254.81	mm			bt =	0	mm

Effective Section Properties,

Ac,eff (Piattabanda Sup) =	15288.8	mm2			
Ac,eff (Piattabanda Inf) =	66000.0	mm2			
Ac,eff (Anima) =	22438.8	mm2			
Ac (Anima tensione) =	13639.9	mm2			
Ac,eff (Total) =	117367.5	mm2			
$y_{g,inf}$ =	597.4	mm	$y_{g,sup}$ =	1502.6	mm
Ieff =	7.90E+10	mm4			
W_{eff} (inf) =	132172497	mm3	W_{eff} (sup) =	52546016	mm3
e =	113.39	mm			
η =	0.54				

Fase 2

Soletta c.a.collaborante

b_{eff} =	2.84	m
Altezza soletta:	0.26	m
Area soletta:	0.74	m^2
J_{yy} =	0.00416	m^4
Peso =	18.46	kN/m

Trave acciaio

Area trave acciaio:	0.1288	m^2
H trave acciaio:	2.10	m
y_G =	0.711	m
J_{yy} =	0.091944	m^4
Peso =	10.11	kN/m

Barre armatura soletta

1° strato barre (superiore)			2° strato barre (inferiore)		
n. Barre:	14		n. Barre:	14	
Interasse:	0.20	m	Interasse:	0.20	m
Diametro:	0.024	m	Diametro:	0.024	m
Area:	0.006333	m^2	Area:	0.006333	m
y_1 =	0.05	m	y_2 =	0.21	m

n = 18.0 Coeff. omogeneizzazione con viscosità in atto

Materiali

cls			Barre armature			Acciaio		
R_{ck} =	40	MPa	f_{yk} =	450	MPa	f_{yk} =	355	MPa
f_{ck} =	33.20	MPa	γ_M =	1.15		γ_{M0} =	1.05	
f_{cd} =	18.81	MPa	$f_{yd,s}$ =	391.30	MPa	$f_{yd,a}$ =	338.10	MPa
f_{cm} =	41.2	MPa						
f_{ctm} =	3.10	MPa						
E_{cm} =	33643	MPa						

Caratteristiche geometriche

A_{id} =	0.1825	m^2	Area sezione omogeneizzata in area di acciaio
A_v =	41150	mm^2	Area taglio sezione di acciaio
$y_{G,inf,id}$ =	1.16	m	Asse neutro rispetto lembo inferiore:
$y_{G,sup,id}$ =	1.20	m	Asse neutro rispetto lembo superiore
$J_{xx,id}$ =	0.179717	m^4	Momento d'inerzia sezione omogeneizzata ad acciaio
$W_{inf,id}$ =	0.155232	m^3	Modulo elastico sezione omogeneizzata ad acciaio
$W_{sup,id}$ =	0.149481	m^3	Modulo elastico sezione omogeneizzata ad acciaio

Sollecitazioni

M_{sd} =	12183.00	kNm	(SLU)		
M_{rd} =	50538.97	kNm	=>	0.24	ok!
T_{sd} =	394.37	kN	(SLU)		
T_{rd} =	7649.96	kN	=>	0.05	ok!

Tensioni

σ_c =	4.53	MPa	=>	0.24	ok!(<1)	Tensione al lembo superiore soletta
$\sigma_{s,sup}$ =	78.11	MPa	=>	0.20	ok!(<1)	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	67.27	MPa	=>	0.17	ok!(<1)	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	63.88	MPa	=>	0.19	ok!(<1)	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	78.48	MPa	=>	0.23	ok!(<1)	Tensione acciaio lembo inferiore

Fase 3

Soletta c.a.collaborante

b_{eff} =	2.84	m
Altezza soletta:	0.26	m
Area soletta:	0.74	m^2
J_{xx} =	0.00416	m^4
Peso =	18.46	kN/m

Trave acciaio

Area trave acciaio:	0.1288	m^2
H trave acciaio:	2.10	m
y_G =	0.711	m
J_{xx} =	0.091944	m^4
Peso =	10.11	kN/m

Barre armatura soletta

1° strato barre (superiore)			2° strato barre (inferiore)		
n. Barre:	14		n. Barre:	14	
Interasse:	0.20	m	Interasse:	0.20	m
Diametro:	0.024	m	Diametro:	0.024	m
Area:	0.006333	m^2	Area:	0.006333	m
y_1 =	0.05	m	y_2 =	0.21	m

n = 6.2 Coeff. omogeneizzazione a tempo infinito

Materiali

cls			Barre armature			Acciaio		
R_{ck} =	40	MPa	f_{yk} =	450	MPa	f_{yk} =	355	MPa
f_{ck} =	33.20	MPa	γ_M =	1.15		γ_{M0} =	1.05	
f_{cd} =	18.81	MPa	$f_{yd,s}$ =	391.30	MPa	$f_{yd,a}$ =	338.10	MPa
f_{cm} =	41.2	MPa						
f_{ctm} =	3.10	MPa						
E_{cm} =	33643	MPa						

Caratteristiche geometriche

A_{id} =	0.2606	m^2	Area sezione omogeneizzata in area di acciaio
A_v =	41150	mm^2	Area taglio sezione di acciaio
$y_{G,inf,id}$ =	1.48	m	Asse neutro rispetto lembo inferiore:
$y_{G,sup,id}$ =	0.88	m	Asse neutro rispetto lembo superiore
$J_{ex,id}$ =	0.243027	m^4	Momento d'inerzia sezione omogeneizzata ad acciaio
$W_{inf,id}$ =	0.164316	m^3	Modulo elastico sezione omogeneizzata ad acciaio
$W_{sup,id}$ =	0.27586	m^3	Modulo elastico sezione omogeneizzata ad acciaio

Sollecitazioni

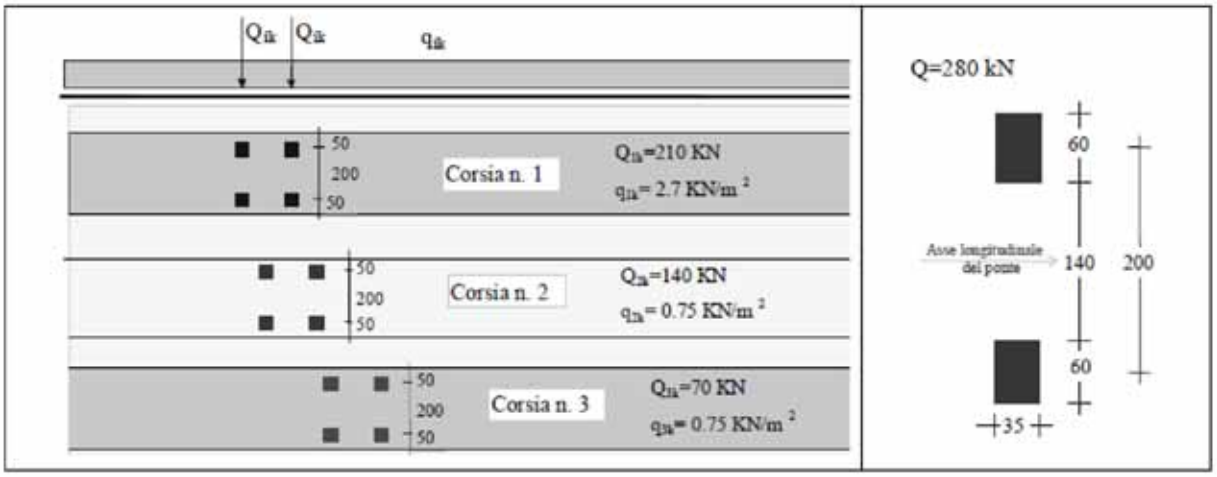
M_{sd} =	31913.80	kNm	(SLU)		
M_{rd} =	55554.42	kNm	=>	0.57	ok!
T_{sd} =	1326.00	kN	(SLU)		
T_{rd} =	7649.96	kN	=>	0.17	ok!

Tensioni

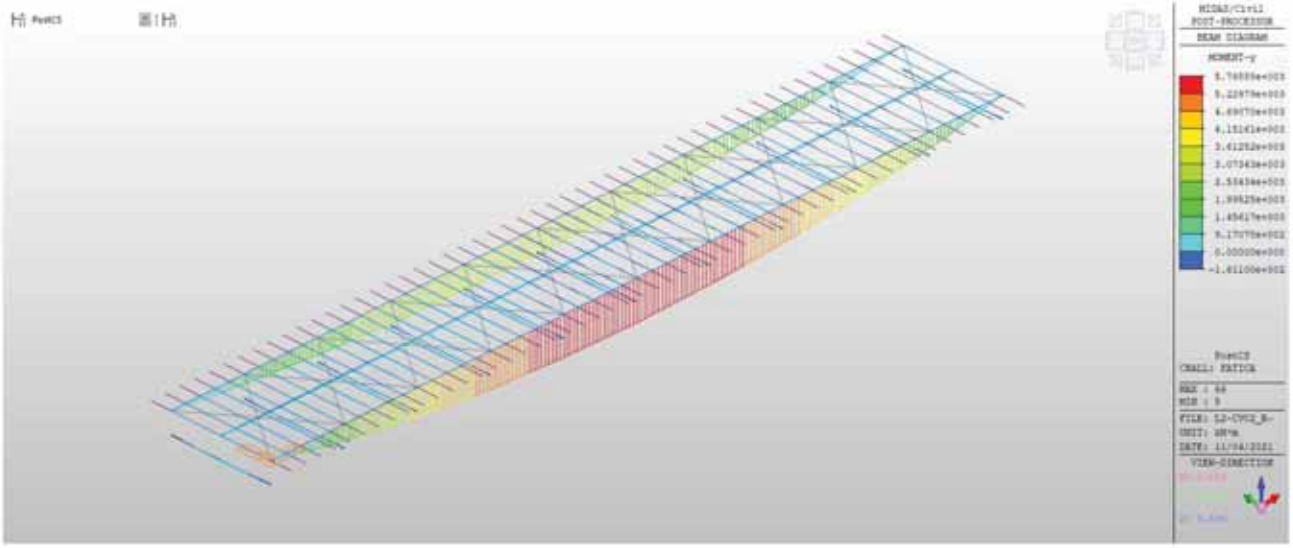
σ_c =	18.66	MPa	=>	0.99	ok!(<1)	Tensione al lembo superiore soletta
$\sigma_{s,sup}$ =	109.12	MPa	=>	0.28	ok!(<1)	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	88.11	MPa	=>	0.23	ok!(<1)	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	81.55	MPa	=>	0.24	ok!(<1)	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	194.22	MPa	=>	0.57	ok!(<1)	Tensione acciaio lembo inferiore

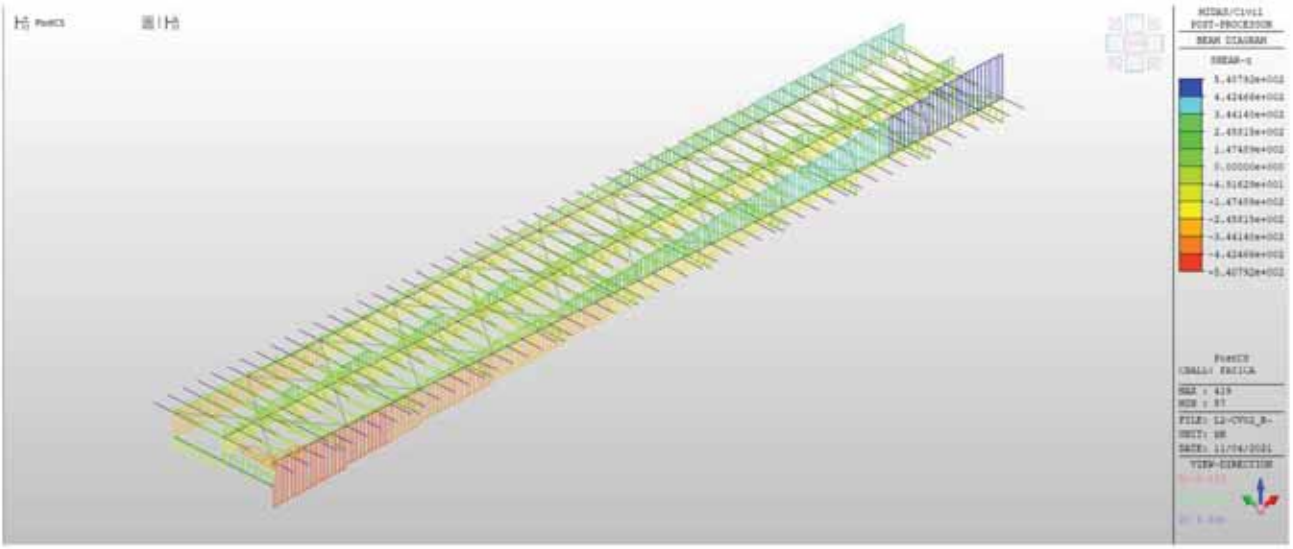
6.2.2 VERIFICA A FATICA

Le verifiche a fatica sono state effettuate considerando il modello di carico che è costituito dallo schema di carico 1 con valori dei carichi concentrati ridotti del 30% e valori dei carichi distribuiti ridotti del 70%.



Si riportano di seguito le sollecitazioni calcolate sulla trave oggetto di verifica soggetta ai carichi suddetti.





Si procede con il calcolo delle variazioni di tensioni sulla trave in acciaio dovute al transito dei carichi suddetti.

Sollecitazioni					
M_{sd} =	5768.88	kNm	(SLU)		
M_{rd} =	55554.42	kNm	=>	*0.10*	***ok!***
T_{sd} =	540.79	kN	(SLU)		
T_{rd} =	7649.96	kN	=>	*0.07*	***ok!***

Tensioni						
$\sigma_{s,sup}$ =	19.73	MPa	=>	*0.05*	*ok!(<1)*	Tensione barre superiori soletta
$\sigma_{s,inf}$ =	15.93	MPa	=>	*0.04*	*ok!(<1)*	Tensione barre inferiori soletta
$\sigma_{a,sup}$ =	14.74	MPa	=>	*0.04*	*ok!(<1)*	Tensione acciaio lembo superiore
$\sigma_{a,inf}$ =	35.11	MPa	=>	*0.10*	*ok!(<1)*	Tensione acciaio lembo inferiore

VERIFICHE PER VITA ILLIMITATA

Le verifiche a fatica per vita illimitata possono essere condotte controllando che il massimo delta di tensione Δs_{max} indotto nel dettaglio stesso dallo spettro di carico risulti minore del limite di fatica del dettaglio stesso:

$\Delta s_{max,d} = \gamma_{Mf} \Delta s_{max} \leq \Delta s_{\Delta}$

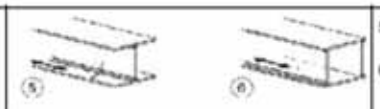
oppure

$\Delta t_{max,d} = \gamma_{Mf} \Delta t_{max} < \Delta t_D = \Delta t_L$

$\Delta s_D = 0{,}737\ \Delta s_C$

$\gamma_{Mf} = 1{,}35$ (strutture sensibili alla rottura per fatica - conseguenze significative)

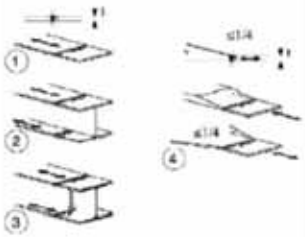
Travi in composizione saldata

100		5) Saldatura manuale a cordoni d'angolo o a piena penetra-zione 6) Saldatura a piena penetra-zione manuale o automatica eseguita da un sol lato, in particolare per travi a cassone	5) e 6) Deve essere assicurato un corretto contatto tra anima e piattabanda. Il bordo dell'anima deve essere preparato in modo da garantire una penetrazione regolare alla radice, senza interruzioni

Delta massimo di tensione attacco anima-ala inf:
Δs_{max} = 35,11 MPa
Limiti di fatica ad ampiezza costante: Δs_D = 0,737x100 = 73,70 MPa

Verifica a fatica: $\gamma_{Mf}\,\Delta s_{max} < \Delta s_D$ 1,35 x 35,11 = 47,40 MPa < 73,70 MPa = Δs_D

Saldature di testa trasversali

112		Saldature senza piatto di sostegno 1) Giunti trasversali in piatti e lamiere 2) Giunti di anime e piattabande in travi composte eseguiti prima dell'assemblaggio 3) Giunti trasversali completi di profili laminati, in assenza di lunette di scarico 4) Giunti trasversali di lamiere e piatti con rastremazioni in larghezza e spessore con pendenza non mag-giore di 1:4. Nelle zone di transi-zione gli intagli nelle saldature devono essere eliminati Per spessori t>25 mm, si deve adot-tare una classe ridotta del coefficiente $k_s = (25/t)^{0,2}$	Saldature effettuate da entrambi i lati, molate in direzione degli sforzi e sottoposte a controlli non distruttivi Le saldature devono essere iniziate e terminate su tacchi d'estremità, da rimuovere una volta completata la saldatura I bordi esterni delle saldature devono essere molati in direzione degli sforzi 3) Vale solo per profilati tagliati e risaldati

Delta massimo di tensione attacco anima-ala inf:
Δs_{max} = 35,11 MPa
Limiti di fatica ad ampiezza costante: Δs_D = 0,737x112 = 82,54 MPa
Verifica a fatica: $\gamma_{Mf}\,\Delta s_{max} < \Delta s_D$ 1,35x35,11 = 47,40 MPa < 82,54 MPa = Δs_D

6.2.3 TRAVE DI SPINA

Si riporta di seguito la verifica della trave di spina. La trave presenta un valore di momento flettente di inviluppo positivo e negativo lungo tutto il suo sviluppo per effetto dell'inviluppo delle azioni statiche e sismiche. In particolare, le azioni sismiche verticali, producono proprio un effetto di inversione di momento. Per tale motivo a favore di sicurezza si verifica la trave di spina solo come elemento in acciaio trascurando l'effetto della soletta collaborante.

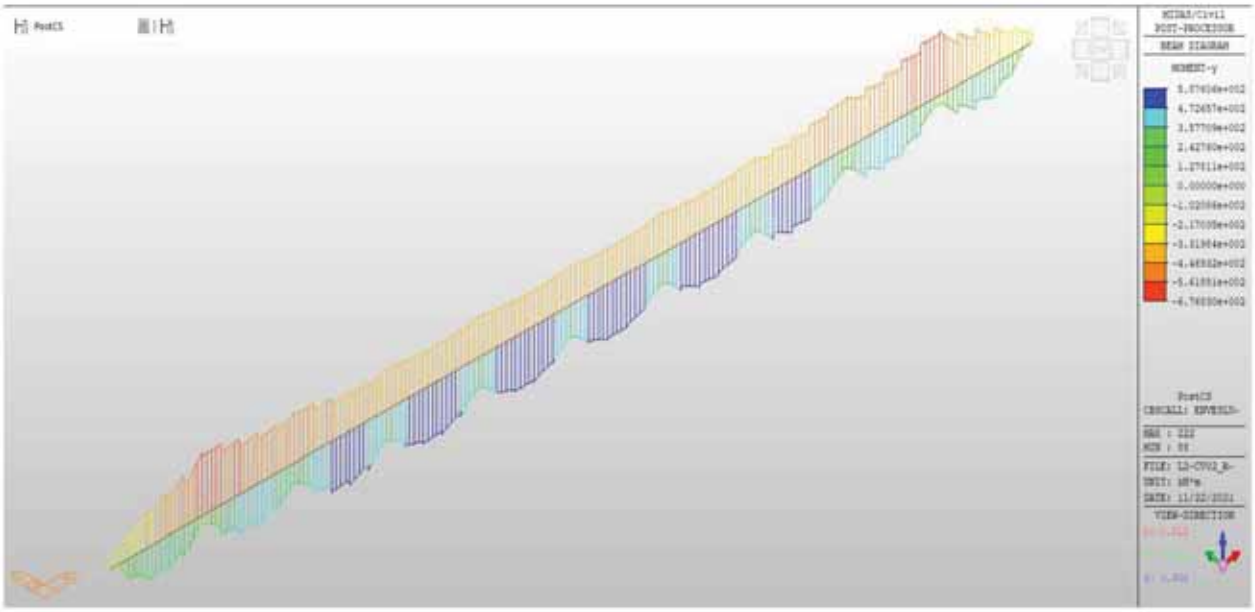


Figura 67- Trave di spina - Diagramma My - Inviluppo SLU-SLV

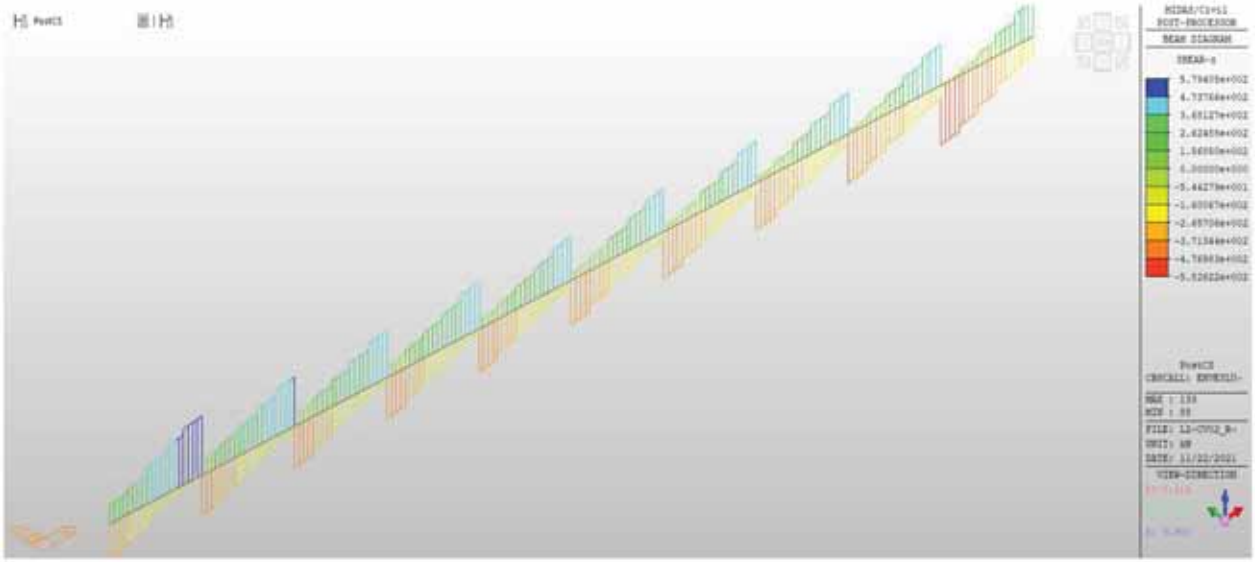
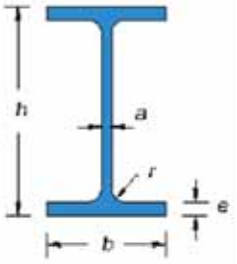


Figura 68 - Trave di spina - Diagramma Tz - Inviluppo SLU-SLV

CARATTERISTICHE PROFILO:



Tipo: S355

B_{SUP} =	300	mm			
$t_{f,SUP}$ =	25.0	mm	$A_{f,sup}$ =	7500.00	mm²
B_{INF} =	300	mm			
$t_{f,INF}$ =	25.0	mm	$A_{f,INF}$ =	7500.00	mm²
H =	590	mm			
t_w = a =	13.0	mm	A_w =	7020.00	mm²
L =	4400	mm	n. traversi:	1	
A_{TOT} =	22020.00	mm²			

$y_{G,inf}$ =	295.00	mm	$y_{G,sup}$ =	295.00	mm
J_{xx} =	1368461000	mm⁴	J_t =	3520460	mm⁴
J_{yy} =	112608019	mm⁴	J_ω =	5.070E+11	mm⁶
$W_{el,inf}$ =	4638851	mm³	$W_{el,sup}$ =	4638851	mm³
W_{pl} =	5185200	mm³			

$$W_{pl,xx} = 2\left[\frac{t_w H^2}{8} + t_f(b - t_w)\frac{H - t_f}{2} + 2r^2\left(\frac{H}{2} - t_f - \frac{r}{2}\right) - 2\frac{\pi r^2}{4}\left(\frac{H}{2} - t_f + r + \frac{4r}{3\pi}\right)\right]$$

ρ_{xx} =	249.29	mm	$\rho_{xx} = \sqrt{\frac{J_{xx}}{A}}$	
ρ_{yy} =	71.51	mm		
Peso =	172.86	kg/m		
E =	210000	N/mm²	modulo elastico	
ν =	0.3			coeff. poisson
G =	80769	N/mm²	$G = \frac{E}{2(1+\nu)}$	modulo elasticità trasversale
α =	0.000012	°C⁻¹	coeff. espansione termica lineare	
f_{yk} =	355	N/mm²	tensione snervamento caratteristica	
f_{tk} =	510	N/mm²	tensione rottura caratteristica	
γ_{M0} =	1.05		per sezioni classe 1,2,3 e 4	
γ_{M1} =	1.05		per instabilità membrature	
γ_{M1} =	1.10		per instabilità membrature ponti stradali e ferroviari	
γ_{M2} =	1.25		per sezioni tese indebolite dai fori nei riguardi della frattura	

SOLLECITAZIONI:

$N_{t,sd}$ =	0	N	caso per trave tesa
$N_{c,sd}$ =	0	N	caso per trave compressa
M_{sd} =	676830000	Nmm	caso per trave inflessa in una direzione
V_{sd} =	582620	N	taglio

Caso per treve a flessione deviata:

$M_{y,sd}$ =	0	Nmm	$M_{z,sd}$ =	0	Nmm

Valori del momento massimo e minimo dell'asta:

$M_{max,y,sd}$ =	0	Nmm	$M_{max,y,sd}$ =	0	Nmm
$M_{max,z,sd}$ =	0	Nmm	$M_{max,z,sd}$ =	0	Nmm

CLASSE APPARTENENZA PROFILO (NTC2008, 4.2.3.1):

ALA SUPERIORE		ALA INFERIORE		ANIMA	
$C/t_{f,sup}$ =	5.74	$C/t_{f,inf}$ =	5.74	C/t_w =	41.54
ε =	0.81	ε =	0.81	ε =	0.81

Curva di instabilità "b":
Fattore di imperfezione α: 0.34

ANIMA
Classe 1

- (●) Parte soggetta a flessione
- ( ) Parte soggetta a compressione
- ( ) Parte soggetta a flessione ed a compressione

SOLLECITAZIONE DELL'ASTA A TAGLIO (NTC2008, 4.2.4.1.2):

$$\frac{V_{sd}}{V_{c,Rd}} \leq 1$$

Area taglio resistente: A_v = 7345 mm²

$$V_{c,Rd} = \frac{A_v f_{yk}}{\sqrt{3}\gamma_{M0}}$$ $V_{c,Rd}$ = 1433739 N => 0.41 **OK!(<1)**

SOLLECITAZIONE DELL'ASTA A FLESSIONE MONOASSIALE RETTA (NTC2008, 4.2.4.1.2):

$$\frac{M_{sd}}{M_{c,Rd}} \leq 1$$

$V_{sd} < 0,5\, V_{c,Rd}$ *Il taglio non influisce sulla verifica a flessione!*

$$\rho = \left[\frac{2V_{sd}}{V_{c,Rd}} - 1\right]^2$$ 0.03507

$f_{y,red} = (1-\rho) f_{yk}$ = 343 N/mm²
f_{yk} = 355 N/mm²

Calcolo resistenza plastica sezione lorda, classe 1 e 2:

$$M_{pl,Rd} = \frac{W_{pl} f_{yk}}{\gamma_{M0}}$$ $M_{pl,Rd}$ = 1753091429 Nmm => 0.39 **OK!(<1)**

Calcolo resistenza elastica sezione lorda, classe 3:

$$M_{el,Rd} = \frac{W_{el,min} f_{yk}}{\gamma_{M0}}$$ $M_{c,Rd}$ = 1568373382 Nmm => 0.43 **OK!(<1)**

6.2.4 TRAVERSO

Si riportano di seguito i diagrammi di sollecitazione e di verifica dei traversi.

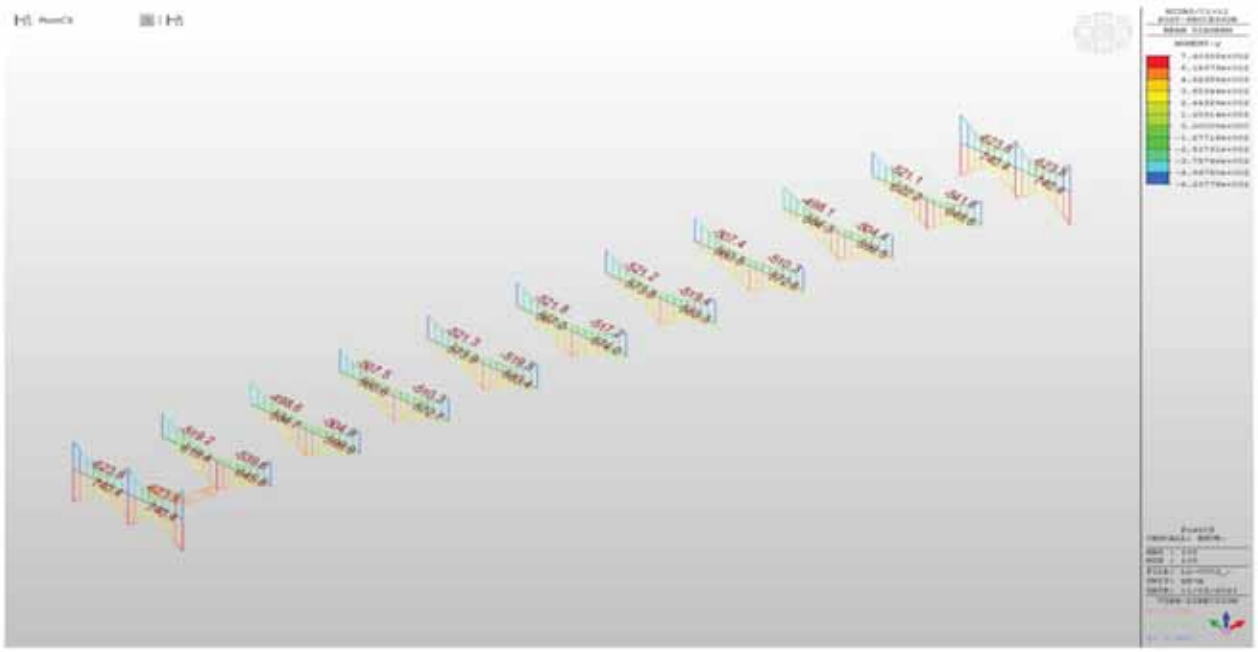


Figura 69 – Traverso - Momento SLU-SLV

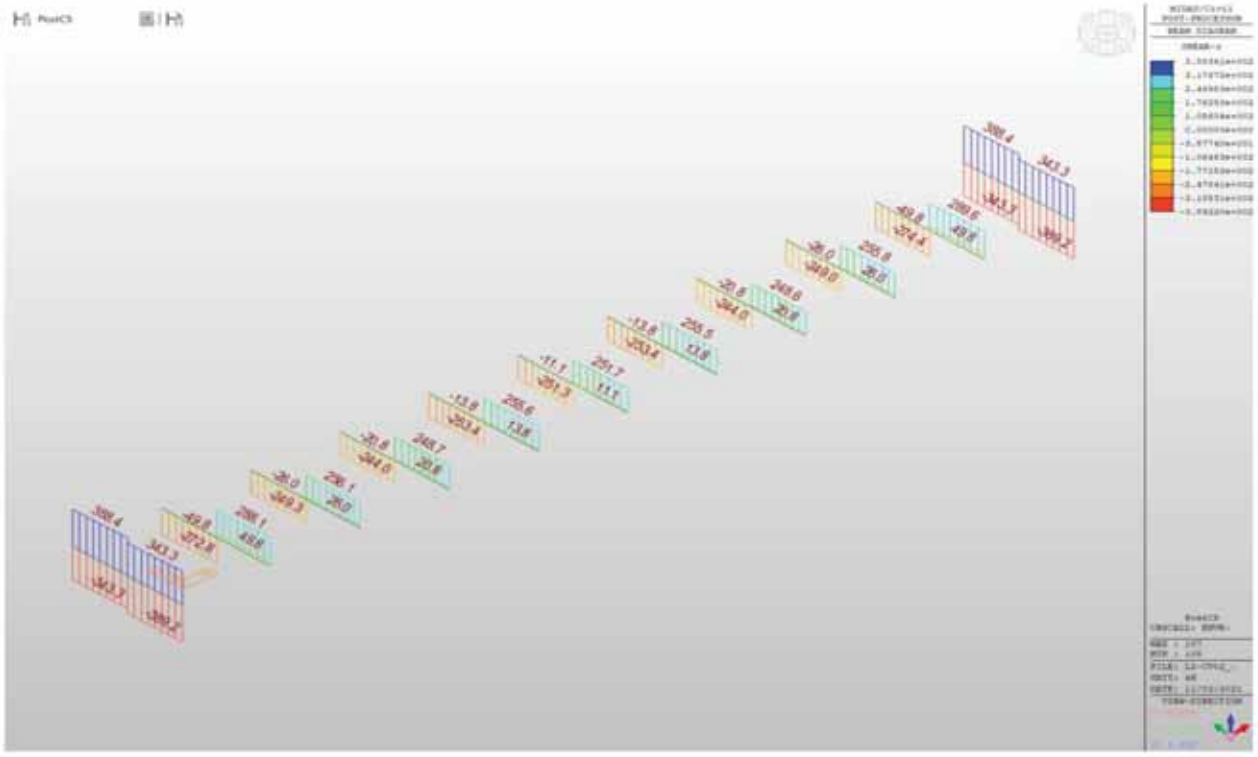
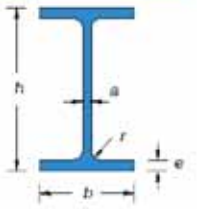


Figura 70 - Traverso - Taglio SLU-SLV

6.2.4.1 VERIFICA TRAVERSO DI CAMPATA

CARATTERISTICHE PROFILO:

Tipo: S355



B_{SUP} =	350	mm			
$t_{f,SUP}$ =	25,0	mm	$A_{f,sup}$ =	8750,00	mm²
B_{INF} =	350	mm			
$t_{f,INF}$ =	25,0	mm	$A_{f,INF}$ =	8750,00	mm²
H =	800	mm			
t_w = a =	20,0	mm	A_w =	15000,00	mm²
L =	6000	mm	n. traversi:	1	
A_{TOT} =	32500,00	mm²			

$y_{G,inf}$ =	400,00	mm	$y_{G,sup}$ =	400,00	mm
J_w =	3331770833	mm⁴	J_t =	5645833	mm⁴
J_y =	179179167	mm⁴	J_w =	2,731E+14	mm⁶
$W_{el,inf}$ =	8329427	mm³	$W_{el,sup}$ =	8329427	mm³
W_{pl} =	9593750	mm³			

$$W_{pl,xx} = 2\left[\frac{t_w H^2}{8} + t_f(b - t_w)\frac{H - t_f}{2} + 2r^2\left(\frac{H}{2} - t_f - \frac{r}{2}\right) - 2\frac{\pi r^2}{4}\left(\frac{H}{2} - t_f + r + \frac{4r}{3\pi}\right)\right]$$

ρ_w =	320,18	mm	$\rho_{xx} = \sqrt{\frac{J_{xx}}{A}}$	
ρ_y =	74,25	mm		
Peso =	255,13	kg/m		
E =	210000	N/mm²	modulo elastico	
ν =	0,3		coeff. poisson	
G =	80769	N/mm²	$G = \frac{E}{2(1+\nu)}$	modulo elasticità trasversale
α =	0,000012	°C⁻¹	coeff. espansione termica lineare	
f_{yk} =	355	N/mm²	tensione snervamento caratteristica	
f_{tk} =	510	N/mm²	tensione rottura caratteristica	
γ_{M0} =	1,05		per sezioni classe 1,2,3 e 4	
γ_{M1} =	1,05		per instabilità membrature	
γ_{M1} =	1,10		per instabilità membrature ponti stradali e ferroviari	
γ_{M2} =	1,25		per sezioni tese indebolite dai fori nei riguardi della frattura	

SOLLECITAZIONI:

$N_{t,Ed}$ =	0	N	caso per trave tesa
$N_{c,Ed}$ =	0	N	caso per trave compressa
$M_{y,Ed}$ =	648600000	Nmm	caso per trave inflessa in una direzione
$V_{z,Ed}$ =	289000	N	taglio

Caso per treve a flessione deviata:

$M_{y,Ed}$ =	0	Nmm	$M_{z,Ed}$ =	0	Nmm

Valori del momento massimo e minimo dell'asta:

$M_{max,y,Ed}$ =	0	Nmm	$M_{min,y,Ed}$ =	0	Nmm
$M_{max,z,Ed}$ =	0	Nmm	$M_{min,z,Ed}$ =	0	Nmm

CLASSE APPARTENENZA PROFILO (NTC2008, 4.2.3.1):

ALA SUPERIORE		ALA INFERIORE		ANIMA	
$C/t_{f,sup}$ =	6,60	$C/t_{f,inf}$ =	6,60	C/t_w =	37,50
ε =	0,81	ε =	0,81	ε =	0,81

Curva di instabilità "b":

Fattore di imperfezione α: 0,34

ANIMA: Classe 1

- (●) Parte soggetta a flessione
- ( ) Parte soggetta a compressione
- ( ) Parte soggetta a flessione ed a compressione

SOLLECITAZIONE DELL'ASTA A TAGLIO (NTC2008, 4.2.4.1.2):

$$\frac{V_{sd}}{V_{c,Rd}} \leq 1$$

Area taglio resistente: A_v = 15500 mm^2

$$V_{c,Rd} = \frac{A_v f_{yk}}{\sqrt{3}\gamma_{M0}}$$ $V_{c,Rd}$ = 3025590 N => 0,10 **OK!(<1)**

Verifica in presenza di torsione uniforme:

$\tau_{t,sd}$ = 0 N/mm^2

$$V_{c,Rd,red} = \left[1 - \frac{\tau_{t,sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}}\right] V_{c,Rd}$$

$V_{c,Rd,red}$ = 3025590 N => 0,10 **OK!(<1)**

SOLLECITAZIONE DELL'ASTA A FLESSIONE MONOASSIALE RETTA (NTC2008, 4.2.4.1.2):

$$\frac{M_{sd}}{M_{c,Rd}} \leq 1$$

$V_{sd} < 0,5\ V_{c,Rd}$ *Il taglio non influisce sulla verifica a flessione!*

$$\rho = \left[\frac{2V_{sd}}{V_{c,Rd}} - 1\right]^2$$ 0,65442

$f_{y,red} = (1-\rho)f_{yk}$ 123 N/mm^2

f_{yk} = 355 N/mm^2

Calcolo resistenza plastica sezione lorda, classe 1 e 2:

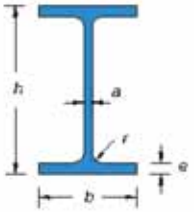
$$M_{pl,Rd} = \frac{W_{pl} f_{yk}}{\gamma_{M0}}$$ $M_{pl,Rd}$ = 3243601190 Nmm => 0,20 **OK!(<1)**

Calcolo resistenza elastica sezione lorda, classe 3:

$$M_{el,Rd} = \frac{W_{el,min} f_{yk}}{\gamma_{M0}}$$ $M_{c,Rd}$ = 2816139633 Nmm => 0,23 **OK!(<1)**

6.2.4.2 VERIFICA TRAVERSO DI TESTATA

CARATTERISTICHE PROFILO:



Tipo:	S355				
B_{sup} =	350	mm			
$t_{f,sup}$ =	25,0	mm	$A_{f,sup}$ =	8750,00	mm²
B_{inf} =	350	mm			
$t_{f,inf}$ =	25,0	mm	$A_{f,inf}$ =	8750,00	mm²
H =	1350	mm			
t_w = a =	20,0	mm	A_w =	26000,00	mm²
L =	6000	mm	n. traversi:	1	
A_{tot} =	43500,00	mm²			

$y_{G,inf}$ =	675,00	mm	$y_{G,sup}$ =	675,00	mm
J_{xx} =	11343437500	mm⁴	J_t =	7112500	mm⁴
J_{yy} =	179545833	mm⁴	J_ω =	2,731E+14	mm⁶
$W_{el,inf}$ =	16805093	mm³	$W_{el,sup}$ =	16805093	mm³
W_{pl} =	20043750	mm³			

$$W_{pl,xx} = 2\left[\frac{t_w H^2}{8} + t_f(b - t_w)\frac{H - t_f}{2} + 2r^2\left(\frac{H}{2} - t_f - \frac{r}{2}\right) - 2\frac{\pi r^2}{4}\left(\frac{H}{2} - t_f + r + \frac{4r}{3\pi}\right)\right]$$

ρ_{xx} =	510,66	mm	$\rho_{xx} = \sqrt{\frac{J_{xx}}{A}}$	
ρ_{yy} =	64,25	mm		
Peso =	341,48	kg/m		
E =	210000	N/mm²	modulo elastico	
ν =	0,3			coeff. poisson
G =	80769	N/mm²	$G = \frac{E}{2(1+\nu)}$	modulo elasticità trasversale
α =	0,000012	°C⁻¹	coeff. espansione termica lineare	
f_{yk} =	355	N/mm²	tensione snervamento caratteristica	
f_{tk} =	510	N/mm²	tensione rottura caratteristica	
γ_{M0} =	1,05		per sezioni classe 1,2,3 e 4	
γ_{M1} =	1,05		per instabilità membrature	
γ_{M1} =	1,10		per instabilità membrature ponti stradali e ferroviari	
γ_{M2} =	1,25		per sezioni tese indebolite dai fori nei riguardi della frattura	

SOLLECITAZIONI:

$N_{t,Ed}$ =	0	N	caso per trave tesa
$N_{c,Ed}$ =	0	N	caso per trave compressa
M_{Ed} =	752430000	Nmm	caso per trave inflessa in una direzione
V_{Ed} =	397333	N	taglio

Caso per treve a flessione deviata:

$M_{y,Ed}$ =	0	Nmm	$M_{z,Ed}$ =	0	Nmm

Valori del momento massimo e minimo dell'asta:

$M_{max,y,Ed}$ =	0	Nmm	$M_{min,y,Ed}$ =	0	Nmm
$M_{max,z,Ed}$ =	0	Nmm	$M_{min,z,Ed}$ =	0	Nmm

CLASSE APPARTENENZA PROFILO (NTC2008, 4.2.3.1):

ALA SUPERIORE		ALA INFERIORE		ANIMA	
$C/t_{f,sup}$ =	6,60	$C/t_{f,inf}$ =	6,60	C/t_w =	65,00
ε =	0,81	ε =	0,81	ε =	0,81

Curva di instabilità "b":
Fattore di imperfezione α: 0,34

ANIMA
Classe 2

- (●) Parte soggetta a flessione
- ( ) Parte soggetta a compressione
- ( ) Parte soggetta a flessione ed a compressione

SOLLECITAZIONE DELL'ASTA A TAGLIO (NTC2008, 4.2.4.1.2):

$$\frac{V_{sd}}{V_{c,Rd}} \leq 1$$

Area taglio resistente: A_v = 26500 mm^2

$$V_{c,Rd} = \frac{A_v f_{yk}}{\sqrt{3}\gamma_{M0}}$$ $V_{c,Rd}$ = 5172783 N => 0,08 *OK!(<1)*

Verifica in presenza di torsione uniforme:

$\tau_{t,sd}$ = 0 N/mm^2

$$V_{c,Rd,red} = \left[1 - \frac{\tau_{t,sd}}{\frac{f_{yk}}{\sqrt{3}\gamma_{M0}}}\right] V_{c,Rd}$$

$V_{c,Rd,red}$ = 5172783 N => 0,08 *OK!(<1)*

SOLLECITAZIONE DELL'ASTA A FLESSIONE MONOASSIALE RETTA (NTC2008, 4.2.4.1.2):

$$\frac{M_{sd}}{M_{c,Rd}} \leq 1$$

$V_{sd} < 0{,}5\ V_{c,Rd}$ *Il taglio non influisce sulla verifica a flessione!*

$$\rho = \left[\frac{2V_{sd}}{V_{c,Rd}} - 1\right]^2$$ 0,71635

$f_{y,red} = (1-\rho) f_{yk}$ 101 N/mm^2

f_{yk} = 355 N/mm^2

Calcolo resistenza plastica sezione lorda, classe 1 e 2:

$$M_{pl,Rd} = \frac{W_{pl} f_{yk}}{\gamma_{M0}}$$ $M_{pl,Rd}$ = 6776696429 Nmm => 0,11 *OK!(<1)*

Calcolo resistenza elastica sezione lorda, classe 3:

$$M_{el,Rd} = \frac{W_{el,min} f_{yk}}{\gamma_{M0}}$$ $M_{c,Rd}$ = 5681721781 Nmm => 0,13 *OK!(<1)*

6.2.5 VERIFICA PIOLI

Si riporta nel seguito la verifica del sistema di collegamento fra trave metallica e soletta gettata in opera.

Il sistema di connessione è realizzato mediante pioli di tipo Nelson resistenti a taglio, saldati alla piattabanda superiore della trave principale ed annegati nella soletta in calcestruzzo. Si ritiene che l'intera forza di scorrimento sia assorbita solo dalla piolatura predisposta sulle travi principali di impalcato, trascurando, a favore di sicurezza il contributo della piolatura posta sulla trave di spina. Il dimensionamento dei connettori è stato eseguito in riferimento alle prescrizioni indicate dalla normativa. Scegliendo di inserire i pioli a passo costante lungo tutto lo sviluppo della trave, si è scelto di determinare la forza di scorrimento applicata tramite l'integrazione delle tensioni indotte sulla soletta collaborante considerando le tensioni indotte ai lembi della soletta stessa.

La collaborazione tra la trave metallica e la soletta e assicurata mediante pioli elettrosaldati all'ala della trave di acciaio. Per le verifiche si fa riferimento al punto 4.3.4.3.1.2 delle NTC.

$$P_{Rd,a} = 0{,}8\, f_{tk}\, (\pi\, d^2 / 4) / \gamma_V \qquad [4.3.9]$$

$$P_{Rd,c} = 0{,}29\, \alpha\, d^2\, (f_{ck}\, E_{cm})^{0.5} / \gamma_V \qquad [4.3.10]$$

In cui:

γ_V è il fattore parziale definito al § 4.3.3;

f_{tk} è la resistenza caratteristica a rottura dell'acciaio del piolo (comunque $f_{tk} \le 500$ MPa);

f_{ck} è la resistenza cilindrica caratteristica del calcestruzzo della soletta;

E_{cm} è il valore medio del modulo elastico secante del calcestruzzo della soletta definito al § 11.2.10.3;

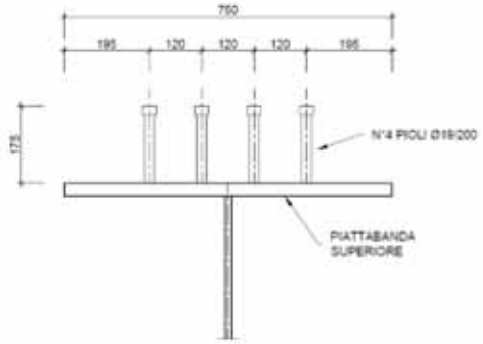
d è il diametro del piolo, compreso tra 16 e 25 mm;

h_{sc} è l'altezza del piolo dopo la saldatura;

$\alpha = 0{,}2\,(h_{sc} / d + 1)$ per $3 \le h_{sc} / d \le 4$, [4.3.11 a]

$\alpha = 1{,}0$ per $h_{sc} / d > 4$. [4.3.11 b]

Per il caso in esame si ottiene:



ftk =	450	Mpa
fck =	32	Mpa
Ecm =	33346	Mpa
α =	1	
d =	19	mm
γv =	1,25	
Prd,a =	81,656	kN
Prd,c =	86,515	kN

Si procedere ora con il calcolo della forza di scorrimento e quindi con il valore di carico massimo determinato per ciascun piolo.

L =	44	m
Bsol =	2840	mm
H tot =	2360	mm
H sol =	260	mm
$y_{G,sup,id}$ =	880,98	mm
σ_{c1} =	18,66	Mpa
σ_{c2} =	13,15	Mpa
$Fv_{(L/2)}$=	533,8624	kN
Δx =	200	mm
N_{Pioli} =	4	
$Fv_{\_(PIOLO)}$ =	26,69	kN

Fv_Piolo < min (Prd,a ; Prd,c) - Ok Verificato

6.2.6 GIUNTI BULLONATI

Si riporta di seguito la verifica dei giunti bullonati previsti nei traversi di spalla che risultano essere maggiormente sollecitati.

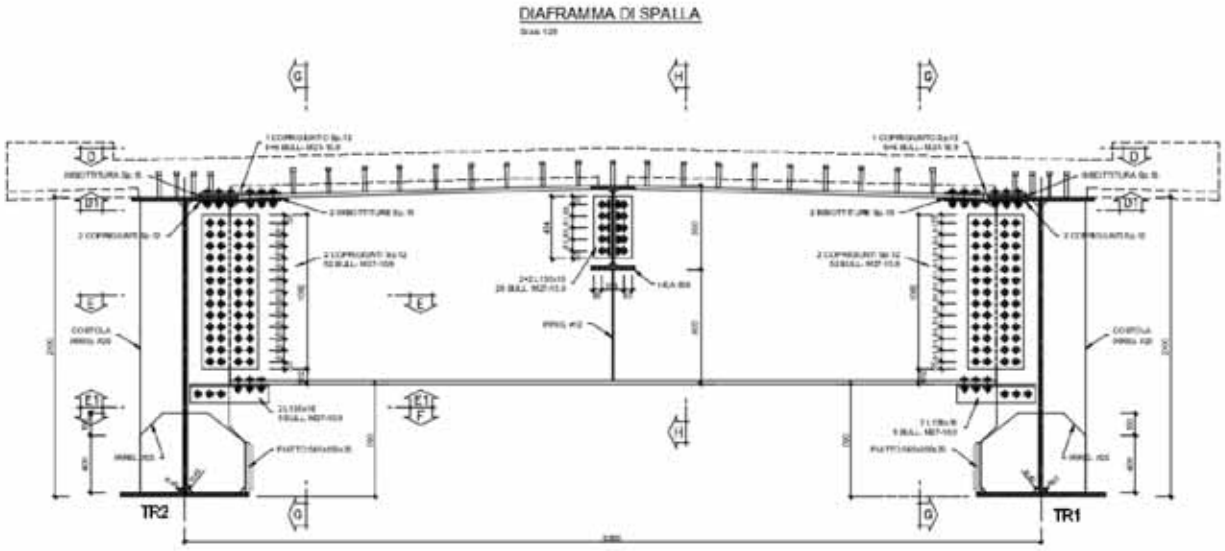


Figura 71 – Traverso di Testata

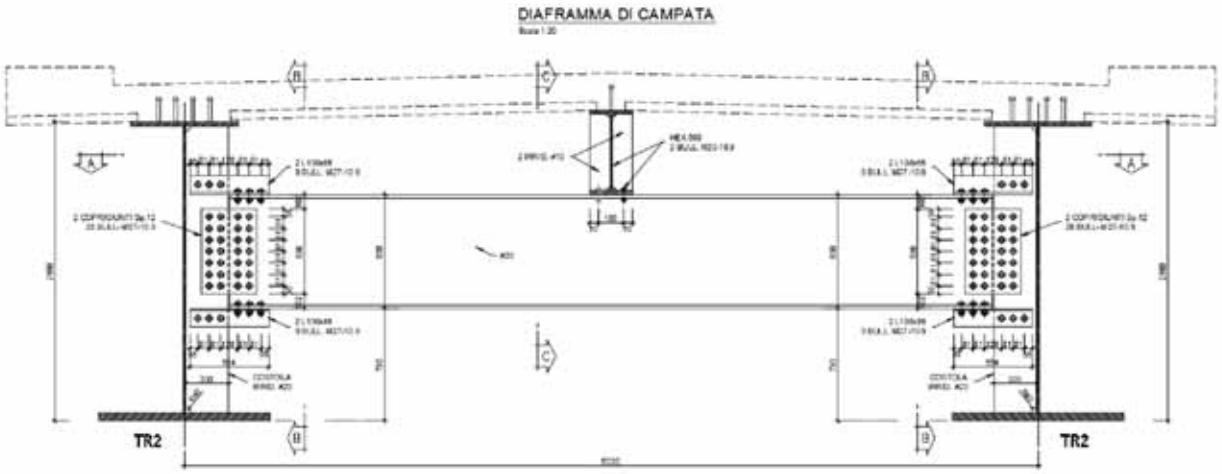


Figura 72 – Traverso di Campata

6.2.6.1 VERIFICA GIUNTO TRAVERSO DI CAMPATA

γ_{M0} =	1,05	per sezioni classe 1,2,3 e 4
γ_{M1} =	1,05	per instabilità membrature
γ_{M1} =	1,10	per instabilità membrature ponti stradali e ferroviari
γ_{M2} =	1,25	per sezioni tese indebolite dai fori nei riguardi della frattura

Resistenza a taglio bulloni 4.6, 5.6 e 8.8

27 | 10,9

$$F_{V,Rd} = \frac{0,6 \cdot f_{ub} \cdot A_{res}}{\gamma_{M_2}}$$ 220,32 kN

Resistenza a taglio bulloni 6.8 e 10.9

$$F_{V,Rd} = \frac{0,5 \cdot f_{ub} \cdot A_{res}}{\gamma_{M_2}}$$ 183,6 kN

Resistenza a rifollamento

$$F_{b,Rd} = \frac{k \cdot \alpha \cdot f_{tk} \cdot d \cdot t}{\gamma_{M_2}}$$ 182,87 kN di bordo

182,87 kN interni

dove:
d è il diametro nominale del gambo del bullone,
t è lo spessore della piastra collegata,
f_u è la resistenza a rottura del materiale della piastra collegata,
α=min {$e_1/(3\ d_0)$; f_{ub}/f_t; 1} per bulloni di bordo nella direzione del carico applicato,
α=min {$p_1/(3\ d_0) - 0,25$; f_{ub}/f_t ; 1} per bulloni interni nella direzione del carico applicato,
k=min {$2,8\ e_2/d_0 - 1,7$; 2,5} per bulloni di bordo nella direzione perpendicolare al carico applicato,
k=min {$1,4\ p_2 / d_0 - 1,7$, 2,5} per bulloni interni nella direzione perpendicolare al carico applicato,
essendo e_1 , e_2 , p_1 e p_2 indicati in Fig. 4.2.3 e d_0 il diametro nominale del foro di alloggiamento del bullone.

S355

d =	27	mm	
f_{tk} =	510	mm	
α =	0,50	mm	
α =	0,50	mm	
k =	1,66	mm	
k =	1,66	mm	
e_1 =	36	mm	
e_2 =	36	mm	
p_1 =	66	mm	
p_2 =	72	mm	

$V_{s,d}$ =	289,00	kN	taglio assorbito da anima
$M_{s,d}$ =	541,60	kNm	
Braccio =	0,800	m	
$F_{s,d}$ =	677,00	kN	forza alle flange

Resistenza a taglio bulloni (flangia)

$t_{piastra}$ =	20	mm			
$h_{piastra}$ =	272	mm			
$n_{piastre}$ =	1	piastre			
n_f =	1	file			
n_{pt} =	2	piani di taglio			
n_b =	3	bulloni			
$F_{V,Rd\_anima} = n \cdot n_b \cdot F_{V,Rd}$			1101,6	kN	ok!

Resistenza a taglio delle piastre anima:

n_f =	2	file			
n_{pt} =	2	piani di taglio			
n_b =	7	bulloni			
$t_{piastra}$ =	12	mm			
$h_{piastra}$ =	596	mm			
$n_{piastre}$ =	2	piastre			
$V_{V,Rd\_piastre} = n_{piastre} \cdot \frac{f_y \cdot A}{\gamma_{M_0} \cdot \sqrt{3}}$			5584	kN	ok!

Resistenza a rifollamento flangia

$F_{V,Ed}$ =	112,83	kN	Sollecitazione taglio bullone
$F_{b,Rd}$ =	182,87	kN	ok!

Resistenza a rifollamento anima

$F_{V,Ed}$ =	10,32	kN	Sollecitazione taglio bullone
$F_{b,Rd}$ =	182,87	kN	ok!

6.2.6.2 VERIFICA GIUNTO TRAVERSO DI TESTATA

γ_{M0} =	1,05	per sezioni classe 1,2,3 e 4			
γ_{M1} =	1,05	per instabilità membrature			
γ_{M1} =	1,10	per instabilità membrature ponti stradali e ferroviari			
γ_{M2} =	1,25	per sezioni tese indebolite dai fori nei riguardi della frattura			

Resistenza a taglio bulloni 4.6, 5.6 e 8.8

27 | 10,9

$$F_{V,Rd} = \frac{0,6 \cdot f_{tb} \cdot A_{res}}{\gamma_{M_2}}$$ 220,32 kN

Resistenza a taglio bulloni 6.8 e 10.9

$$F_{V,Rd} = \frac{0,5 \cdot f_{tb} \cdot A_{res}}{\gamma_{M_2}}$$ 183,6 kN

Resistenza a rifollamento

$$F_{b,Rd} = \frac{k \cdot \alpha \cdot f_{tk} \cdot d \cdot t}{\gamma_{M_2}}$$ 182,87 kN di bordo

182,87 kN interni

dove:
d è il diametro nominale del gambo del bullone,
t è lo spessore della piastra collegata,
f_{tk} è la resistenza a rottura del materiale della piastra collegata,
α=min {$e_1/(3\ d_0)$; f_{tb}/f_t; 1} per bulloni di bordo nella direzione del carico applicato,
α=min {$p_1/(3\ d_0) - 0,25$; f_{tb}/f_t ; 1} per bulloni interni nella direzione del carico applicato,
k=min {$2,8\ e_2/d_0 - 1,7$; 2,5} per bulloni di bordo nella direzione perpendicolare al carico applicato,
k=min {$1,4\ p_2 / d_0 - 1,7$, 2,5} per bulloni interni nella direzione perpendicolare al carico applicato,
essendo e_1 , e_2 , p_1 e p_2 indicati in Fig. 4.2.3 e d_0 il diametro nominale del foro di alloggiamento del bullone.

S355

d =	27	mm
f_{tk} =	510	mm
α =	0,50	mm
α =	0,50	mm
k =	1,66	mm
k =	1,66	mm
e_1 =	36	mm
e_2 =	36	mm
p_1 =	66	mm
p_2 =	72	mm

$V_{s,d}$ =	**397,33**	**kN**	taglio assorbito da anima
$M_{s,d}$ =	**752,43**	**kNm**	
Braccio =	**1,260**	**m**	
$F_{s,d}$ =	**597,17**	**kN**	forza alle flange

Resistenza a taglio bulloni (flangia)

$t_{piastra}$ =	20	mm				
$h_{piastra}$ =	272	mm				
$n_{piastre}$ =	1	piastre				
n_f =	1	file				
n_{pt} =	2	piani di taglio				
n_b =	6	bulloni				
$F_{V,Rd\_anima} = n \cdot n_b \cdot F_{V,Rd}$			2203,2	kN		ok!

Resistenza a taglio delle piastre anima:

n_f =	2	file				
n_{pt} =	2	piani di taglio				
n_b =	13	bulloni				
$t_{piastra}$ =	12	mm				
$h_{piastra}$ =	1082	mm				
$n_{piastre}$ =	2	piastre				
$V_{V,Rd\_piastre} = n_{piastre} \cdot \frac{f_y \cdot A}{\gamma_{M_0} \cdot \sqrt{3}}$				10138	kN	ok!

Resistenza a rifollamento flangia

$F_{V,Ed}$ =	49,76	kN	Sollecitazione taglio bullone
$F_{b,Rd}$ =	182,87	kN	ok!

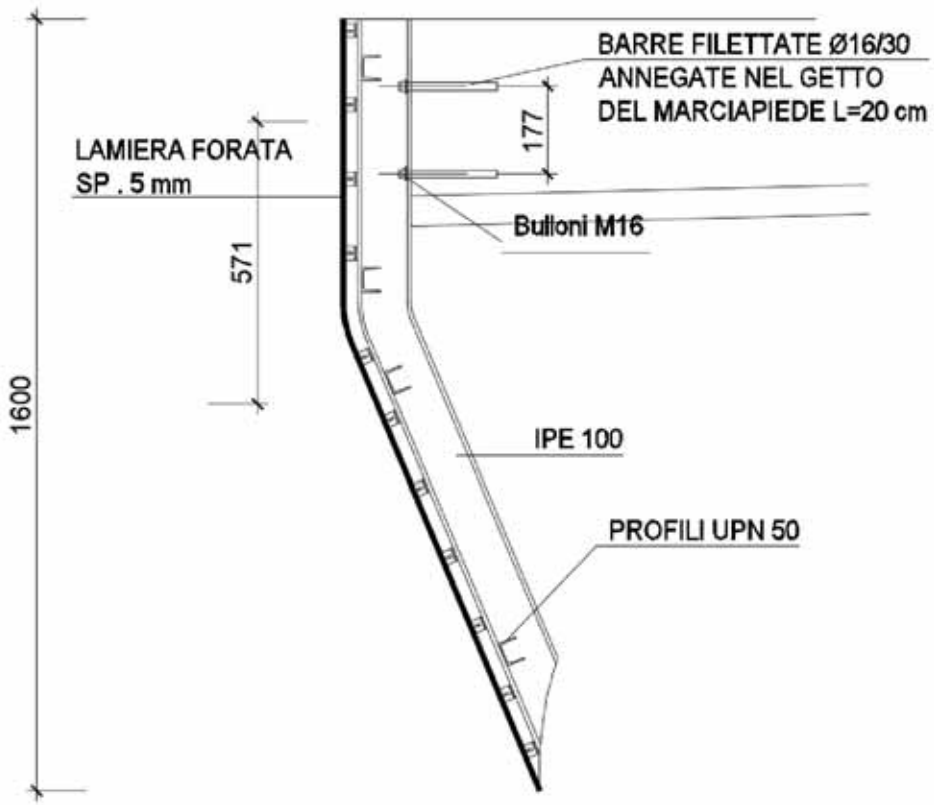
Resistenza a rifollamento anima

$F_{V,Ed}$ =	7,64	kN	Sollecitazione taglio bullone
$F_{b,Rd}$ =	182,87	kN	ok!

6.2.7 VERIFICA VELETTA METALLICA

Si riporta di seguito la verifica degli elementi di supporto previsti a sostegno della veletta metallica laterale al cordolo dell'impalcato.

La veletta è composta da elementi di sostegno in acciaio sia trasversali IPE100 che trasversali UPN 50 ed una lamiera forata in alluminio di spessore pari a 5mm.



Peso Proprio Veletta		
Peso UPN 50 =	5,59	kg/ml
Peso Totale UPN 50 =	**22,36**	kg/ml
Peso IPE 100 =	8,10	kg/ml
Lunghezza IPE 100 =	1,40	m
Peso Totale IPE 100 =	**11,34**	kg/ml
Lunghezza Lamiera alluminio =	1,65	ml
Spessore Lamiera alluminio =	0,005	m
% Foratura Lamiera alluminio =	60%	
Peso Lamiera alluminio =	8,91	kg/mq
Peso Totale =	**42,61**	**kg/mq**
	0,4261	**kN/ml**

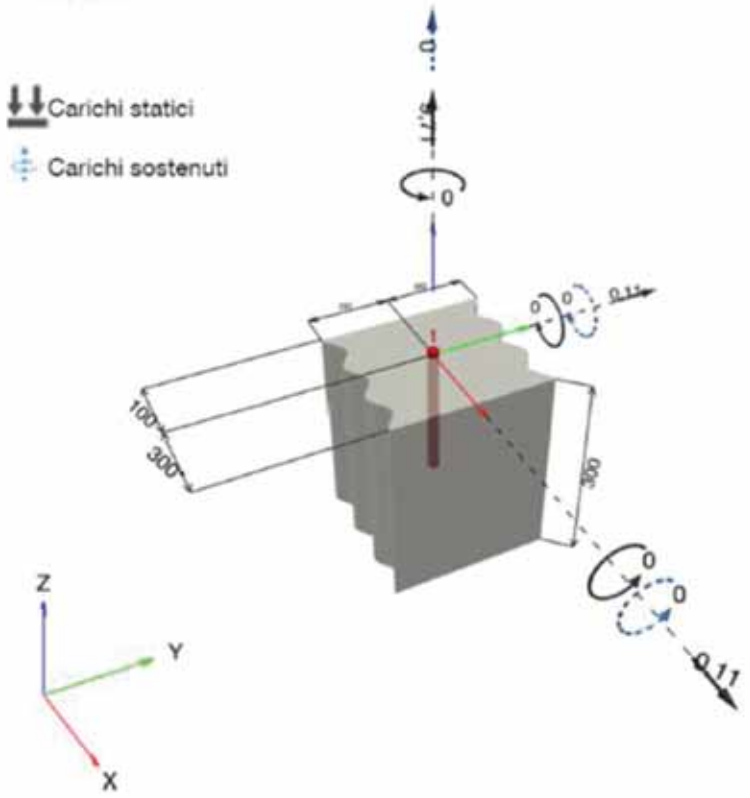
Forza Orizzontale Vento		
ph =	1,88	kN/mq
H =	1,6	m
Fv =	3,008	kN
Braccio Fv =	0,571	m
Ftrazione =	6,469	kN
Taglio =	0,071	kN
Ft_d =	9,704	kN
T_d =	0,107	kN

Si riporta di seguito la verifica di aderenza a trazione della barra filettata ϕ16 prevista ammorsata per 20cm all'interno del cordolo laterale.

1 Dati da inserire

Tipo e dimensione dell'ancorante:	**HIT-RE 500 V4 + HAS-U 5.8 HDG M16**
Periodo di ritorno (durata in anni):	50
Codice articolo:	2223897 HAS-U 5.8 HDG M16x260 (inserire) / 2287552 HIT-RE 500 V4 (composto indurente)
Profondità di posa effettiva:	$h_{ef,act}$ = 200.0 mm ($h_{ef,limit}$ = - mm)
Materiale:	5.8
Certificazione No.:	ETA 20/0541
Emesso I Valido:	04/09/2021 | -
Prova:	metodo di calcolo EN 1992-4, chimica
Fissaggio distanziato:	
Profilo:	
Materiale base:	non fessurato calcestruzzo, C25/30, $f_{c,cyl}$ = 25,00 N/mm²; h = 300,0 mm, Temp. Breve/Lungo: 0/0 °C, Coefficiente parziale di sicurezza materiale definito dall'utente γ_c = 1,500
Installazione:	**Foro eseguito con perforatore, Condizioni di installazione: asciutto**
Armatura:	nessuna armatura o interasse tra le armature >= 150 mm (qualunque Ø) o >= 100 mm (Ø <= 10 mm)
	senza armatura di bordo longitudinale

Geometria [mm] & Carichi [kN, kNm]



1.1 Combinazione carichi

Caso	Descrizione	Forze [kN] / Momenti [kNm]	Sismico	Fuoco	Util. max. Tassello [%]
1	Combinazione 1	N = 9,710; V_x = 0,110; V_y = 0,110; M_x = 0,000; M_y = 0,000; M_z = 0,000; N_{sup} = 0,000; $M_{x,sup}$ = 0,000; $M_{y,sup}$ = 0,000;	no	no	20

2 Condizione di carico/Carichi risultanti sull'ancorante

Carichi sull'ancorante [kN]
Trazione: (+ Trazione, - Compressione)

Ancorante	Trazione	Taglio	Taglio in dir. x	Taglio in dir. y
1	9,710	0,156	0,110	0,110

Compressione max. nel calcestruzzo: - [‰]
Max. sforzo di compressione nel calcestruzzo: - [N/mm²]
risultante delle forze di trazione nel (x/y)=(0,0/0,0): 0,000 [kN]
risultante delle forze di compressione (x/y)=(0,0/0,0): 0,000 [kN]

3 Carico di trazione (EN 1992-4, sezione 7.2.1)

	Carico [kN]	Resistenza [kN]	Utilizzo β_N [%]	Stato
Rottura dell'acciaio*	9,710	52,333	19	OK
Rottura combinata conica del calcestruzzo e per sfilamento**	9,710	67,984	15	OK
Rottura conica del calcestruzzo**	9,710	55,311	18	OK
Fessurazione**	9,710	49,893	20	OK

*ancorante più sollecitato **gruppo di ancoranti (ancoranti sollecitati)

3.1 Rottura dell'acciaio

$$N_{Ed} \le N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{M,s}} \qquad \text{EN 1992-4, Tabella 7.1}$$

$N_{Rk,s}$ [kN]	$\gamma_{M,s}$	$N_{Rd,s}$ [kN]	N_{Ed} [kN]
78,500	1,500	52,333	9,710

3.2 Rottura combinata conica del calcestruzzo e per sfilamento

$$N_{Ed} \le N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{M,p}}$$ EN 1992-4, Tabella 7.1

$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{g,Np} \cdot \Psi_{s,Np} \cdot \Psi_{re,N} \cdot \Psi_{ec1,Np} \cdot \Psi_{ec2,Np}$$ EN 1992-4, Eq. (7.13)

$$N^0_{Rk,p} = \Psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef}$$ EN 1992-4, Eq. (7.14)

$$\Psi_{sus} = 1$$ EN 1992-4, Eq. (7.14a)

$$s_{cr,Np} = 7{,}3 \cdot d \cdot \sqrt{\Psi_{sus} \cdot \tau_{Rk}} \le 3 \cdot h_{ef}$$ EN 1992-4, Eq. (7.15)

$$\Psi_{g,Np} = \Psi^0_{g,Np} - \left(\frac{s}{s_{cr,Np}}\right)^{0,5} \cdot \left(\Psi^0_{g,Np} - 1\right) \ge 1{,}00$$ EN 1992-4, Eq. (7.17)

$$\Psi^0_{g,Np} = \sqrt{n} - (\sqrt{n} - 1) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1,5} \ge 1{,}00$$ EN 1992-4, Eq. (7.18)

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f_{ck}}$$ EN 1992-4, Eq. (7.19)

$$\Psi_{s,Np} = 0{,}7 + 0{,}3 \cdot \frac{c}{c_{cr,Np}} \le 1{,}00$$ EN 1992-4, Eq. (7.20)

$$\Psi_{ec1,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c1,N}}{s_{cr,Np}}\right)} \le 1{,}00$$ EN 1992-4, Eq. (7.21)

$$\Psi_{ec2,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c2,N}}{s_{cr,Np}}\right)} \le 1{,}00$$ EN 1992-4, Eq. (7.21)

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,20}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]	$f_{c,cyl}$ [N/mm²]
164.117	231.918	17,00	481,6	240,8	100,0	25,00

Ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k_3	$\tau_{Rk,c}$ [N/mm²]	$\Psi^0_{g,Np}$	$\Psi_{g,Np}$
1,023	17,38	11,000	15,47	1,000	1,000

$e_{c1,N}$ [mm]	$\Psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\Psi_{ec2,Np}$	$\Psi_{s,Np}$	$\Psi_{re,Np}$
0,0	1,000	0,0	1,000	0,825	1,000

Ψ^0_{sus}	α_{sus}	Ψ_{sus}
0,880	0,000	1,000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{M,p}$	$N_{Rd,p}$ [kN]	N_{Ed} [kN]
174,759	101,976	1,500	67,984	9,710

ID gruppo ancoranti
1

3.3 Rottura conica del calcestruzzo

$$N_{Ed} \le N_{Rd,c} = \frac{N_{Rk,c}}{\gamma_{M,c}}$$ EN 1992-4, Tabella 7.1

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec1,N} \cdot \Psi_{ec2,N} \cdot \Psi_{M,N}$$ EN 1992-4, Eq. (7.1)

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1,5}$$ EN 1992-4, Eq. (7.2)

$$A^0_{c,N} = s_{cr,N} \cdot s_{cr,N}$$ EN 1992-4, Eq. (7.3)

$$\Psi_{s,N} = 0{,}7 + 0{,}3 \cdot \frac{c}{c_{cr,N}} \le 1{,}00$$ EN 1992-4, Eq. (7.4)

$$\Psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,1}}{s_{cr,N}}\right)} \le 1{,}00$$ EN 1992-4, Eq. (7.6)

$$\Psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,2}}{s_{cr,N}}\right)} \le 1{,}00$$ EN 1992-4, Eq. (7.6)

$$\Psi_{M,N} = 1$$ EN 1992-4, Eq. (7.7)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	$f_{c,cyl}$ [N/mm²]	
240.000	360.000	300,0	600,0	25,00	

$e_{c1,N}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$
0,0	1,000	0,0	1,000	0,800	1,000

z [mm]	$\Psi_{M,N}$	k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$N_{Rd,c}$ [kN]	N_{Ed} [kN]
0,0	1,000	11,000	155,563	1,500	55,311	9,710

ID gruppo ancoranti
1

3.4 Fessurazione

$$N_{Ed} \le N_{Rd,sp} = \frac{N_{Rk,sp}}{\gamma_{M,sp}}$$ EN 1992-4, Tabella 7.1

$$N_{Rk,sp} = N^0_{Rk,sp} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec1,N} \cdot \Psi_{ec2,N} \cdot \Psi_{h,sp}$$ EN 1992-4, Eq. (7.23)

$$N^0_{Rk,sp} = \min\left(N^0_{Rk,p}; N^0_{Rk,c}\right)$$

$$A^0_{c,N} = s_{cr,sp} \cdot s_{cr,sp}$$ EN 1992-4, Eq. (7.3)

$$\Psi_{s,N} = 0{,}7 + 0{,}3 \cdot \frac{c}{c_{cr,sp}} \le 1{,}00$$ EN 1992-4, Eq. (7.4)

$$\Psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,1}}{s_{cr,sp}}\right)} \le 1{,}00$$ EN 1992-4, Eq. (7.6)

$$\Psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,2}}{s_{cr,sp}}\right)} \le 1{,}00$$ EN 1992-4, Eq. (7.6)

$$\Psi_{h,sp} = \left(\frac{h}{h_{min}}\right)^{2/3} \le \max\left\{1; \left(\frac{h_{ef} + 1{,}5 \cdot c_1}{h_{min}}\right)^{2/3}\right\} \le 2{,}00$$ EN 1992-4, Eq. (7.24)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	$\Psi_{h,sp}$	$f_{c,cyl}$ [N/mm²]	
304.000	577.600	380,0	760,0	1,173	25,00	

$e_{c1,N}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$	k_1
0,0	1,000	0,0	1,000	0,779	1,000	11,000

$N^0_{Rk,sp}$ [kN]	$\gamma_{M,sp}$	$N_{Rd,sp}$ [kN]	N_{Ed} [kN]
155,563	1,500	49,893	9,710

ID gruppo ancoranti
1

4 Carico di taglio (EN 1992-4, sezione 7.2.2)

	Carico [kN]	Resistenza [kN]	Utilizzo β_V [%]	Stato
Rottura dell'acciaio (senza braccio di leva)*	0,156	37,728	1	OK
Rottura dell'acciaio (con braccio di leva)*	N/A	N/A	N/A	N/A
Rottura per pryout**	0,156	110,623	1	OK
Rottura del bordo del calcestruzzo in direzione x-**	0,110	33,825	1	OK

*ancorante più sollecitato **gruppo di ancoranti (ancoranti specifici)

4.1 Rottura dell'acciaio (senza braccio di leva)

$V_{Ed} \le V_{Rd,s} = \frac{V_{Rk,s}}{\gamma_{M,s}}$ EN 1992-4, Tabella 7.2

$V_{Rk,s} = k_7 \cdot V^0_{Rk,s}$ EN 1992-4, Eq. (7.35)

$V^0_{Rk,s}$ [kN]	k_7	$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Ed} [kN]
47,160	1,000	47,160	1,250	37,728	0,156

4.2 Rottura per pryout (cono del calcestruzzo)

$V_{Ed} \le V_{Rd,cp} = \frac{V_{Rk,cp}}{\gamma_{M,c,p}}$ EN 1992-4, Tabella 7.2

$V_{Rk,cp} = k_8 \cdot \min\{N_{Rk,c}; N_{Rk,p}\}$ EN 1992-4, Eq. (7.39c)

$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec1,N} \cdot \Psi_{ec2,N} \cdot \Psi_{M,N}$ EN 1992-4, Eq. (7.1)

$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1,5}$ EN 1992-4, Eq. (7.2)

$A^0_{c,N} = s_{cr,N} \cdot s_{cr,N}$ EN 1992-4, Eq. (7.3)

$\Psi_{s,N} = 0,7 + 0,3 \cdot \frac{c}{c_{cr,N}} \le 1,00$ EN 1992-4, Eq. (7.4)

$\Psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{V,1}}{s_{cr,N}}\right)} \le 1,00$ EN 1992-4, Eq. (7.6)

$\Psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{V,2}}{s_{cr,N}}\right)} \le 1,00$ EN 1992-4, Eq. (7.6)

$\Psi_{M,N} = 1$ EN 1992-4, Eq. (7.7)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k_8	$f_{c,cyl}$ [N/mm²]	
240.000	360.000	300,0	600,0	2,000	25,00	
$e_{c1,V}$ [mm]	$\Psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\Psi_{ec2,N}$	$\Psi_{s,N}$	$\Psi_{re,N}$	$\Psi_{M,N}$
0,0	1,000	0,0	1,000	0,800	1,000	1,000
k_1	$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Ed} [kN]		
11,000	155,563	1,500	110,623	0,156		

ID gruppo ancoranti
1

4.3 Rottura del bordo del calcestruzzo in direzione x-

$V_{Ed} \le V_{Rd,c} = \frac{V_{Rk,c}}{\gamma_{M,c}}$ EN 1992-4, Tabella 7.2

$V_{Rk,c} = k_T \cdot V^0_{Rk,c} \cdot \frac{A_{c,V}}{A^0_{c,V}} \cdot \Psi_{s,V} \cdot \Psi_{h,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{ec,V} \cdot \Psi_{re,V}$ EN 1992-4, Eq. (7.40)

$V^0_{Rk,c} = k_3 \cdot d_{nom}^{\alpha} \cdot \beta^{\beta} \cdot \sqrt{f_{ck}} \cdot c_1^{1,5}$ EN 1992-4, Eq. (7.41)

$\alpha = 0,1 \cdot \left(\frac{l_f}{c_1}\right)^{0,5}$ EN 1992-4, Eq. (7.42)

$\beta = 0,1 \cdot \left(\frac{d_{nom}}{c_1}\right)^{0,2}$ EN 1992-4, Eq. (7.43)

$A^0_{c,V} = 4,5 \cdot c_1^2$ EN 1992-4, Eq. (7.44)

$\Psi_{s,V} = 0,7 + 0,3 \cdot \frac{c_2}{1,5 \cdot c_1} \le 1,00$ EN 1992-4, Eq. (7.45)

$\Psi_{h,V} = \left(\frac{1,5 \cdot c_1}{h}\right)^{0,5} \ge 1,00$ EN 1992-4, Eq. (7.46)

$\Psi_{ec,V} = \frac{1}{1 + \left(\frac{2 \cdot e_V}{3 \cdot c_1}\right)} \le 1,00$ EN 1992-4, Eq. (7.47)

$\Psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + (0,5 \cdot \sin \alpha_V)^2}} \ge 1,00$ EN 1992-4, Eq. (7.48)

l_f [mm]	d_{nom} [mm]	k_3	α	β	$f_{c,cyl}$ [N/mm²]
192,0	16,00	2,400	0,139	0,069	25,00

c_1 [mm]	$A_{c,V}$ [mm²]	$A^0_{c,V}$ [mm²]
100,0	45.000	45.000

$\Psi_{s,V}$	$\Psi_{h,V}$	$\Psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\Psi_{ec,V}$	$\Psi_{re,V}$
1,000	1,000	2,000	0,0	1,000	1,000

$V^0_{Rk,c}$ [kN]	k_T	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Ed} [kN]
25,369	1,0	1,500	33,825	0,110

5 Carichi combinati di trazione e di taglio (EN 1992-4, sezione 7.2.3)

Rottura dell'acciaio

β_N	β_V	α	Utilizzo $\beta_{N,V}$ [%]	Stato
0,186	0,004	2,000	4	OK

$\beta_N^{\alpha} + \beta_V^{\alpha} \le 1,0$

Rottura del calcestruzzo

β_N	β_V	α	Utilizzo $\beta_{N,V}$ [%]	Stato
0,195	0,003	1,500	9	OK

$\beta_N^{\alpha} + \beta_V^{\alpha} \le 1,0$

6 Spostamenti (ancorante più sollecitato)

Carichi a breve termine:

N_{Sk} = 7,193 [kN] δ_N = 0,0429 [mm]

V_{Sk} = 0,115 [kN] δ_V = 0,0046 [mm]

δ_{NV} = 0,0432 [mm]

Carichi a lungo termine:

N_{Sk} = 7,193 [kN] δ_N = 0,0930 [mm]

V_{Sk} = 0,115 [kN] δ_V = 0,0069 [mm]

δ_{NV} = 0,0933 [mm]

7 VERIFICA SOLETTA

Si riportano di seguito le verifiche effettuate per il dimensionamento delle solette di impalcato.

7.1 VERIFICA SOLETTA FASE TRANSITORIA

In questa fase di calcolo viene verificata la lastra di predalles con relativi tralicci al fine di sostenere i carichi della soletta, del peso degli operatori e di eventuali barriere di protezione laterali provvisorie per la sicurezza degli operatori.

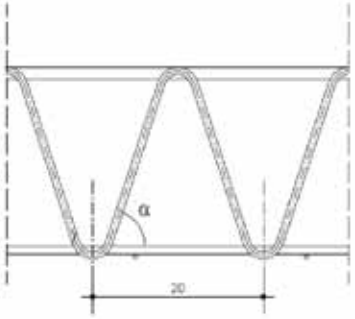
Si riportano di seguito i valori dei carichi utilizzati ed il calcolo delle sollecitazioni in campata ed in appoggio al fine di dimensionare il traliccio da prevedere nel predalles.

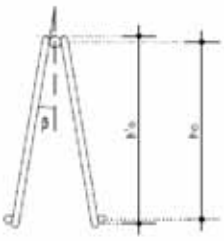
7.1.1 ANALISI DEI CARICHI

Si considera il peso proprio della lastra di predalles, il peso del getto della soletta, il peso di un parapetto di protezione e di un mezzo operativo per le varie lavorazioni.

		Sp	γ		
		[m]	[kN/m3]		
Gk1	**Peso Proprio**	0.05	25	1.25	kN/m2
Gk2	**Peso Soletta**	0.21	25	5.25	kN/m2
Gk2	**Peso Parapetto Sic.**			0.4	kN/m
Qk	**Peso Mezzo Operativo**			1	kN/m2

Le verifiche vengono eseguite facendo riferimento allo Stato Limite Ultimo della sezione. Si verifica che le tensioni sugli elementi metallici che costituiscono il traliccio siano inferiori alla tensione di calcolo e che la stabilità degli elementi compressi risulti soddisfatta. Di seguito si riporta una rappresentazione schematica del traliccio utilizzato.





Altezza totale del traliccio: $h'_0 = 165$ mm

Diametro correnti superiori: $f_{cs} = 16$ mm

Diametro correnti inferiori: $f_{ci} = 14$ mm

Diametro staffa: $f_{ci} = 10$ mm

7.1.2 VERIFICA A MOMENTO POSITIVO - CAMPATA

Analizzando gli elaborati grafici allegati al presente progetto esecutivo, si evince che la distanza tra le anime delle travi di appoggio è pari a 2.55m e considerando 5 cm di appoggio su entrambe le strutture,

si considera una luce di calcolo pari a 2.65m. Si riporta di seguito il calcolo delle sollecitazioni di progetto.

SEZIONE IN CAMPATA				
	LC	2.65		
	MOMENTO FLETTENTE	TAGLIO	Med	Ted
Gk1	1.25 x 1.20 x 2.65^2 / 8	1.25 x 1.20 x 2.65/2	1.32	1.99
Gk2	5.25 x 1.20 x 2.65^2 / 8	5.25 x 1.20 x 2.65/2	5.53	8.35
Qk	1 x 1.20 x 2.65^2 / 8	1 x 1.20 x 2.65/2	1.05	1.59
	Med		**13.85**	**15.50**
	Ted			
	Ned = (Med / h_0) / 3		**30.77**	

Altezza totale traliccio		ht=	16.50	cm		
Larghezza totale traliccio		B=	9.00	cm		
Interasse tralicci		i=	40.00	cm		
Numero di tralicci /m		n=	3			
Passo traliccio		p=	20.00	cm		
Quota corrente inferiore		s=	2.00	cm		
Corrente superiore	1	Øs=	1.60	cm		
Ferro integr sup (I)	0	Øs'=	0.00	cm		
Ferro integr sup (II)	0	Øs''=	0.00	cm		
Corrente inferiore	2	Øi=	1.40	cm		
Diagonale		Ød=	1.00	cm		
Altezza utile traliccio		d=	13.0	cm		
Interasse ferri inferiori		pi=	7.6	cm		
Interasse trasv. diagonale		bd=	5.2	cm		
Inclinazione longitudinale		α=	1.065	rad	61.0	°
Inclinazione trasversale		β=	0.192	rad	11.0	°
Area corrente superiore		As=	2.01	cm^2		
Area ferro integr sup (I)		As'=	0.00	cm^2		
Area ferro integr sup (II)		As''=	0.00	cm^2		
Area corrente inferiore		Ai=	3.08	cm^2		
Area diagonale		Ad=	0.79	cm^2		
Inerzia corrente superiore		Js=	0.3217	cm^4		
Inerzia ferro integr sup (I)		Js'=	0.0000	cm^4		
Inerzia ferro integr sup (II)		Js''=	0.0000	cm^4		
Inerzia corrente inferiore		Ji=	0.3771	cm^4		
Inerzia diagonale		Jd=	0.0491	cm^4		

CARATTERISTICHE DI RESISTENZA TRALICCIO

	Area cm^2	Quota cm	J cm^4	Jtrasp cm^4	J+Jtrasp cm^4
Corr sup + ferro (I)	2.01	15.7	0.322	124.3	124.7
Ferro (II)	0.00	14.9	0.000	0.0	0.0
Corrente inf	3.08	2.7	0.377	81.2	81.6

Quota baricentro	YG=	7.84	cm
Area totale	Atot=	5.1	cm^2
Inerzia totale	Jtot=	206.3	cm^4
Modulo di resistenza c. sup.	Ws=	26.23	cm^3
Modulo di resistenza ferro (II)	Ws''=	29.2	cm^3
Modulo di resistenza c. inf.	Wi=	40.2	cm^3

CARATTERISTICHE DI RESISTENZA ALL'INSTABILITÀ TRALICCIO

Corrente superiore

Lunghezza asta	L=	20.0	cm
Coefficiente riduttivo	β=	0.7	
Lunghezza libera inflessione	L0=	14.0	cm
Carico critico Euleriano	Ncr=	340183	N
Snellezza adimensionale	$\underline{\lambda}$=	0.52	
Fattore di imperfezione	α=	0.49	
Coefficiente	Φ=	0.71	
Fattore di riduzione (≤ 1)	χ=	0.83	
Resistenza asta compressione	NbRd=	-65.6	kN

Corrente inferiore

Lunghezza asta	L=	20.0	cm
Coefficiente riduttivo	β=	0.7	
Lunghezza libera inflessione	L0=	14.0	cm
Carico critico Euleriano	Ncr=	199409	N
Snellezza adimensionale	$\underline{\lambda}$=	0.59	
Fattore di imperfezione	α=	0.49	
Coefficiente	Φ=	0.77	
Fattore di riduzione (≤ 1)	χ=	0.79	
Resistenza asta compressione	NbRd=	-47.7	kN

Diagonale

Lunghezza asta	L=	16.6	
Coefficiente riduttivo	β=	0.7	
Lunghezza libera inflessione	L0=	11.6	cm
Carico critico Euleriano	Ncr=	75294	N
Snellezza adimensionale	$\underline{\lambda}$=	0.69	
Fattore di imperfezione	α=	0.49	
Coefficiente	Φ=	0.85	
Fattore di riduzione (≤ 1)	χ=	0.73	
Resistenza asta compressione	NbRd=	-22.6	kN

VERIFICA TRALICCIO

Momento sollecitante	Msd=	13.85	kNm	campata
Taglio sollecitante	Vsd=	15.5	kN	appoggio
Momento soll. /traliccio	msd=	4.62	kNm	campata
Taglio sollec. /traliccio	vsd=	5.17	kN	appoggio

Corrente superiore — compresso

Verifica di resistenza

Tensione limite di calcolo	fyd=	-391	N/mm^2
Tensione corrente superiore	σs=	-176	N/mm^2
Coefficiente di sicurezza	c.s.=	2.22	*VERIFICATO*

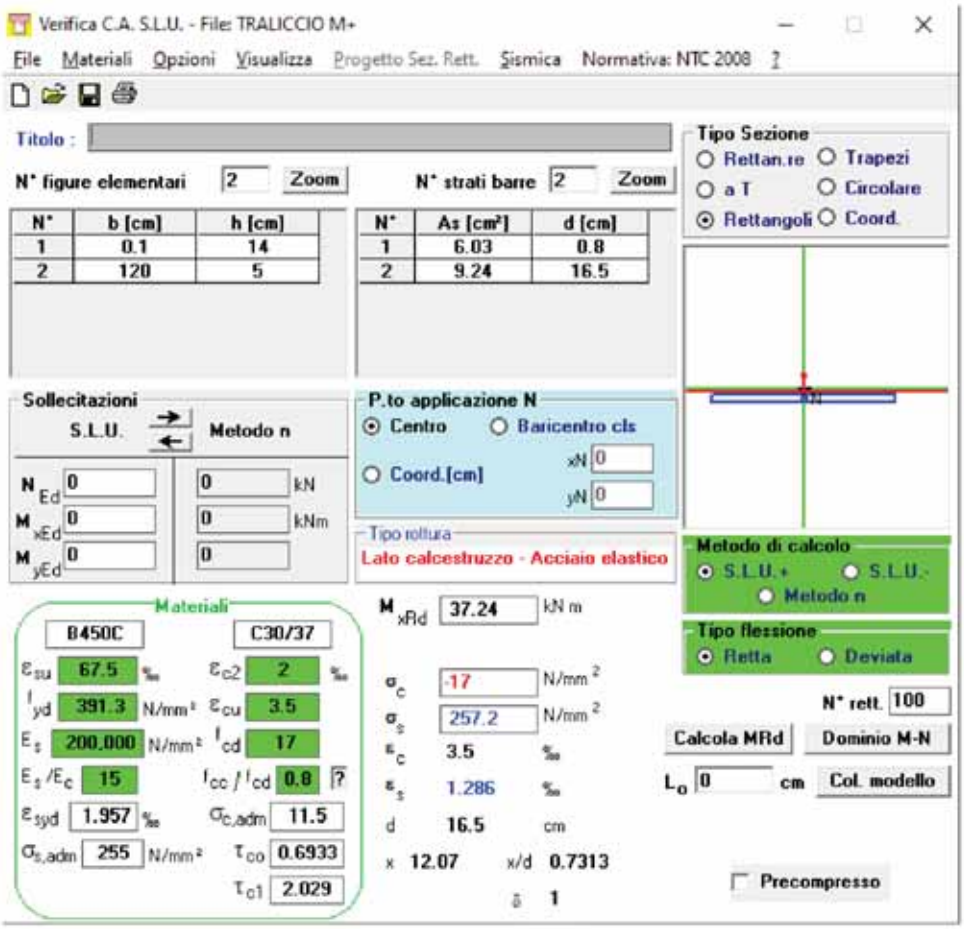
Verifica di instabilità

Resistenza asta compressa	NbRd=	-65.6	kN
Compressione	Nsd=	-35.4	kN
Coefficiente di sicurezza	c.s.=	1.85	*VERIFICATO*

Corrente inferiore	**teso**		
Verifica di resistenza			
Tensione limite di calcolo	fyd=	391	N/mm^2
Tensione corrente inferiore	σi=	115	N/mm^2
Coefficiente di sicurezza	c.s.=	3.40	*VERIFICATO*

Diagonale			
All'appoggio, per effetto del taglio si ha:			
Compressione sul diagonale		-3.0	kN
Verifica di resistenza			
Tensione limite	fyd=	-391.3	N/mm^2
Tensione diagonale	σ=	-38.3	N/mm^2
Coefficiente di sicurezza	c.s.=	10.21	*VERIFICATO*
Verifica di instabilità			
Resistenza asta compressa	NbRd=	-22.6	kN
Compressione	Nsd=	-3.0	kN
Coefficiente di sicurezza	c.s.=	7.50	*VERIFICATO*

Si esegue ora la verifica della struttura allo SLU.



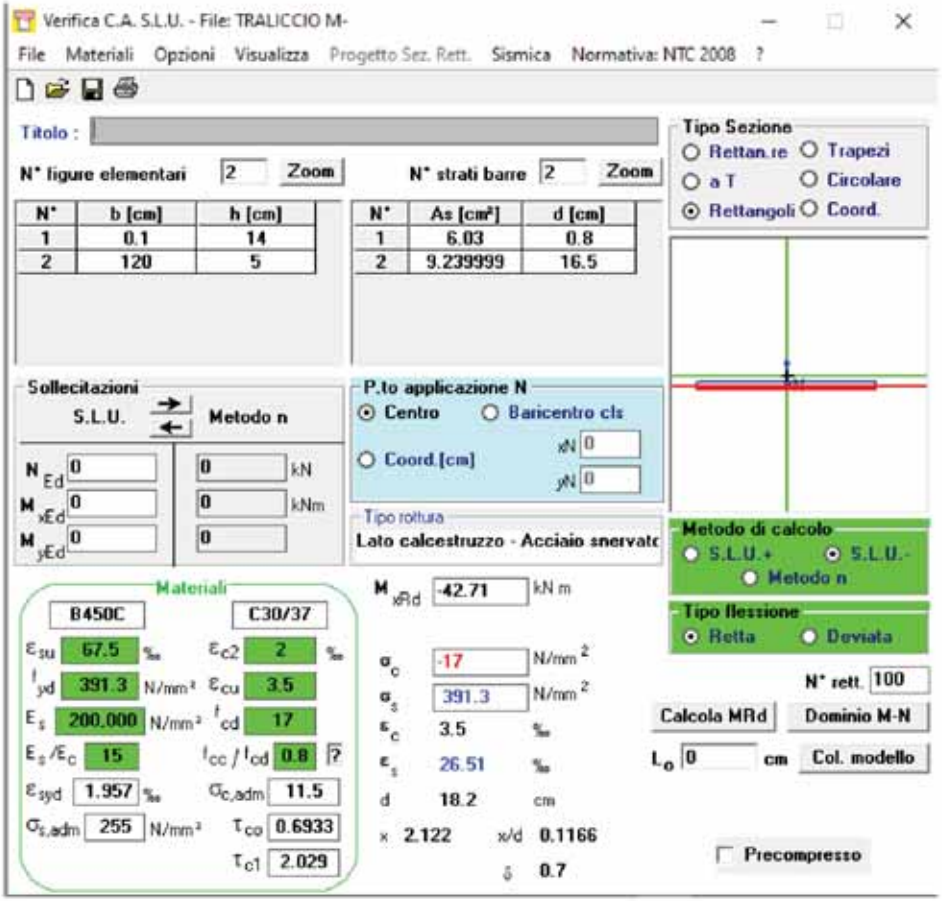
Med < Mrd Verifica soddisfatta

7.1.3 VERIFICA A MOMENTO NEGATIVO APPOGGIO

Analizzando gli elaborati grafici allegati al presente progetto esecutivo, si evince che la distanza dello sbalzo rispetto all'asse dell'anima della trave di appoggio è pari a 1.25m. Si riporta di seguito il calcolo delle sollecitazioni e la verifica strutturale allo SLU.

SEZIONE IN APPOGGIO		
	LC	1.25
	MOMENTO FLETTENTE	
Gk1	1.25 x 1.20 x 1.25^2 / 2	1.17
Gk2	5.25 x 1.20 x 1.25^2 / 2	4.92
Gk2	0.4 x 1.20 x 1.25	0.60
Qk	1 x 1.20 x 1.25^2 / 2	0.94
	Med	**11.27**

Si esegue ora la verifica della struttura allo SLU.



Med < Mrd Verifica soddisfatta

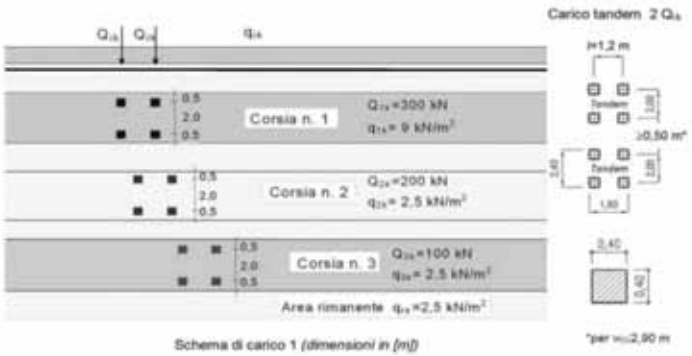
7.2 VERIFICA SOLETTA FASE DEFINITIVA

In questa fase di calcolo viene effettuato il calcolo della soletta considerando i seguenti carichi permanenti compatibilmente a quanto utilizzato per il dimensionamento dell'impalcato metallico.

PESO SOLETTA		
Hsoletta =	**0.26**	m
γ =	25	kN/mc
peso =	6.5	kN/mq
CORDOLI		
Hcordoli =	**0.15**	m
γ =	25	kN/mc
peso =	3.75	kN/mq
PERMANENTE PORTATO		
Hsoletta =	**0.11**	cm
γ =	24	kN/mc
peso =	**2.64**	kN/mq
BARRIERE+VELETTE E TUBAZIONI		
Barriere =	1.5	kN/ml
Tubazioni =	0.1	kN/ml
Veletta =	0.4	kN/ml
Totale	**2.000**	kN/ml

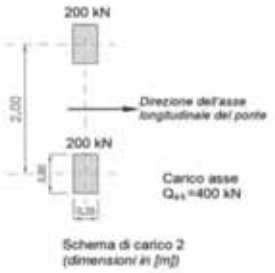
I carichi accidentali considerati sono quelli prescritti dalla normativa ed in particolare lo schema di carico 1, costituito da carichi concentrati su due assi in tandem, applicati su impronte di pneumatico di forma quadrata e lato pari a 0,40 m (Qik), oltre che da un carico distribuito a metro quadrato (qik) applicato alla corsia di carico.

I valori adottati per i carichi variano in base alla corsia di carico, secondo lo schema di normativa riportato nel seguito.



Schema di carico 1 *(dimensioni in [m])*

Oltre a questo, è stato adottato anche lo schema di carico 2, costituito da un singolo asse applicato su specifiche impronte di pneumatico di forma rettangolare, con larghezza 0,60 m ed altezza 0,35 m. Nel seguito l'immagine estratta dalla normativa.



Schema di carico 2
(dimensioni in [m])

In aggiunta a quanto sopra, occorre tenere in conto anche l'urto di veicoli in svio (q_8). La normativa, a tal proposito, indica che le forze causate da collisioni accidentali sugli elementi di sicurezza, possono essere considerate attraverso una forza orizzonale equivalente di collisione pari a 100 kN. Tale forza è da intendersi applicata trasversalmente ed orizzontalmente 100 mm sotto la sommità dell'elemento su cui insiste, oppure, 1,0 m sopra il piano di marcia, a seconda di quale sia il minore per una striscia di 0.5m. Ai fini dell'applicazione di tale forza alla soletta di impalcato, è stata considerata una diffusione a terra ottenendo una larghezza di carico pari a 1.00 + 0.50 + 1.00 ottenendo un effetto torcente sul bordo della soletta pari a Mt = 100 kN/2.5m = 40 kNm/m. I carichi concentrati previsti nei casi di carico, sono stati applicati tenendo in considerazione dell'effettiva geometria della mesh di calcolo utilizzata e considerando (come previsto dalla norma) una diffusione di carico a 45° fino al baricentro della soletta in cls.

Si riportano di seguito alcune immagini relative al modello e ai carichi applicati.

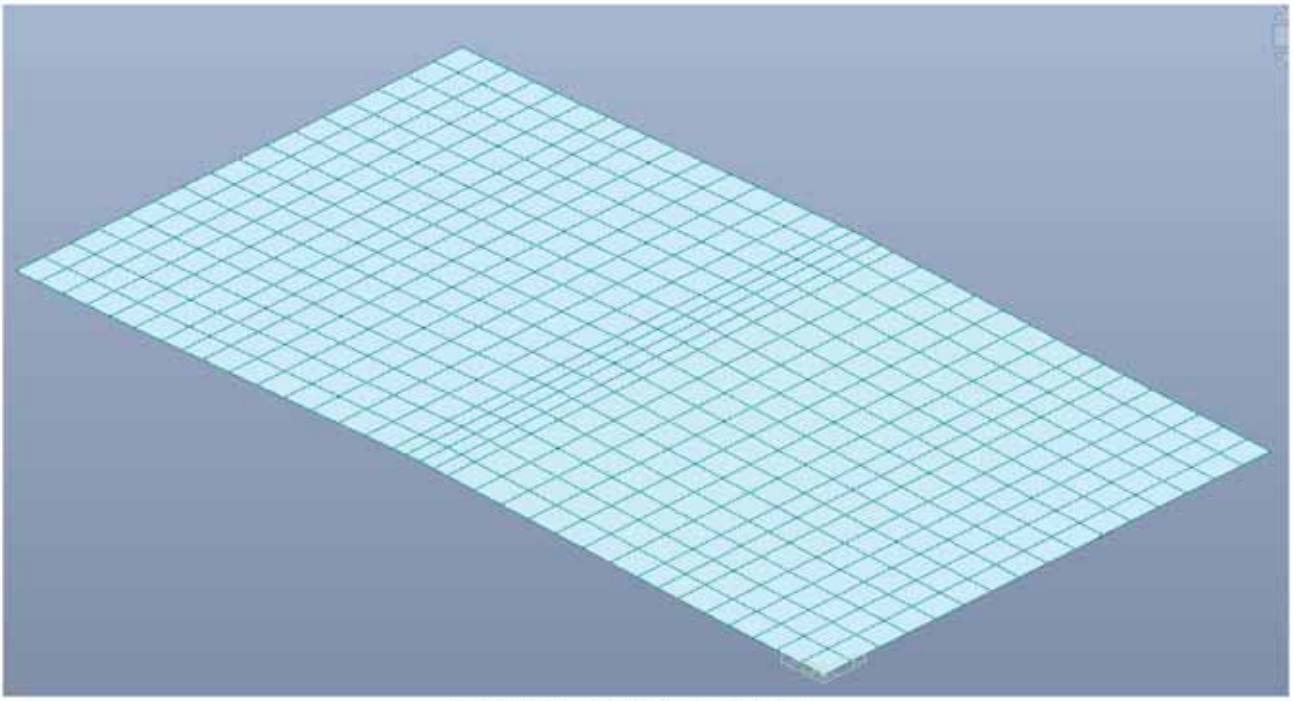


Figura 73 - Modello di calcolo

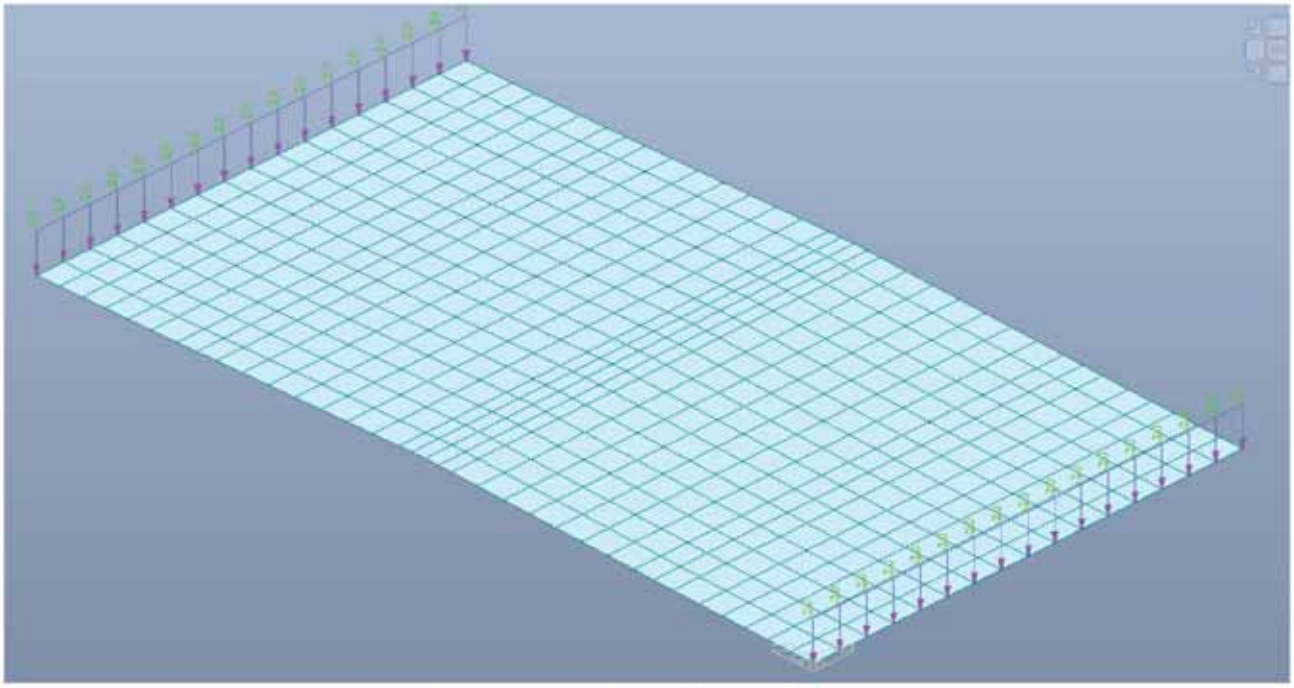


Figura 74 – Peso Barriera + Veletta + Tubazioni

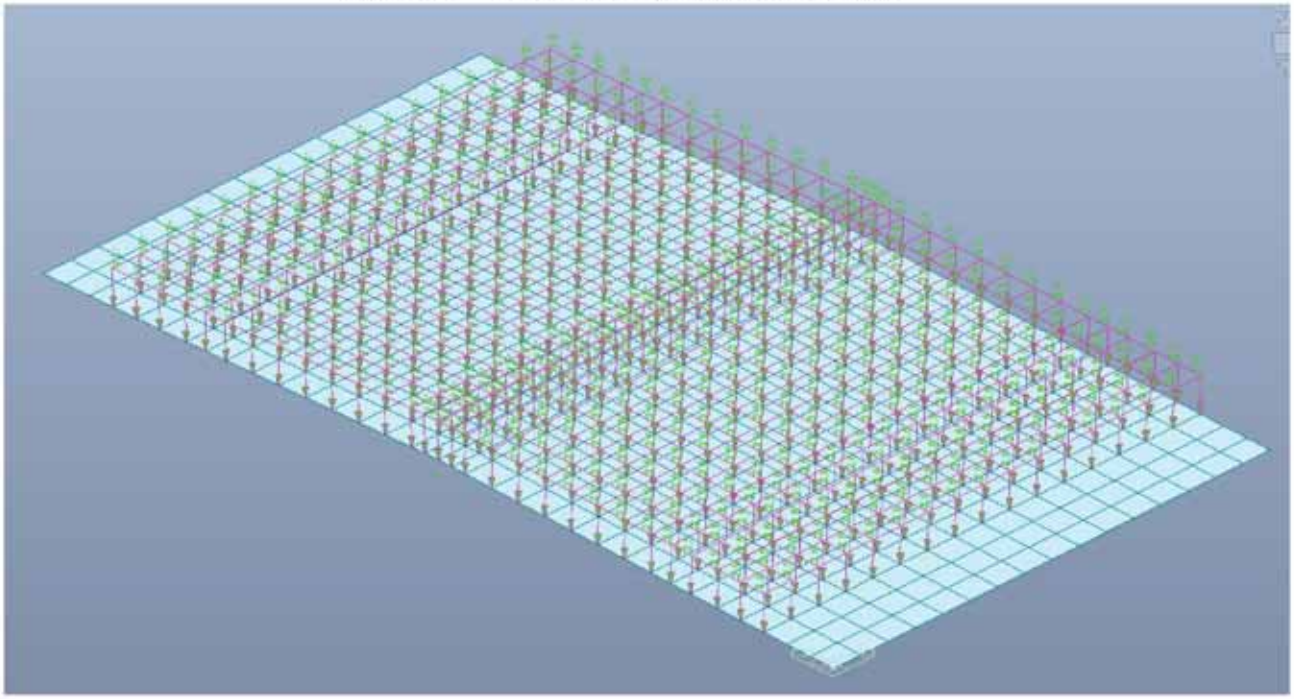


Figura 75 - Peso permanente portato

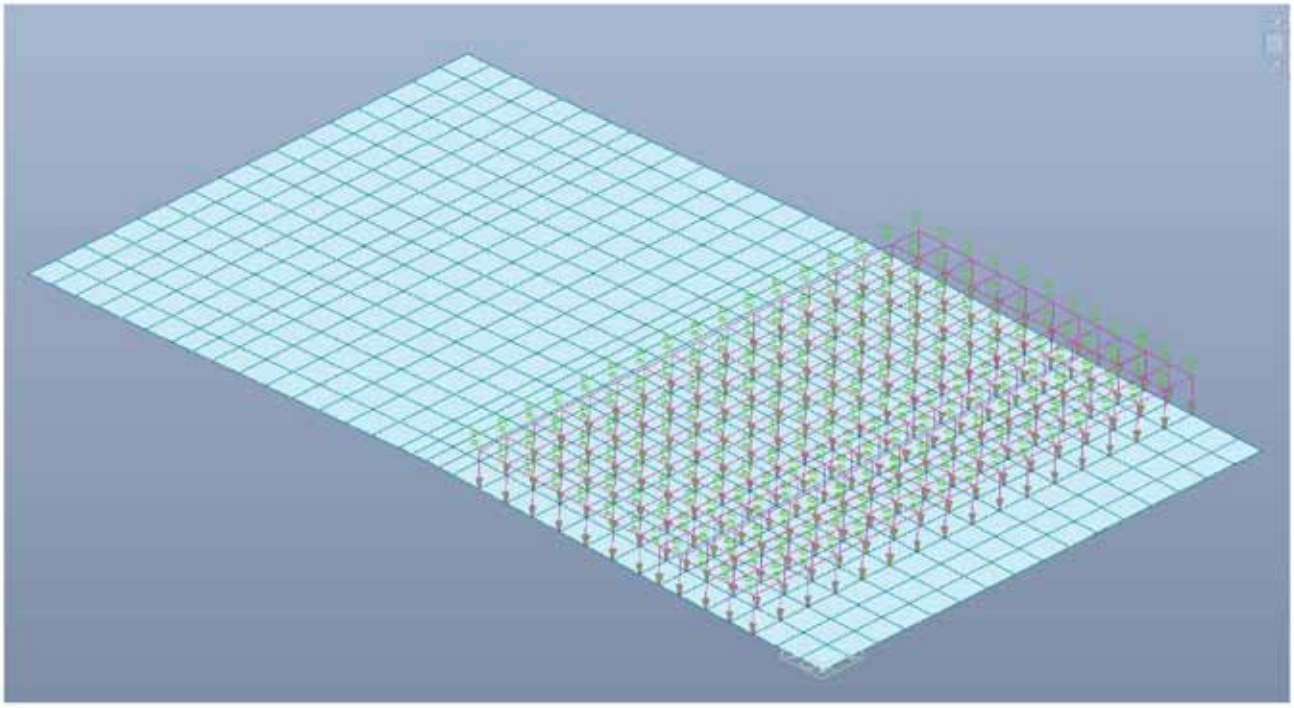


Figura 76 - Carico Distribuito prima colonna di carico

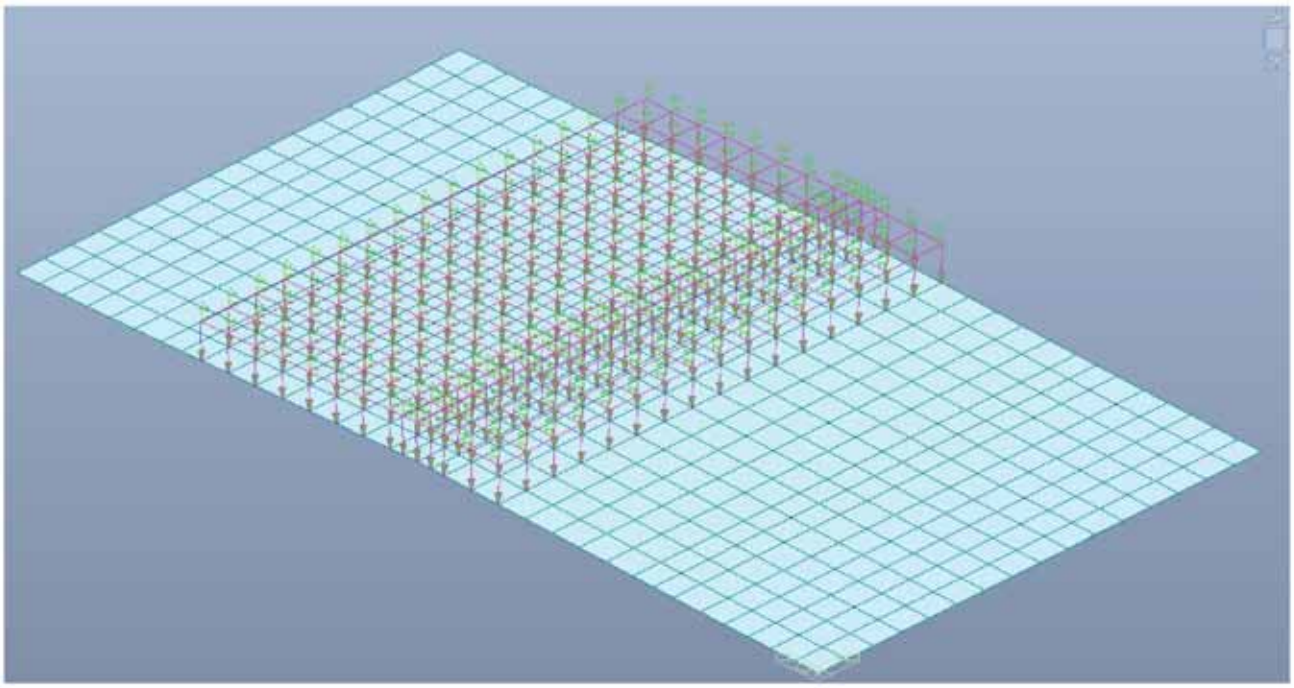


Figura 77 - Carico Distribuito seconda colonna di carico

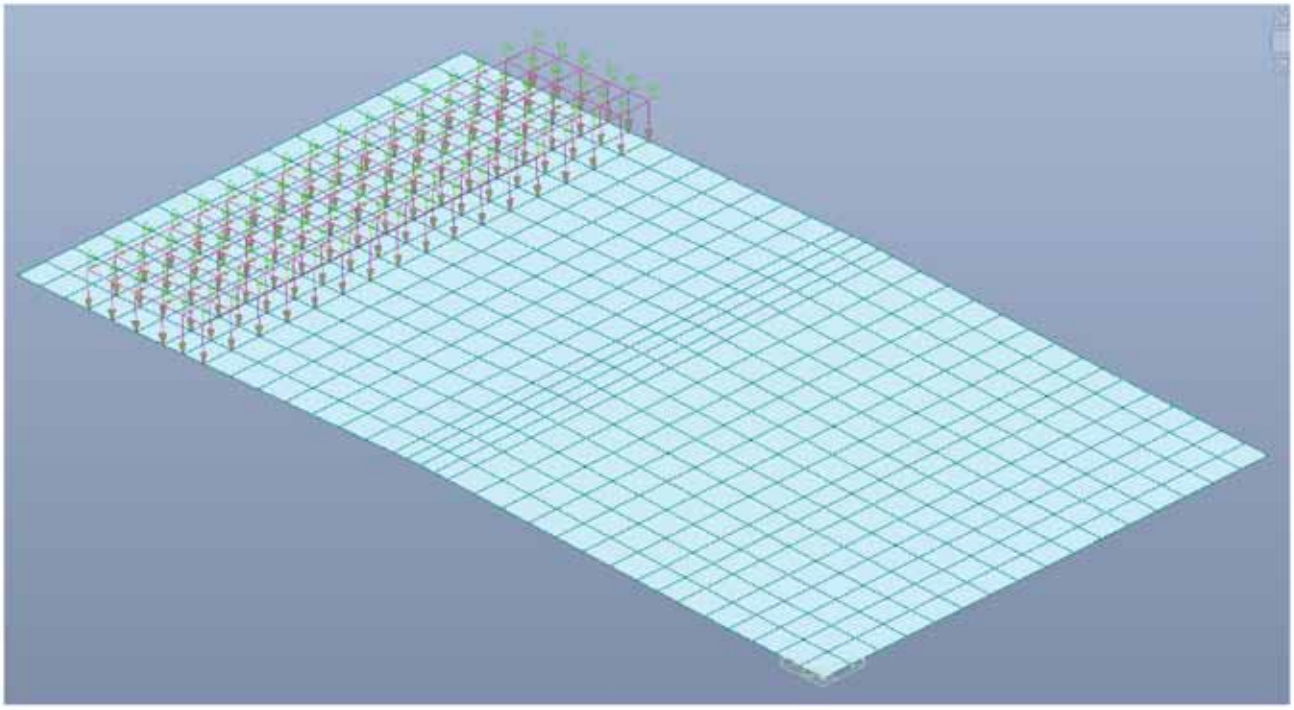


Figura 78 - Carico Distribuito terza colonna di carico

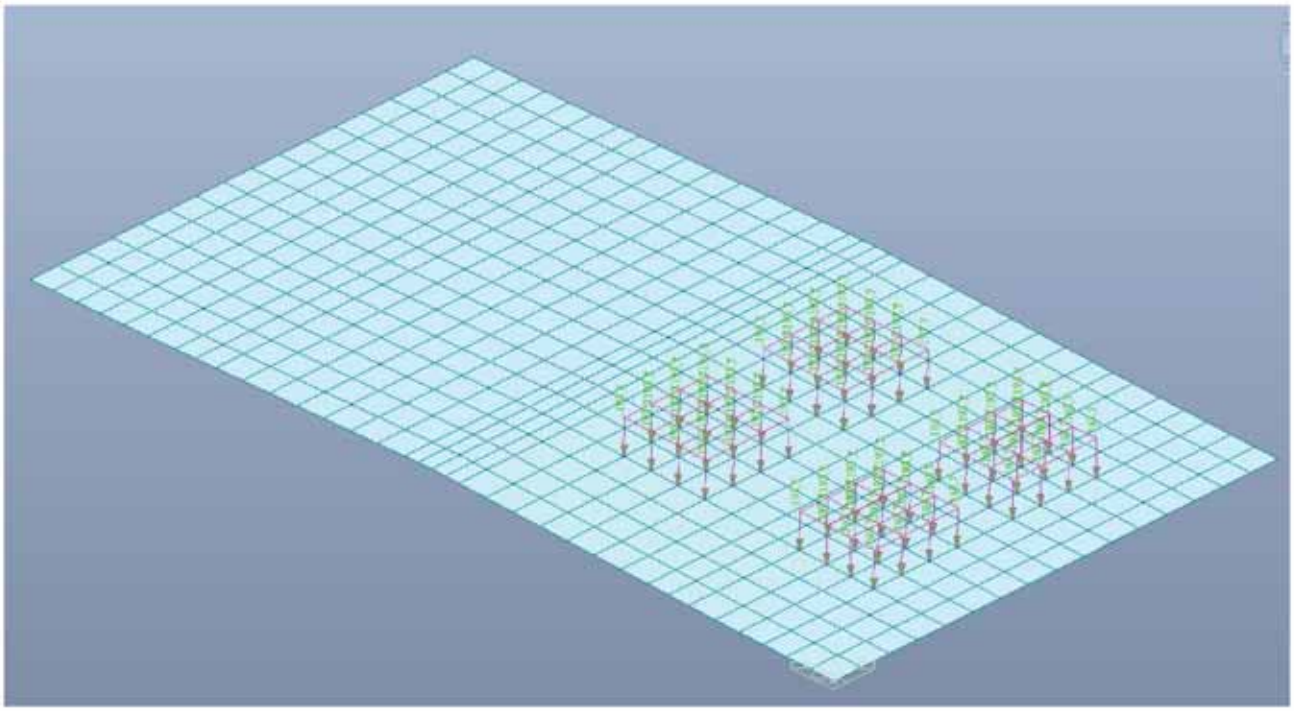


Figura 79 – Caico Q1a

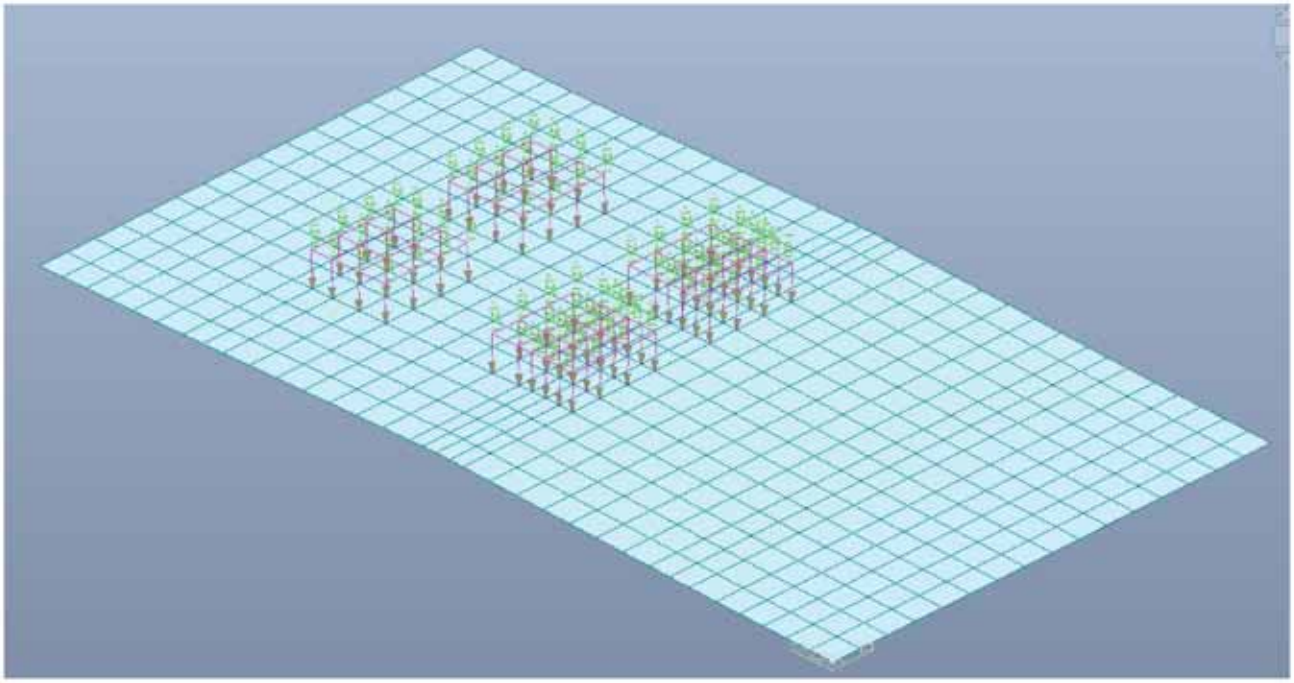


Figura 80 – Carico Q1b

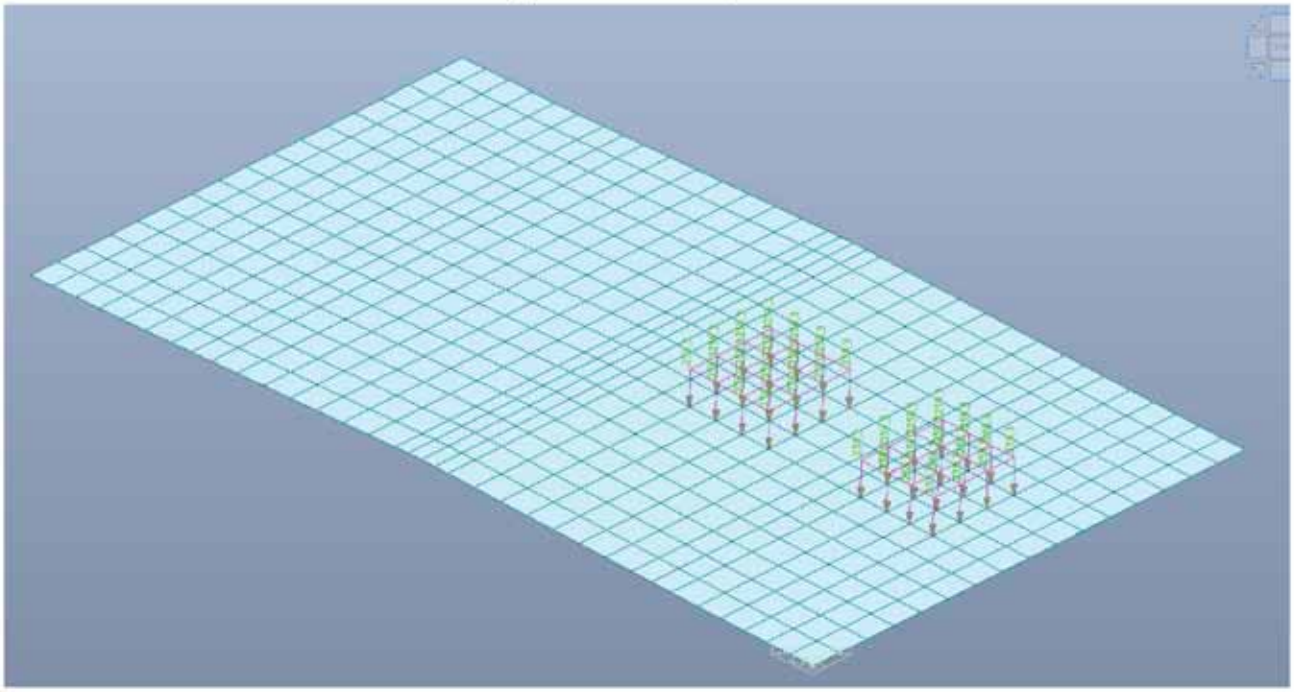


Figura 81 - Carico Schema 2

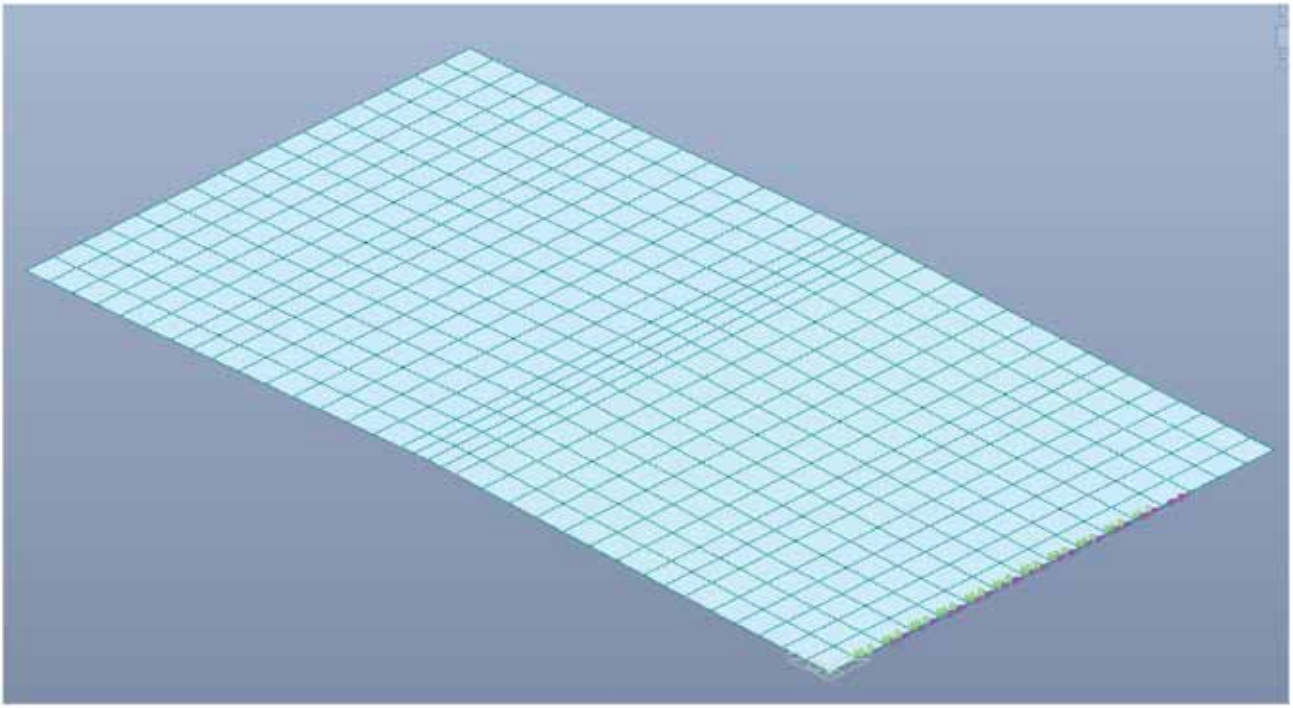


Figura 82 - Momento torcente che simula l'effetto dell'urto

Di riporta di seguito i diagrammi delle sollecitazioni ottenute sia agli Stati limiti Ultimi che agli Stati limiti di esercizio con le relative verifiche strutturali.

7.2.1 Verifica STRUTTURALE soletta

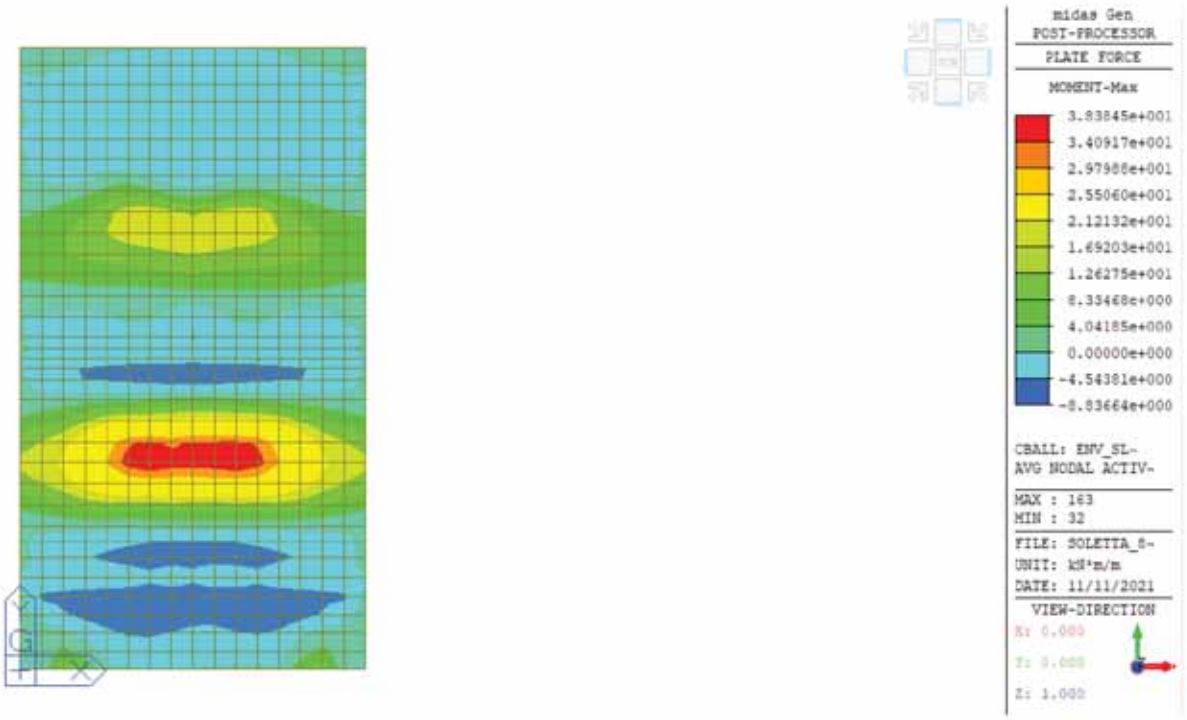


Figura 83 - Max Momento SLU

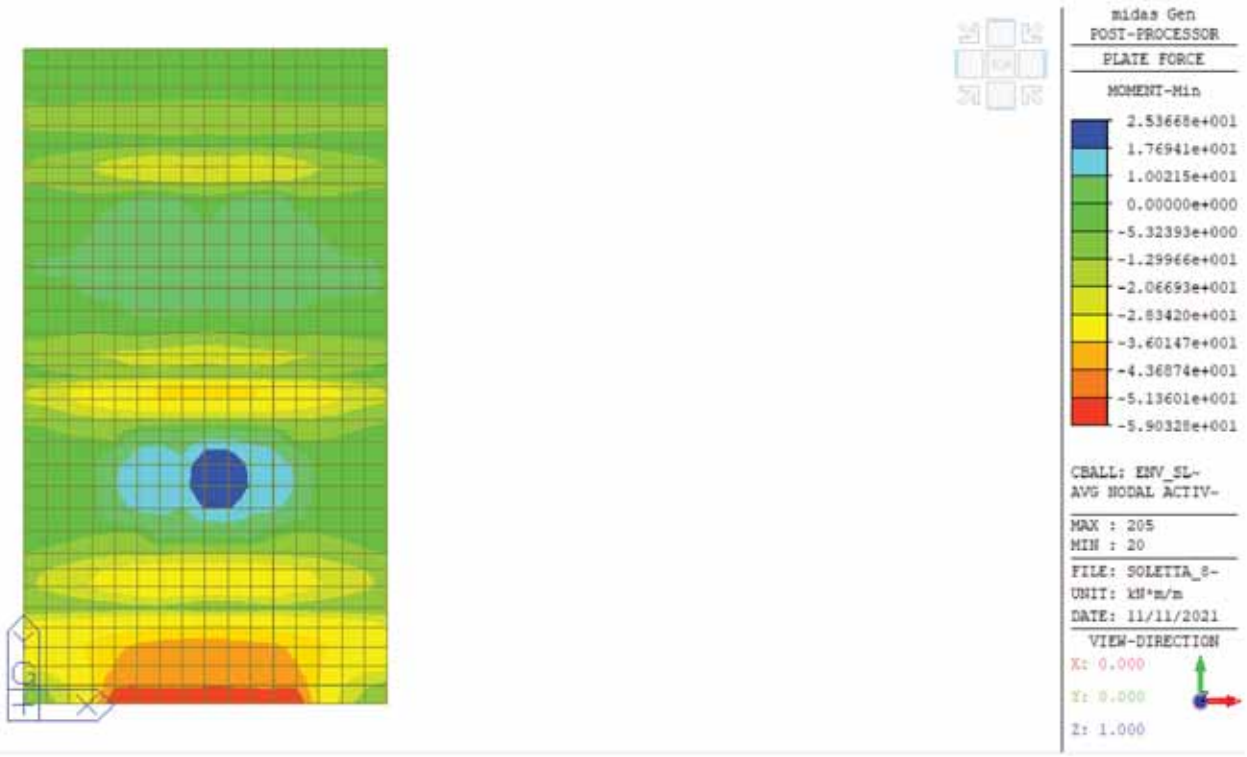


Figura 84 - Min Momento SLU

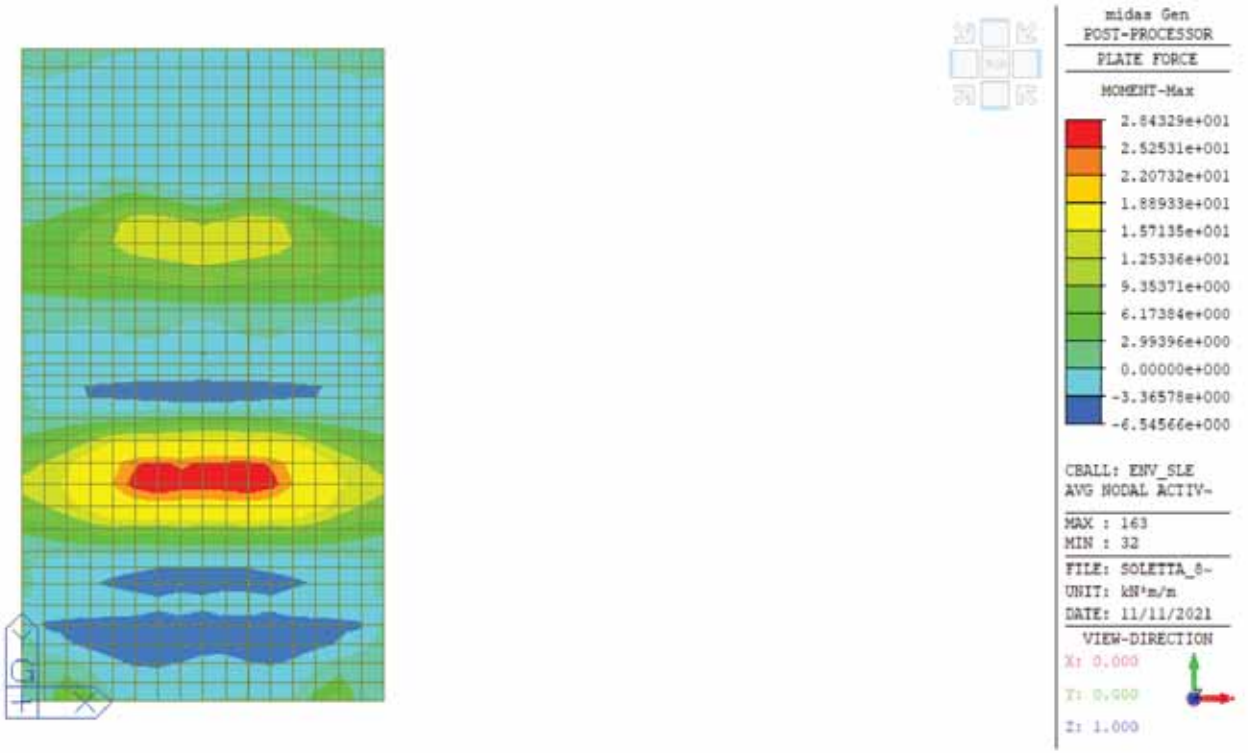


Figura 85 - Max Momento SLE

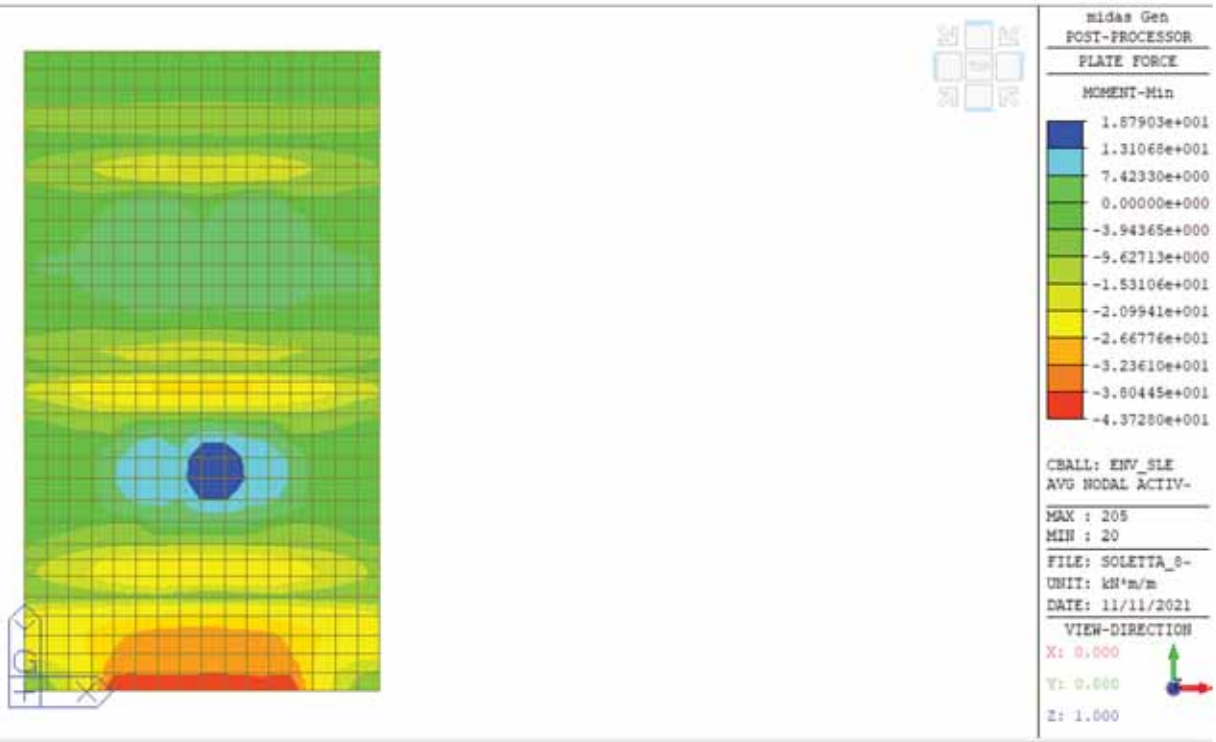


Figura 86 - Min Momento SLE

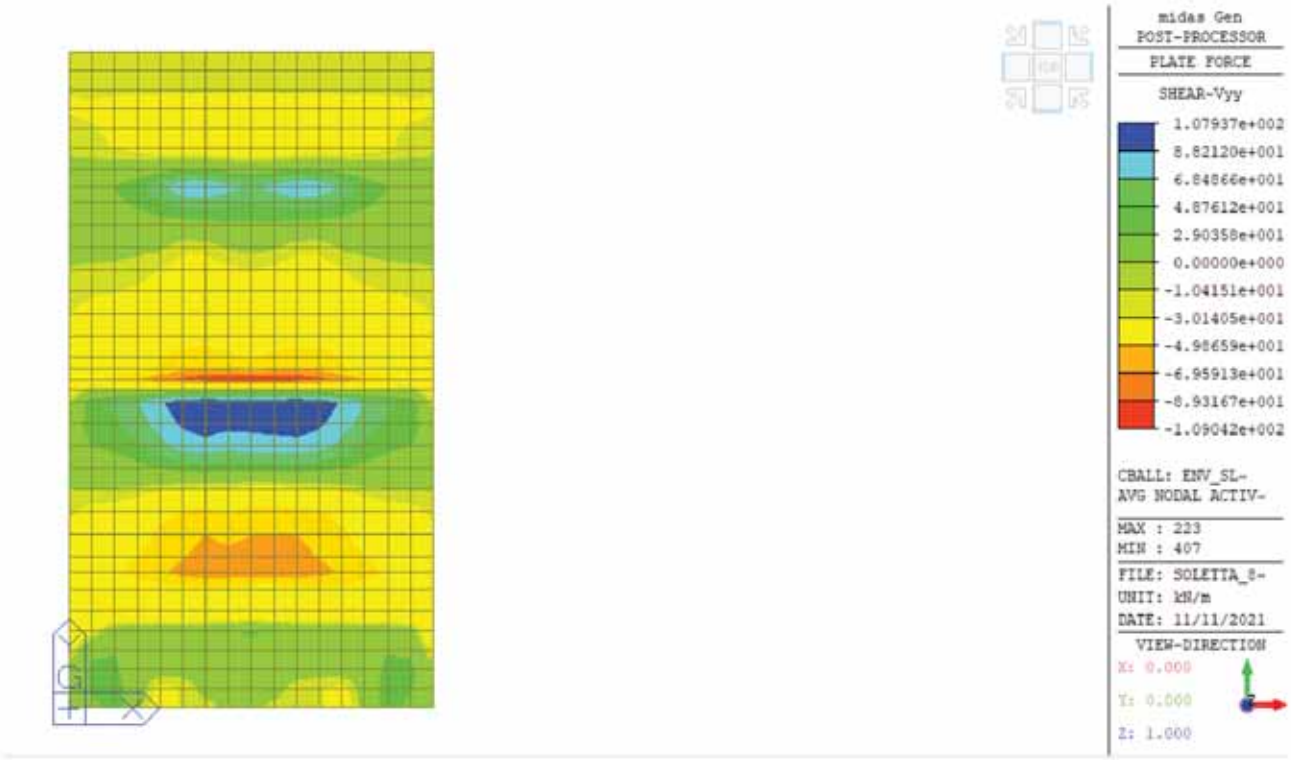
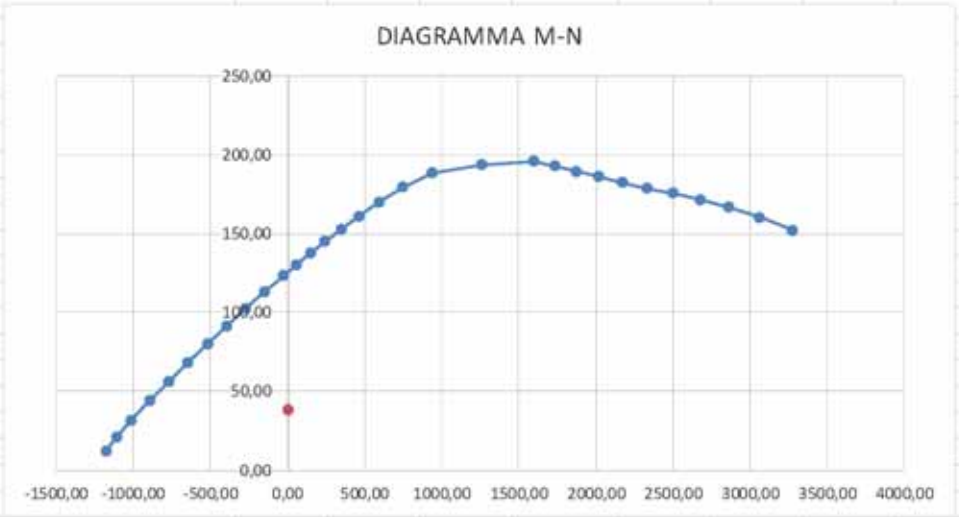


Figura 87 - Taglio SLU

VERIFICA FLESSIONALE MOMENTO POSITIVO

RIEPILOGO SOLLECITAZIONI			RIEPILOGO ARMATURE			RIEPILOGO GEOMETRIA			RIEPILOGO MATERIALI		
	M	N	n°	ϕ (mm)	y	B =	100	cm	fck	33,2	N/mm²
	kNm	kN		(mm)	(cm)	H =	26	cm	Rck	40	N/mm²
SLU/SLV	38,38	0,0							fcd =	18,81	
RARA	28,43	0,0	5	16	5				c	5	cm
FREQUENTE	28,43	0,0	1	0	0				fmax	16	mm
QUASI PERMANENTE	28,43	0,0	5	16	21				i	10	cm
			5	16	21				i'	0	cm
									fyk	450	N/mm²



		σc	σs	σcmax	σsmax
		N/mm2	N/mm2	N/mm2	N/mm2
VERIFICHE TENSIONALI	RARA	3,37	78,65	19,92	360,00
	QUASI PERMANENTE	3,37		14,94	

		Wk	Mf	M	Wklim	
		mm	kNm	kNm		
VERIFICHE A FESSURAZIONE	QUASI PERMANENTE	0,0275	43,28	36,36	0,2	Ms < M1f
	FREQUENTE	0,0275	43,28	36,36	0,3	Ms < M1f

VERIFICA TENSIONALE COMBINAZIONE QUASI PERMANENTE :

M = 28,43 kNm

N = 0 kN

H/6 = 4,33 cm

B = 100 cm

H = 26 cm

Verifica:

n = 15

x = 8,21 cm

s-c = 3,37 N/mm2

s-a = -19,76 N/mm2 (y = 5 cm: 5 f 16, Aa = 10,05 cm2, passo 20,0 cm)

s-a' = 78,65 N/mm2 (y = 21 cm: 5 f 16, Aa' = 10,05 cm2, passo 20,0 cm)

s-a'' = 78,65 N/mm2 (y = 21 cm: 5 f 16, Aa'' = 10,05 cm2, passo 20,0 cm)

VERIFICA TENSIONALE COMBINAZIONE RARA :

M = 28,43 kNm

N = 0 kN

H/6 = 4,33 cm

B = 100 cm

H = 26 cm

Verifica:

n = 15

x = 8,21 cm

s-c = 3,37 N/mm2

s-a = -19,76 N/mm2 (y = 5 cm: 5 f 16, Aa = 10,05 cm2, passo 20,0 cm)

s-a' = 78,65 N/mm2 (y = 21 cm: 5 f 16, Aa' = 10,05 cm2, passo 20,0 cm)

s-a'' = 78,65 N/mm2 (y = 21 cm: 5 f 16, Aa'' = 10,05 cm2, passo 20,0 cm)

VERIFICA A FESSURAZIONE COMBINAZIONE QUASI PERMANENTE :

M = 28,43 kNm

N = 0 kNm

Rck = 40 N/mm2

fctm = 3,16 N/mm2 (0,27xRck^2/3)

B = 100 cm (larghezza sezione)

H = 26 cm (altezza sezione)

y = 5 cm (posizione di armatura)

Aa = 10,05 cm2 (n¡ 5 f 16 passo 20 cm)

y' = 21 cm (posizione di armatura)

Aa' = 10,05 cm2 (n¡ 5 f 16 passo 10 cm)

y'' = 21 cm (posizione di armatura)

Aa'' = 10,05 cm2 (n¡ 5 f 16 passo 20 cm)

STADIO NON FESSURATO

n = 15 (coeff. omogeneizzazione)

Jid(I) = 173'070 cm4

Aid = 3'022 cm2

x(I) = 13,373 cm (asse neutro stato I, dal lembo compresso)

M = 36,36 kNm (Momento di formazione fessura fcfk = 0,7x1,2xfctm)

Mf = 43,28 kNm (Momento di fessurazione fctm)

Momento d'esercizio inferiore al momento di fessurazione quindi non serve calcolare l'ampiezza delle fessure

VERIFICA A FESSURAZIONE COMBINAZIONE FREQUENTE :

M = 28,43 kNm

N = 0 kNm

Rck = 40 N/mm2

fctm = 3,16 N/mm2 (0,27xRck^2/3)

B = 100 cm (larghezza sezione)

H = 26 cm (altezza sezione)

y = 5 cm (posizione di armatura)

Aa = 10,05 cm2 (n¡ 5 f 16 passo 20 cm)

y' = 21 cm (posizione di armatura)

Aa' = 10,05 cm2 (n¡ 5 f 16 passo 10 cm)

y'' = 21 cm (posizione di armatura)

Aa'' = 10,05 cm2 (n¡ 5 f 16 passo 20 cm)

STADIO NON FESSURATO

n = 15 (coeff. omogeneizzazione)

Jid(I) = 173'070 cm4

Aid = 3'022 cm2

x(I) = 13,373 cm (asse neutro stato I, dal lembo compresso)

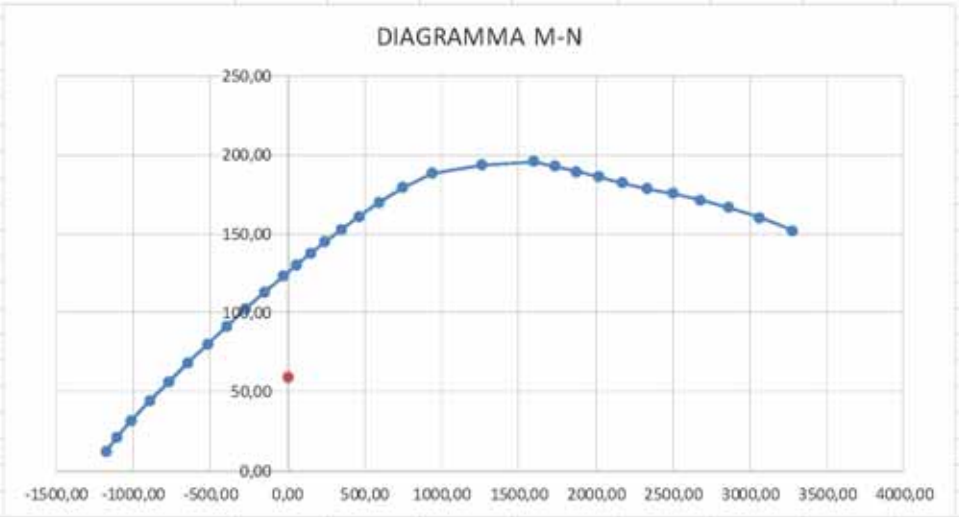
M = 36,36 kNm (Momento di formazione fessura fcfk = 0,7x1,2xfctm)

Mf = 43,28 kNm (Momento di fessurazione fctm)

Momento d'esercizio inferiore al momento di fessurazione quindi non serve calcolare l'ampiezza delle fessure

VERIFICA FLESSIONALE MOMENTO NEGATIVO

RIEPILOGO SOLLECITAZIONI			RIEPILOGO ARMATURE			RIEPILOGO GEOMETRIA			RIEPILOGO MATERIALI		
	M	N	n°	ϕ (mm)	y	B =	100	cm	fck	33,2	N/mm²
	kNm	kN		(mm)	(cm)	H =	26	cm	Rck	40	N/mm²
SLU/SLV	59,03	0,0							fcd =	18,81	
RARA	43,73	0,0	5	16	5				c	5	cm
FREQUENTE	43,73	0,0	1	0	0				fmax	16	mm
QUASI PERMANENTE	43,73	0,0	5	16	21				l	10	cm
			5	16	21				l'	0	cm
									fyk	450	N/mm²



		σc	σs	σcmax	σsmax
		N/mm2	N/mm2	N/mm2	N/mm2
VERIFICHE TENSIONALI	RARA	5,18	120,97	19,92	360,00
	QUASI PERMANENTE	5,18		14,94	

		Wk	Mf	M	Wklim	
		mm	kNm	kNm		
VERIFICHE A FESSURAZIONE	QUASI PERMANENTE	0,0539	43,28	36,36	0,2	Controllo Wk
	FREQUENTE	0,0539	43,28	36,36	0,3	Controllo Wk

VERIFICA TENSIONALE COMBINAZIONE QUASI PERMANENTE :

M = 43,73 kNm

N = 0 kN

H/6 = 4,33 cm

B = 100 cm

H = 26 cm

Verifica:

n = 15

x = 8,21 cm

s-c = 5,18 N/mm2
s-a = -30,39 N/mm2 (y = 5 cm: 5 f 16, Aa = 10,05 cm2, passo 20,0 cm)
s-a' = 120,97 N/mm2 (y = 21 cm: 5 f 16, Aa' = 10,05 cm2, passo 20,0 cm)
s-a'' = 120,97 N/mm2 (y = 21 cm: 5 f 16, Aa'' = 10,05 cm2, passo 20,0 cm)

VERIFICA TENSIONALE COMBINAZIONE RARA :

M = 43,73 kNm
N = 0 kN
H/6 = 4,33 cm
B = 100 cm
H = 26 cm
Verifica:
n = 15
x = 8,21 cm
s-c = 5,18 N/mm2
s-a = -30,39 N/mm2 (y = 5 cm: 5 f 16, Aa = 10,05 cm2, passo 20,0 cm)
s-a' = 120,97 N/mm2 (y = 21 cm: 5 f 16, Aa' = 10,05 cm2, passo 20,0 cm)
s-a'' = 120,97 N/mm2 (y = 21 cm: 5 f 16, Aa'' = 10,05 cm2, passo 20,0 cm)

VERIFICA A FESSURAZIONE COMBINAZIONE QUASI PERMANENTE :

M = 43,73 kNm
N = 0 kNm
Rck = 40 N/mm2
fctm = 3,16 N/mm2 (0,27xRck^2/3)
B = 100 cm (larghezza sezione)
H = 26 cm (altezza sezione)
y = 5 cm (posizione di armatura)
Aa = 10,05 cm2 (ni 5 f 16 passo 20 cm)
y' = 21 cm (posizione di armatura)
Aa' = 10,05 cm2 (ni 5 f 16 passo 10 cm)
y'' = 21 cm (posizione di armatura)
Aa'' = 10,05 cm2 (ni 5 f 16 passo 20 cm)
STADIO NON FESSURATO
n = 15 (coeff. omogeneizzazione)
Jid(I) = 173'070 cm4
Aid = 3'022 cm2
x(I) = 13,373 cm (asse neutro stato I, dal lembo compresso)
M = 36,36 kNm (Momento di formazione fessura fcfk = 0,7x1,2xfctm)
Mf = 43,28 kNm (Momento di fessurazione fctm)

STADIO FESSURATO (II)
n = 15 (coeff. omogeneizzazione)
x(II) = 8,2 cm (asse neutro stato II)
Jid(II) = 69'336 cm2
s s = 120,97 N/mm2 (M,N)
e s = 0,000576
Geometria tirante ideale
b = 100 cm
h' = 17,8 cm (c + f/2 + i' + 7,5xf)
As = 20,11 cm2
Ac = 1780,00 cm2
As/Ac = 0,0113
Distanza media fessure:
c = 5 cm (copriferro, da estradosso cls ad estradosso barra)
i = 10,0 cm (interasse ferri in orizzontali)
i' = 0 cm (interasse ferri verticale, nel caso di due strati di barre)
f max = 16 mm diametro massimo barre
r = 0,0113 (As/Ac tirante ideale)
k1 = 0,4 (barre a.m.)
k2 = 0,074 (0,25x[1-h'/(2x(H-x1))])
sm = 16,18 cm (2x(c+i/10)+k1xk2xf/r)

Deformazione media:
b1 = 1 (barre a.m.)
b2 = 0,5 (carichi di lunga durata o numerosi cicli di carico)
s sr = 119,74 N/mm2 (stato II, Mf)
s ss = 120,97 N/mm2 (stato II, Magente)
e sm = 0,000294 (ss/Esx(1-b1xb2x(ssr/ss)^2))
Ampiezza teorica di fessura:
wk = 0,081 mm (1,7xesmxsm)

VERIFICA A FESSURAZIONE COMBINAZIONE FREQUENTE :
M = 43,73 kNm
N = 0 kNm
Rck = 40 N/mm2
fctm = 3,16 N/mm2 (0,27xRck^2/3)
B = 100 cm (larghezza sezione)
H = 26 cm (altezza sezione)
y = 5 cm (posizione di armatura)

Aa = 10,05 cm2 (nį 5 f 16 passo 20 cm)
y' = 21 cm (posizione di armatura)
Aa' = 10,05 cm2 (nį 5 f 16 passo 10 cm)
y'' = 21 cm (posizione di armatura)
Aa'' = 10,05 cm2 (nį 5 f 16 passo 20 cm)
STADIO NON FESSURATO
n = 15 (coeff. omogeneizzazione)
Jid(I) = 173'070 cm4
Aid = 3'022 cm2
x(I) = 13,373 cm (asse neutro stato I, dal lembo compresso)
M = 36,36 kNm (Momento di formazione fessura fcfk = 0,7x1,2xfctm)
Mf = 43,28 kNm (Momento di fessurazione fctm)

STADIO FESSURATO (II)
n = 15 (coeff. omogeneizzazione)
x(II) = 8,2 cm (asse neutro stato II)
Jid(II) = 69'336 cm2
s s = 120,97 N/mm2 (M,N)
e s = 0,000576
Geometria tirante ideale
b = 100 cm
h' = 17,8 cm (c + f/2 + i' + 7,5xf)
As = 20,11 cm2
Ac = 1780,00 cm2
As/Ac = 0,0113
Distanza media fessure:
c = 5 cm (copriferro, da estradosso cls ad estradosso barra)
i = 10,0 cm (interasse ferri in orizzontali)
i' = 0 cm (interasse ferri verticale, nel caso di due strati di barre)
f max = 16 mm diametro massimo barre
r = 0,0113 (As/Ac tirante ideale)
k1 = 0,4 (barre a.m.)
k2 = 0,074 (0,25x[1-h'/(2x(H-x1))])
sm = 16,18 cm (2x(c+i/10)+k1xk2xf/r)
Deformazione media:
b1 = 1 (barre a.m.)
b2 = 0,5 (carichi di lunga durata o numerosi cicli di carico)
s sr = 119,74 N/mm2 (stato II, Mf)
s ss = 120,97 N/mm2 (stato II, Magente)

e sm = 0,000294 (ss/Esx(1-b1xb2x(ssr/ss)^2))

Ampiezza teorica di fessura:

wk = 0,081 mm (1,7xesmxsm)

VERIFICA A TAGLIO

VERIFICA A TAGLIO DELLA SEZIONE IN C.A. SECONDO NTC 14/01/2008

- **Caratteristiche della sezione**

b_w =	1000	mm	larghezza	f_{yk} =	450	MPa	resist. caratteristica		
h =	260	mm	altezza	g_s =	1,15		coeff. sicurezza		
c =	50	mm	copriferro	f_{yd} =	391,3	MPa	resist. di calcolo		
f_{ck} =	33,2	MPa	resist. caratteristica	Armatura longitudinale tesa:					
g_c =	1,50		coeff. sicurezza	$A_{sl,1}$ =	5	Ø	16	= 10,05	cm^2
a_{cc} =	0,85		coeff. riduttivo	$A_{sl,2}$ =	5	Ø	16	= 10,05	cm^2
d =	210	mm	altezza utile	$A_{sl,3}$ =	0	Ø	0	= 0,00	cm^2
f_{cd} =	18,81	MPa	resist. di calcolo					20,11	cm^2

- **Sollecitazioni** (compressione<0, trazione>0, taglio in valore assoluto)

N_{ed} = 0,0 kN V_{ed} = 109,40 kN

- **Elementi senza armature trasversali resistenti a taglio**

$k = 1+(200/d)^{1/2}<2$	k = 1,976		<2
$n_{min} = 0,035\ k^{3/2} f_{ck}^{1/2}$	n_{min} = 0,560		
$r_1 = A_{sl}/(b_w \times d) <0.02$	r_1 = 0,010		<0.02
$\sigma_{cp} = N_{Ed}/A_c <0.2 f_{cd}$	σ_{cp} = 0,00	MPa	<0.2 fcd

$(0,18 \times k \times (100 \times r_1 \times f_{ck})^{1/3}/g_c + 0,15 \times s_{cp}) \times b_w \times d$ = 157,7 kN

$(n_{min} + 0,15 \times s_{cp}) \times b_w \times d$ = 117,6 kN V_{Rd} = 157,7 kN

la sezione è verificata in assenza di armature per il taglio

8 VERIFICA ELEMENTI DI APPOGGIO

Si riporta di seguito l'andamento degli spostamenti orizzontali necessari per il dimensionamento dei varchi, nonché gli scarichi necessari per il dimensionamento dei baggioli e dei ritegni sismici.

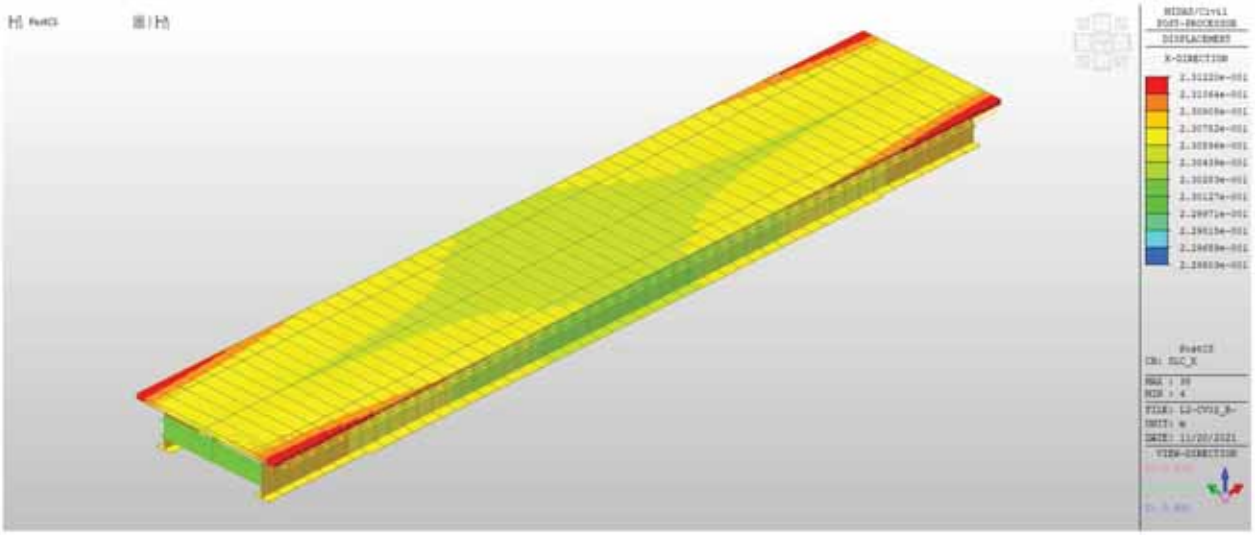


Figura 88 – Spostamenti Stato Limite Collasso X (SISMAX+0.30SISMAY)

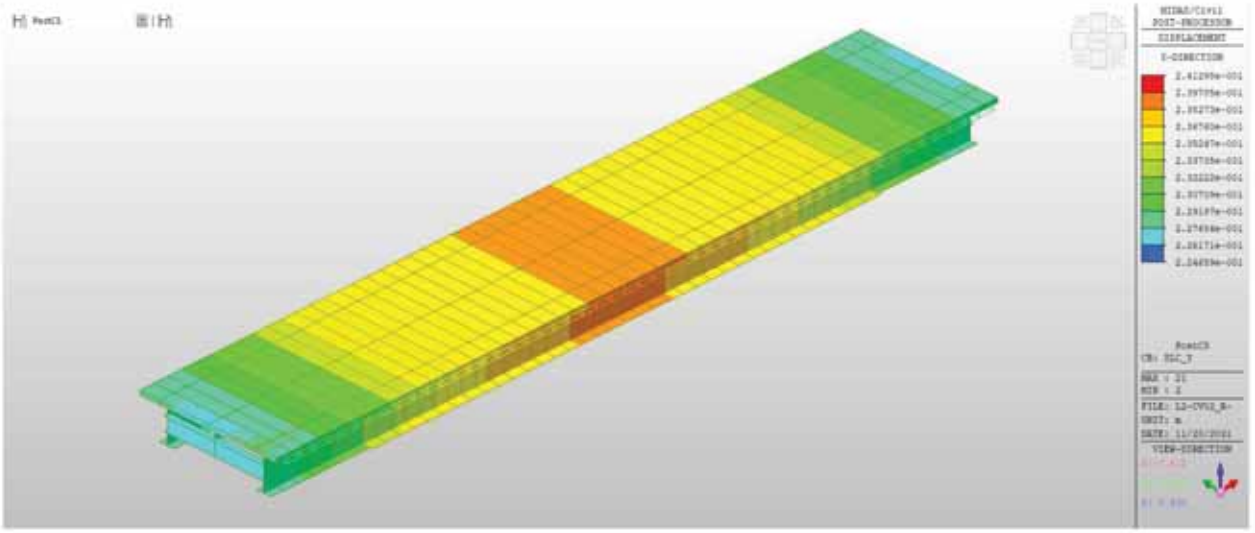


Figura 89 - Spostamenti Stato Limite Collasso Y (SISMAY+0.30SISMAX)

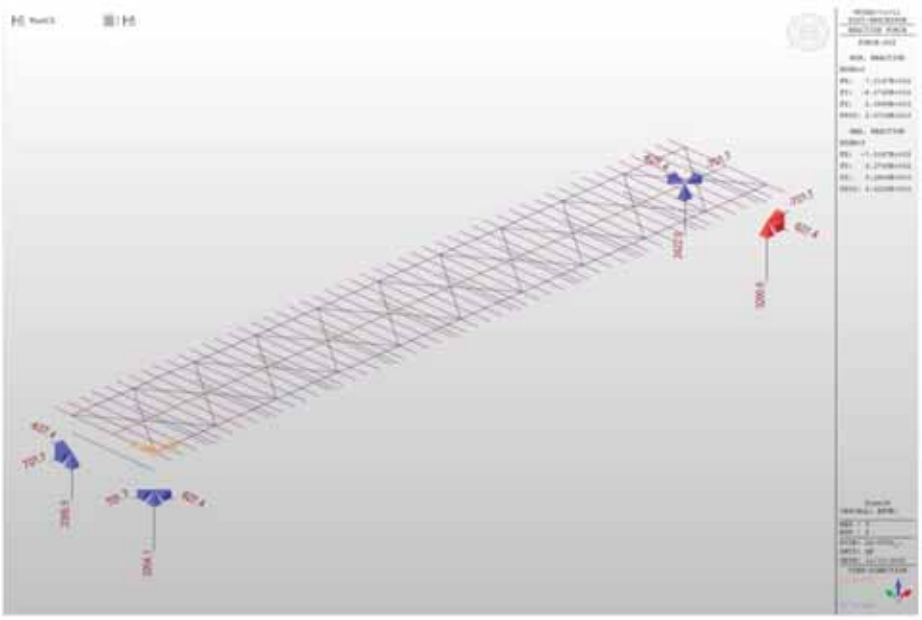


Figura 90 – Reazioni agli appoggi

Node	Load	FX (kN)	FY (kN)	FZ (kN)
1	FASE 3	47.905	0.739	1197.249
2	FASE 3	47.905	-0.739	1197.249
1	VENTO PONTE SCARICO	0.210	49.571	44.578
2	VENTO PONTE SCARICO	-0.210	49.583	-44.578
1	VENTO PONTE CARICO	-0.174	111.548	70.184
2	VENTO PONTE CARICO	0.174	111.576	-70.184
1	TERMICA UNIFORME +	36.436	9.192	0.000
2	TERMICA UNIFORME +	36.436	-9.192	0.000
1	TERMICA UNIFORME -	-34.085	-8.599	0.000
2	TERMICA UNIFORME -	-34.085	8.599	0.000
1	TERMICA GRADIENTE +	-12.462	-0.612	0.000
2	TERMICA GRADIENTE +	-12.462	0.612	0.000
1	TERMICA GRADIENTE -	14.955	0.735	0.000
2	TERMICA GRADIENTE -	14.955	-0.735	0.000
1	FRENATURA	-116.721	0.002	-9.826
2	FRENATURA	-116.721	-0.002	-9.826
1	EX(RS)	635.293	0.016	61.196
2	EX(RS)	635.293	0.016	61.196
1	EY(RS)	0.838	622.108	440.281
2	EY(RS)	0.838	622.108	440.281
1	EZ(RS)	19.908	0.161	624.923
2	EZ(RS)	19.908	0.161	624.923
1	DX(RS)	109.230	0.003	10.544
2	DX(RS)	109.230	0.003	10.544
1	CX(RS)	1030.089	0.026	99.192
2	CX(RS)	1030.089	0.026	99.192
1	LM01(all)	20.998	0.772	988.013
2	LM01(all)	6.439	-0.734	197.805
1	LM02(all)	4.421	0.742	186.469
2	LM02(all)	7.652	-0.752	373.076
1	LM03(all)	0.333	0.013	9.171
2	LM03(all)	1.120	-0.015	45.829

8.1 VERIFICA BAGGIOLI

DATI DI INPUT		
Forza orizzontale	V_{Sd} [kN] =	701.700
Forza verticale (+ se di trazione)	N_{Sd} / 4 [kN] =	-822.650
Altezza di applicazione forza orizzontale	a [m] =	0.16
Base baggiolo	h [m] =	1.05
Copriferro	c [m] =	0.05
Altezza utile	d [m] =	0.875
Profondità di incastro assunta	h' [m] =	0.00
Luce di calcolo mensola	L [m] =	0.16
Profondità baggiolo	b [m] =	1.00
Angolo inclinazione traliccio [°]	α [°] =	11.48
Angolo inclinazione traliccio [rad]	α [rad] =	0.20
Angolo inclinazione traliccio [°]	ψ [°] =	78.52
Angolo inclinazione traliccio [rad]	ψ [rad] =	1.37
VERIFICA CORRENTE TESO		
Trazione sulle barre d'armatura corrente teso	Z_{Sd} [kN] =	-680.08
Classe acciaio		B450C
Resistenza a snervamento armatura	f_{yd} [MPa] =	391.3
Area armatura necessaria	A_{nec} [cm^2] =	17.4
Diametro armatura 1	Ø1 [mm] =	16
Diametro armatura 2	Ø2 [mm] =	0
Numero ferri Ø1	$n_{Ø1}$ [-] =	9
Numero ferri Ø2	$n_{Ø2}$ [-] =	0
Area armatura 1 (singola barra)	A_{s1} [cm^2] =	2.01
Area armatura 2 (singola barra)	A_{s2} [cm^2] =	0.00
Area armatura totale	A_{sTOT} [cm^2] =	18.1
Resistenza corrente teso	Z_{Rd} [kN] =	708.09
Coefficiente di sicurezza	**Z_{Rd} / Z_{Sd} = c.s. =**	**1.04**
VERIFICA PUNTONE CLS COMPRESSO		
Resistenza cubica caratteristica	R_{ck} [MPa] =	40
Resistenza cilindrica caratteristica	f_{ck} [MPa] =	32
Coefficiente parziale di sicurezza	γ_c [-] =	1.50
Resistenza di calcolo a compressione	f_{cd} [MPa] =	18.13
Presenza di staffe		Si
Coefficiente presenza staffe (1 senza staffe; 1.5 con staffe)	c [-] =	1.50
Pendenza del puntone di calcestruzzo	cotgψ = tgα = λ =	0.20
Altezza puntone	0.4*c*d*senψ = hp [m] =	0.514
Compressione nel puntone	C_{Sd} [kN] =	3415.67
Resistenza del puntone di calcestruzzo	0.4*b*d*f_{cd}*c / (1+λ^2) = C_{Rd} [kN] =	**9143**
Coefficiente di sicurezza	**C_{Rd} / C_{Sd} = c.s. =**	**2.68**

8.2 VERIFICA ISOLATORI

Si riportano di seguito le caratteristiche degli isolatori individuati.

V	Fzd	Ke	ξe	Kv	Dg	te	h	H	Z
kN	kN	kN/mm	%	kN/mm	mm	mm	mm	mm	mm
23710	37010	4,49	21	4330	1100	190	322	402	1150

V	Carico verticale massimo agente in presenza del sisma allo SLC
Fzd	Carico verticale massimo in assenza di SISMA e spostamento 10mm
Ke	Rigidezza orizzontale equivalente
ξe	Coefficientae di smorzamento viscoso equivalente
Kv	Rigidezza verticale
Dg	Diametro elastomero
te	Spessore totale gomma
h	Altezza escluse piastre di ancoraggio
H	Altezza totale incluse piastre di ancoraggio
Z	Lato piastre di ancoraggio

Il valore di Fz max = 3290.6 kN inferiore ai limiti previsti per l'isolatore introdotto (Fzd = 37010 kN). Nel caso specifico, sono stati scelti isolatori elastomerici a nucleo di piombo e nell'ambito della rigidezza è stata effettuata una simulazione (che ha fornito sostanzialmente i medesimi risultati in termini di spostamento e reazioni agli appoggi) modificando la rigidezza dell'isolatore di +/-20% così come previsto dalle NTC2008 al punto 11.9.7.

8.3 VERIFICA GIUNTI

Per la determinazione dei varchi e quindi l'individuazione dei corretti giunti da utilizzare, sono stati considerati gli spostamenti sia dovuti alle azioni statiche che sismiche. Nel dettaglio si nota che lo spostamento massimo, dovuto all'azione sismica in condizione SLC è pari a dmax = 23.122 cm. Si introduce quindi un giunto che permetta tale quantità di spostamento.

8.4 VERIFICA RITEGNI SISMICI.

Il presente cavalcavia presenta come appoggi 4 isolatori di appoggio che permettono uno spostamento massimo orizzontale pari a 300mm. Si è scelto di introdurre comunque dei ritegni sismici per bloccare lo spostamento trasversale dell'impalcato in conseguenza dei valori di spostamento generati dal sisma. Si è scelto di permettere uno spostamento trasversale maggiore o comunque prossimo al valore riferito al sisma SLV e di dimensionare il ritegno con la forza che deriva dalla differenza di spostamento tra lo SLC ed il varco previsto.

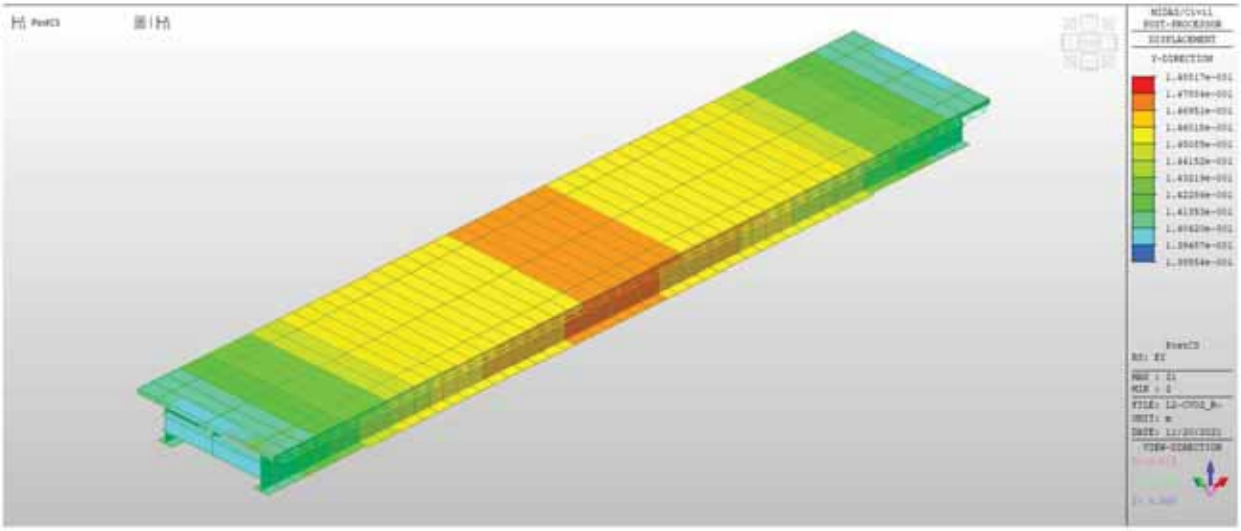
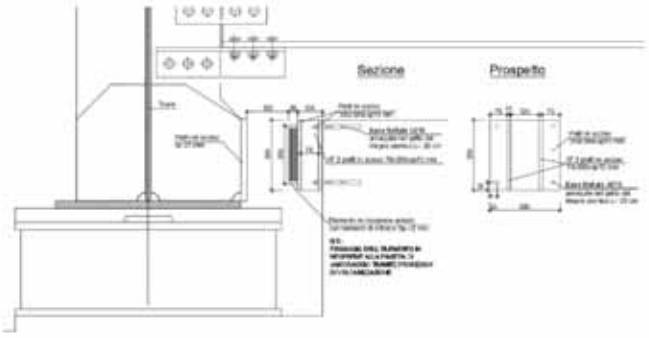


Figura 91 - Spostamento Y SLY (SISMA Y + 0.3 SISMA X)



Spostamento residuo = 24.13 – 18.00 = 6.13cm

K_isolatore = 4.49 kN/mm

F residua = 275.24 kN

Con tale forza vengono dimensionate le armature dei ritegni sismici

DATI DI INPUT		
Forza orizzontale	V_{Sd} [kN] =	550.480
Forza verticale (+ se di trazione)	N_{Sd} / 4 [kN] =	0
Altezza di applicazione forza orizzontale	a [m] =	0.85
Base baggiolo	h [m] =	1.00
Copriferro	c [m] =	0.05
Altezza utile	d [m] =	0.825
Profondità di incastro assunta	h' [m] =	0.00
Luce di calcolo mensola	L [m] =	0.85
Profondità baggiolo	b [m] =	1.00
Angolo inclinazione traliccio [°]	α [°] =	48.86
Angolo inclinazione traliccio [rad]	α [rad] =	0.85
Angolo inclinazione traliccio [°]	ψ [°] =	41.14
Angolo inclinazione traliccio [rad]	ψ [rad] =	0.72
VERIFICA CORRENTE TESO		
Trazione sulle barre d'armatura corrente teso	Z_{Sd} [kN] =	630.18
Classe acciaio		B450C
Resistenza a snervamento armatura	f_{yd} [MPa] =	391.3
Area armatura necessaria	A_{nec} [cm^2] =	16.1
Diametro armatura 1	Ø1 [mm] =	16
Diametro armatura 2	Ø2 [mm] =	0
Numero ferri Ø1	$n_{ø1}$ [-] =	8
Numero ferri Ø2	$n_{ø2}$ [-] =	0
Area armatura 1 (singola barra)	A_{s1} [cm^2] =	2.01
Area armatura 2 (singola barra)	A_{s2} [cm^2] =	0.00
Area armatura totale	A_{sTOT} [cm^2] =	16.1
Resistenza corrente teso	Z_{Rd} [kN] =	629.41
Coefficiente di sicurezza	**Z_{Rd} / Z_{Sd} = c.s. =**	**1.01**
VERIFICA PUNTONE CLS COMPRESSO		
Resistenza cubica caratteristica	R_{ck} [MPa] =	40
Resistenza cilindrica caratteristica	f_{ck} [MPa] =	32
Coefficiente parziale di sicurezza	γ_c [-] =	1.50
Resistenza di calcolo a compressione	f_{cd} [MPa] =	18.13
Presenza di staffe		Si
Coefficiente presenza staffe (1 senza staffe; 1.5 con staffe)	c [-] =	1.50
Pendenza del puntone di calcestruzzo	$\cot g\psi = tg\alpha = \lambda$ =	1.14
Altezza puntone	$0.4*c*d*sen\psi$ = hp [m] =	0.326
Compressione nel puntone	C_{Sd} [kN] =	836.75
Resistenza del puntone di calcestruzzo	$0.4*b*d*f_{cd}*c / (1+\lambda^2) = C_{Rd}$ [kN] =	**3885**
Coefficiente di sicurezza	**C_{Rd} / C_{Sd} = c.s. =**	**4.64**

8.5 VERIFICA DEFORMAZIONI

Si riportano di seguito le deformazioni dell'impalcato dovuto al peso proprio, soletta e permanente, nonché la freccia in condizioni di esercizio.

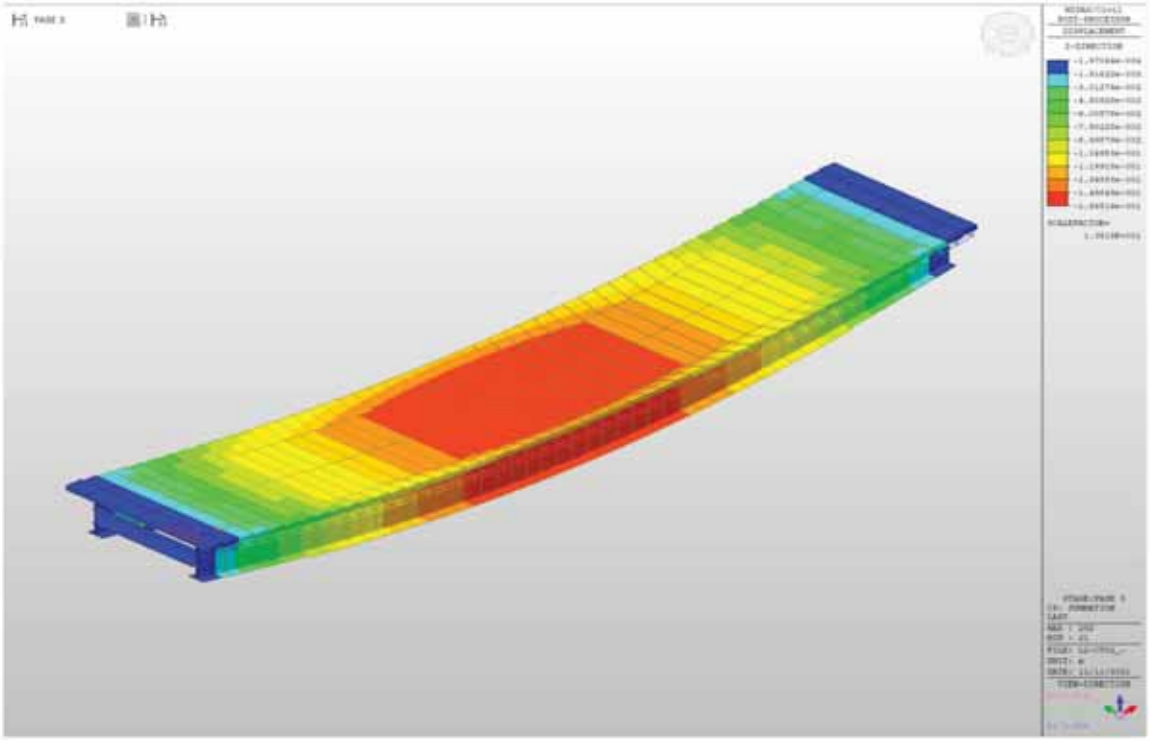


Figura 92 – Deformate - Fase 3

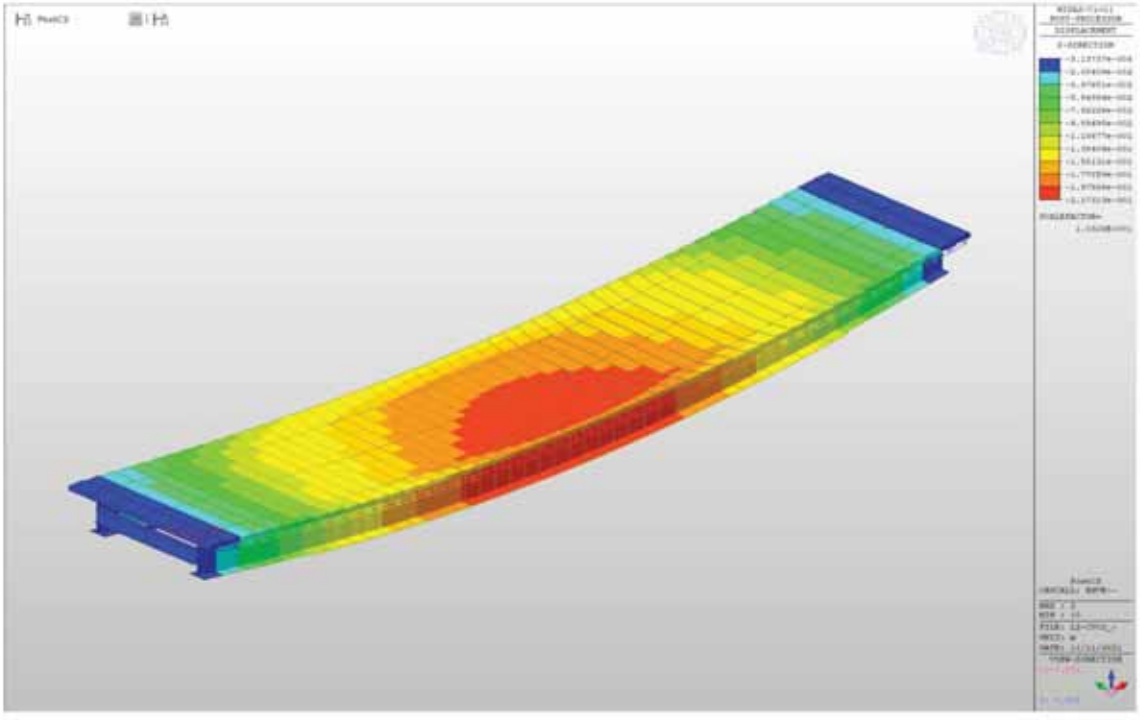


Figura 93 – Deformate - Inviluppo SLE

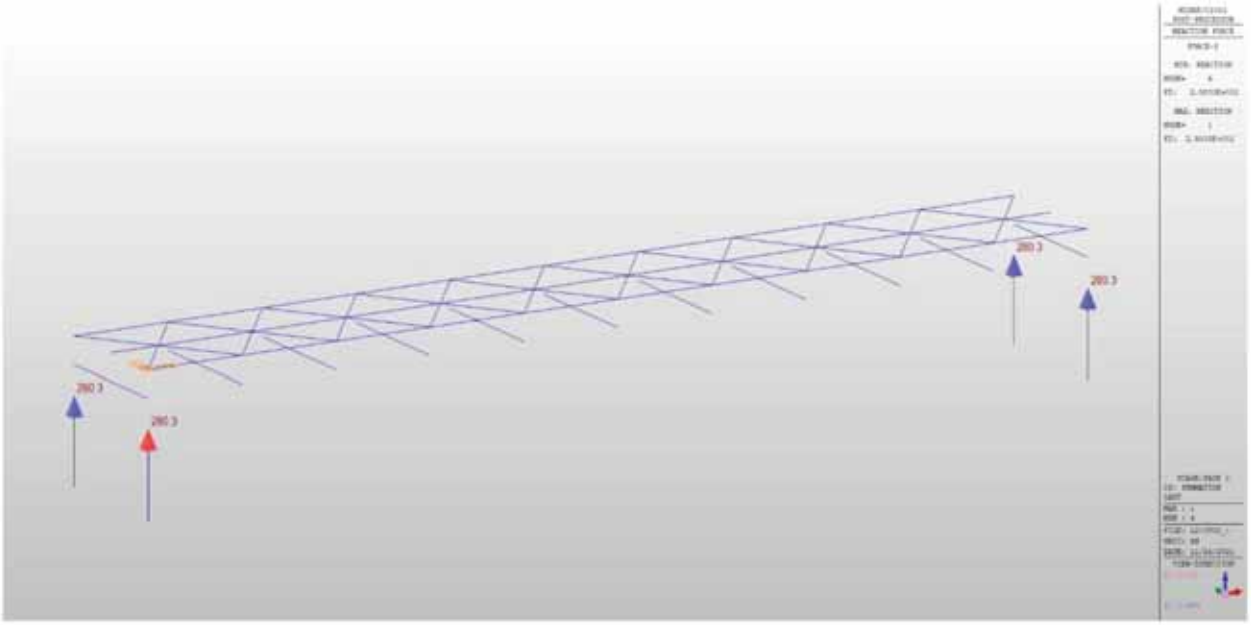
Per effetto del peso proprio dell'impalcato, della soletta e dei permanenti portati, si ottiene uno spostamento in mezzeria pari a circa 16.48 cm (monta da applicare in fase di costruzione). Considerando quindi tale valore come monta iniziale dai imporre all'impalcato, in condizione di esercizio si ottiene il seguente valore di freccia.

f = 21.73cm - 16.48cm = 5.25 cm

9 VALIDAZIONE CODICE DI CALCOLO

Per effettuare la validazione del codice di calcolo, è stato determinato il peso della struttura ed è stato confrontato con gli scarichi derivanti dal modello dovuto ai soli pesi propri.

In base al punto 10.2 delle norme per le costruzioni NTC2008, qualora per la determinazione delle sollecitazioni di progetto sI ricorra all'utilizzo di codici di calcolo, dovrà essere verificata l'attendibilità dei risultati tramite una validazione del modello di carico. Si riporta pertanto di seguito la validazione del modello andando a confrontare le reazioni vincolari per effetto del peso proprio della struttura ottenuti dal modello di calcolo e manualmente calcolando i singoli Pesi strutturali.



Calcolando i pesi in modo manuale e considerando l'incremento del peso proprio dovuto alla presenza delle piastre varie si ottiene:

	LUNGHEZZA CONCIO		PIATTABANDA SUP		PIATTABANDA INF		ANIMA			AREA	VOLME	PESO			
	mm	NUMERO	B mm	Sp mm	B mm	Sp mm	Htrave mm	B mm	Sp mm	mq	mc	kg			
C1	6750	1	750	25	900	30	2100	2045	20	0.08665	0.584888	4591.367			
C2	10000	1	750	28	1200	40	2100	2032	20	0.10964	1.0964	8606.74			
C3	12000	1	750	30	1200	55	2100	2015	20	0.1288	1.5456	12132.96	38529.17		
C4	10000	1	750	28	1200	40	2100	2032	20	0.10964	1.0964	8606.74			
C5	6750	1	750	25	900	30	2100	2045	20	0.08665	0.584888	4591.367		77058.35	
TRAVE DI SPINA	45500	1	300	25	300	25	590	2032	13	0.10964	1.0964	8606.74		8606.74	
TRAVERSI	5400	11	350	25	350	25	800	750	20	0.3575	1.9305	15154.43		15154.43	
													Peso tot	100819.5	
													Reazione	25204.88	
														252.0488	**kN**
													12%	**282.2946**	kN

La reazione vincolare ottenuta risulta essere compatibile con quella calcolata manualmente.

10 ALLEGATO 1 - TABULATO MIDAS

```
;---------------------------------------------------------------------------
;  MIDAS/Civil Text(MCT) File.
;  Date : 2021/11/22
;---------------------------------------------------------------------------

*VERSION
   8.7.5

*UNIT    ; Unit System
; FORCE, LENGTH, HEAT, TEMPER
   KN   , M, BTU, C

*PROJINFO    ; Project Information
   USER=.
   ADDRESS=.

*STRUCTYPE    ; Structure Type
; iSTYP, iMASS, iSMAS, bMASSOFFSET, bSELFWEIGHT, GRAV, TEMPER, bALIGNBEAM, bALIGNSLAB,
 bROTRIGID
     0, 1, 1, NO, YES, 9.806, 18, NO, NO, NO

*REBAR-MATL-CODE    ; Rebar Material Code
; CONC_CODE, CONC_MDB, SRC_CODE, SRC_MDB
 NTC08(RC), B450C, ASTM(RC), Grade 60

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; iNO, X, Y, Z
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; iEL, TYPE, iMAT, iPRO, iN1, iN2, iN3, iN4, iSUB, iWID , LCAXIS    ; Planar Element
; iEL, TYPE, iMAT, iPRO, iN1, iN2, iN3, iN4, iN5, iN6, iN7, iN8     ; Solid  Element
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    83, BEAM  ,    1,     3,   160,   161,     0,     0
    84, BEAM  ,    1,     3,   165,   166,     0,     0
    85, BEAM  ,    1,     3,   170,   171,     0,     0
    86, BEAM  ,    1,     3,   175,   176,     0,     0
    87, BEAM  ,    1,     3,   180,   181,     0,     0
    88, BEAM  ,    1,     3,   185,   186,     0,     0
    89, BEAM  ,    1,     4,    28,    17,     0,     0
    90, BEAM  ,    1,     4,    17,     6,     0,     0
    91, BEAM  ,    1,     4,    29,    18,     0,     0
    92, BEAM  ,    1,     4,    18,     7,     0,     0
    93, BEAM  ,    1,     4,    30,    19,     0,     0
    94, BEAM  ,    1,     4,    19,     8,     0,     0
    95, BEAM  ,    1,     4,    31,    20,     0,     0
    96, BEAM  ,    1,     4,    20,     9,     0,     0
    97, BEAM  ,    1,     4,    32,    21,     0,     0
    98, BEAM  ,    1,     4,    21,    10,     0,     0
    99, BEAM  ,    1,     4,    33,    22,     0,     0
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100, BEAM  ,    1,     4,    22,    11,     0,     0
101, BEAM  ,    1,     4,    34,    23,     0,     0
102, BEAM  ,    1,     4,    23,    12,     0,     0
103, BEAM  ,    1,     4,    35,    24,     0,     0
104, BEAM  ,    1,     4,    24,    13,     0,     0
105, BEAM  ,    1,     4,    36,    25,     0,     0
106, BEAM  ,    1,     4,    25,    14,     0,     0
107, BEAM  ,    1,     4,    37,    26,     0,     0
108, BEAM  ,    1,     4,    26,    15,     0,     0
109, BEAM  ,    3,     6,    39,    90,     0,     0
110, BEAM  ,    1,     7,    90,    91,     0,     0
111, BEAM  ,    3,     6,    90,   141,     0,     0
112, BEAM  ,    1,     3,   141,   142,     0,     0
113, BEAM  ,    3,     6,   141,   192,     0,     0
114, BEAM  ,    1,     7,   192,   193,     0,     0
115, BEAM  ,    3,     6,   192,   243,     0,     0
116, BEAM  ,    3,     6,    40,    91,     0,     0
117, BEAM  ,    1,     7,    91,    92,     0,     0
118, BEAM  ,    3,     6,    91,   142,     0,     0
119, BEAM  ,    1,     3,   142,   143,     0,     0
120, BEAM  ,    3,     6,   142,   193,     0,     0
121, BEAM  ,    1,     7,   193,   194,     0,     0
122, BEAM  ,    3,     6,   193,   244,     0,     0
123, BEAM  ,    3,     6,    41,    92,     0,     0
124, BEAM  ,    1,     7,    92,    93,     0,     0
125, BEAM  ,    3,     6,    92,   143,     0,     0
126, BEAM  ,    1,     3,   143,   144,     0,     0
127, BEAM  ,    3,     6,   143,   194,     0,     0
128, BEAM  ,    1,     7,   194,   195,     0,     0
129, BEAM  ,    3,     6,   194,   245,     0,     0
130, BEAM  ,    3,     6,    42,    93,     0,     0
131, BEAM  ,    1,     7,    93,    94,     0,     0
132, BEAM  ,    3,     6,    93,   144,     0,     0
133, BEAM  ,    1,     3,   144,   145,     0,     0
134, BEAM  ,    3,     6,   144,   195,     0,     0
135, BEAM  ,    1,     7,   195,   196,     0,     0
136, BEAM  ,    3,     6,   195,   246,     0,     0
137, BEAM  ,    3,     6,    43,    94,     0,     0
138, BEAM  ,    3,     6,    94,   145,     0,     0
139, BEAM  ,    3,     6,   145,   196,     0,     0
140, BEAM  ,    3,     6,   196,   247,     0,     0
141, BEAM  ,    3,     6,    44,    95,     0,     0
142, BEAM  ,    1,     7,    95,    96,     0,     0
143, BEAM  ,    3,     6,    95,   146,     0,     0
144, BEAM  ,    1,     3,   146,   147,     0,     0
145, BEAM  ,    3,     6,   146,   197,     0,     0
146, BEAM  ,    1,     7,   197,   198,     0,     0
147, BEAM  ,    3,     6,   197,   248,     0,     0
148, BEAM  ,    3,     6,    45,    96,     0,     0
149, BEAM  ,    1,     8,    96,    97,     0,     0
150, BEAM  ,    3,     6,    96,   147,     0,     0
151, BEAM  ,    1,     3,   147,   148,     0,     0
152, BEAM  ,    3,     6,   147,   198,     0,     0
153, BEAM  ,    1,     8,   198,   199,     0,     0
154, BEAM  ,    3,     6,   198,   249,     0,     0
155, BEAM  ,    3,     6,    46,    97,     0,     0
156, BEAM  ,    1,     8,    97,    98,     0,     0
157, BEAM  ,    3,     6,    97,   148,     0,     0
158, BEAM  ,    1,     3,   148,   149,     0,     0
159, BEAM  ,    3,     6,   148,   199,     0,     0
160, BEAM  ,    1,     8,   199,   200,     0,     0
161, BEAM  ,    3,     6,   199,   250,     0,     0
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162, BEAM  ,     3,      6,     47,     98,      0,      0
163, BEAM  ,     1,      8,     98,     99,      0,      0
164, BEAM  ,     3,      6,     98,    149,      0,      0
165, BEAM  ,     1,      3,    149,    150,      0,      0
166, BEAM  ,     3,      6,    149,    200,      0,      0
167, BEAM  ,     1,      8,    200,    201,      0,      0
168, BEAM  ,     3,      6,    200,    251,      0,      0
169, BEAM  ,     3,      6,     48,     99,      0,      0
170, BEAM  ,     3,      6,     99,    150,      0,      0
171, BEAM  ,     3,      6,    150,    201,      0,      0
172, BEAM  ,     3,      6,    201,    252,      0,      0
173, BEAM  ,     3,      6,     49,    100,      0,      0
174, BEAM  ,     1,      8,    100,    101,      0,      0
175, BEAM  ,     3,      6,    100,    151,      0,      0
176, BEAM  ,     1,      3,    151,    152,      0,      0
177, BEAM  ,     3,      6,    151,    202,      0,      0
178, BEAM  ,     1,      8,    202,    203,      0,      0
179, BEAM  ,     3,      6,    202,    253,      0,      0
180, BEAM  ,     3,      6,     50,    101,      0,      0
181, BEAM  ,     1,      8,    101,    102,      0,      0
182, BEAM  ,     3,      6,    101,    152,      0,      0
183, BEAM  ,     1,      3,    152,    153,      0,      0
184, BEAM  ,     3,      6,    152,    203,      0,      0
185, BEAM  ,     1,      8,    203,    204,      0,      0
186, BEAM  ,     3,      6,    203,    254,      0,      0
187, BEAM  ,     3,      6,     51,    102,      0,      0
188, BEAM  ,     1,      8,    102,    103,      0,      0
189, BEAM  ,     3,      6,    102,    153,      0,      0
190, BEAM  ,     1,      3,    153,    154,      0,      0
191, BEAM  ,     3,      6,    153,    204,      0,      0
192, BEAM  ,     1,      8,    204,    205,      0,      0
193, BEAM  ,     3,      6,    204,    255,      0,      0
194, BEAM  ,     3,      6,     52,    103,      0,      0
195, BEAM  ,     1,      8,    103,    104,      0,      0
196, BEAM  ,     3,      6,    103,    154,      0,      0
197, BEAM  ,     1,      3,    154,    155,      0,      0
198, BEAM  ,     3,      6,    154,    205,      0,      0
199, BEAM  ,     1,      8,    205,    206,      0,      0
200, BEAM  ,     3,      6,    205,    256,      0,      0
201, BEAM  ,     3,      6,     53,    104,      0,      0
202, BEAM  ,     3,      6,    104,    155,      0,      0
203, BEAM  ,     3,      6,    155,    206,      0,      0
204, BEAM  ,     3,      6,    206,    257,      0,      0
205, BEAM  ,     3,      6,     54,    105,      0,      0
206, BEAM  ,     1,      8,    105,    106,      0,      0
207, BEAM  ,     3,      6,    105,    156,      0,      0
208, BEAM  ,     1,      3,    156,    157,      0,      0
209, BEAM  ,     3,      6,    156,    207,      0,      0
210, BEAM  ,     1,      8,    207,    208,      0,      0
211, BEAM  ,     3,      6,    207,    258,      0,      0
212, BEAM  ,     3,      6,     55,    106,      0,      0
213, BEAM  ,     1,      9,    106,    107,      0,      0
214, BEAM  ,     3,      6,    106,    157,      0,      0
215, BEAM  ,     1,      3,    157,    158,      0,      0
216, BEAM  ,     3,      6,    157,    208,      0,      0
217, BEAM  ,     1,      9,    208,    209,      0,      0
218, BEAM  ,     3,      6,    208,    259,      0,      0
219, BEAM  ,     3,      6,     56,    107,      0,      0
220, BEAM  ,     1,      9,    107,    108,      0,      0
221, BEAM  ,     3,      6,    107,    158,      0,      0
222, BEAM  ,     1,      3,    158,    159,      0,      0
223, BEAM  ,     3,      6,    158,    209,      0,      0
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224, BEAM  ,     1,      9,    209,    210,      0,      0
225, BEAM  ,     3,      6,    209,    260,      0,      0
226, BEAM  ,     3,      6,     57,    108,      0,      0
227, BEAM  ,     1,      9,    108,    109,      0,      0
228, BEAM  ,     3,      6,    108,    159,      0,      0
229, BEAM  ,     1,      3,    159,    160,      0,      0
230, BEAM  ,     3,      6,    159,    210,      0,      0
231, BEAM  ,     1,      9,    210,    211,      0,      0
232, BEAM  ,     3,      6,    210,    261,      0,      0
233, BEAM  ,     3,      6,     58,    109,      0,      0
234, BEAM  ,     3,      6,    109,    160,      0,      0
235, BEAM  ,     3,      6,    160,    211,      0,      0
236, BEAM  ,     3,      6,    211,    262,      0,      0
237, BEAM  ,     3,      6,     59,    110,      0,      0
238, BEAM  ,     1,      9,    110,    111,      0,      0
239, BEAM  ,     3,      6,    110,    161,      0,      0
240, BEAM  ,     1,      3,    161,    162,      0,      0
241, BEAM  ,     3,      6,    161,    212,      0,      0
242, BEAM  ,     1,      9,    212,    213,      0,      0
243, BEAM  ,     3,      6,    212,    263,      0,      0
244, BEAM  ,     3,      6,     60,    111,      0,      0
245, BEAM  ,     1,      9,    111,    112,      0,      0
246, BEAM  ,     3,      6,    111,    162,      0,      0
247, BEAM  ,     1,      3,    162,    163,      0,      0
248, BEAM  ,     3,      6,    162,    213,      0,      0
249, BEAM  ,     1,      9,    213,    214,      0,      0
250, BEAM  ,     3,      6,    213,    264,      0,      0
251, BEAM  ,     3,      6,     61,    112,      0,      0
252, BEAM  ,     1,      9,    112,    113,      0,      0
253, BEAM  ,     3,      6,    112,    163,      0,      0
254, BEAM  ,     1,      3,    163,    164,      0,      0
255, BEAM  ,     3,      6,    163,    214,      0,      0
256, BEAM  ,     1,      9,    214,    215,      0,      0
257, BEAM  ,     3,      6,    214,    265,      0,      0
258, BEAM  ,     3,      6,     62,    113,      0,      0
259, BEAM  ,     1,      9,    113,    114,      0,      0
260, BEAM  ,     3,      6,    113,    164,      0,      0
261, BEAM  ,     1,      3,    164,    165,      0,      0
262, BEAM  ,     3,      6,    164,    215,      0,      0
263, BEAM  ,     1,      9,    215,    216,      0,      0
264, BEAM  ,     3,      6,    215,    266,      0,      0
265, BEAM  ,     3,      6,     63,    114,      0,      0
266, BEAM  ,     3,      6,    114,    165,      0,      0
267, BEAM  ,     3,      6,    165,    216,      0,      0
268, BEAM  ,     3,      6,    216,    267,      0,      0
269, BEAM  ,     3,      6,     64,    115,      0,      0
270, BEAM  ,     1,      9,    115,    116,      0,      0
271, BEAM  ,     3,      6,    115,    166,      0,      0
272, BEAM  ,     1,      3,    166,    167,      0,      0
273, BEAM  ,     3,      6,    166,    217,      0,      0
274, BEAM  ,     1,      9,    217,    218,      0,      0
275, BEAM  ,     3,      6,    217,    268,      0,      0
276, BEAM  ,     3,      6,     65,    116,      0,      0
277, BEAM  ,     1,      9,    116,    117,      0,      0
278, BEAM  ,     3,      6,    116,    167,      0,      0
279, BEAM  ,     1,      3,    167,    168,      0,      0
280, BEAM  ,     3,      6,    167,    218,      0,      0
281, BEAM  ,     1,      9,    218,    219,      0,      0
282, BEAM  ,     3,      6,    218,    269,      0,      0
283, BEAM  ,     3,      6,     66,    117,      0,      0
284, BEAM  ,     1,      9,    117,    118,      0,      0
285, BEAM  ,     3,      6,    117,    168,      0,      0
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286, BEAM  ,    1,     3,   168,   169,     0,     0
287, BEAM  ,    3,     6,   168,   219,     0,     0
288, BEAM  ,    1,     9,   219,   220,     0,     0
289, BEAM  ,    3,     6,   219,   270,     0,     0
290, BEAM  ,    3,     6,    67,   118,     0,     0
291, BEAM  ,    1,     9,   118,   119,     0,     0
292, BEAM  ,    3,     6,   118,   169,     0,     0
293, BEAM  ,    1,     3,   169,   170,     0,     0
294, BEAM  ,    3,     6,   169,   220,     0,     0
295, BEAM  ,    1,     9,   220,   221,     0,     0
296, BEAM  ,    3,     6,   220,   271,     0,     0
297, BEAM  ,    3,     6,    68,   119,     0,     0
298, BEAM  ,    3,     6,   119,   170,     0,     0
299, BEAM  ,    3,     6,   170,   221,     0,     0
300, BEAM  ,    3,     6,   221,   272,     0,     0
301, BEAM  ,    3,     6,    69,   120,     0,     0
302, BEAM  ,    1,     9,   120,   121,     0,     0
303, BEAM  ,    3,     6,   120,   171,     0,     0
304, BEAM  ,    1,     3,   171,   172,     0,     0
305, BEAM  ,    3,     6,   171,   222,     0,     0
306, BEAM  ,    1,     9,   222,   223,     0,     0
307, BEAM  ,    3,     6,   222,   273,     0,     0
308, BEAM  ,    3,     6,    70,   121,     0,     0
309, BEAM  ,    1,     9,   121,   122,     0,     0
310, BEAM  ,    3,     6,   121,   172,     0,     0
311, BEAM  ,    1,     3,   172,   173,     0,     0
312, BEAM  ,    3,     6,   172,   223,     0,     0
313, BEAM  ,    1,     9,   223,   224,     0,     0
314, BEAM  ,    3,     6,   223,   274,     0,     0
315, BEAM  ,    3,     6,    71,   122,     0,     0
316, BEAM  ,    1,     8,   122,   123,     0,     0
317, BEAM  ,    3,     6,   122,   173,     0,     0
318, BEAM  ,    1,     3,   173,   174,     0,     0
319, BEAM  ,    3,     6,   173,   224,     0,     0
320, BEAM  ,    1,     8,   224,   225,     0,     0
321, BEAM  ,    3,     6,   224,   275,     0,     0
322, BEAM  ,    3,     6,    72,   123,     0,     0
323, BEAM  ,    1,     8,   123,   124,     0,     0
324, BEAM  ,    3,     6,   123,   174,     0,     0
325, BEAM  ,    1,     3,   174,   175,     0,     0
326, BEAM  ,    3,     6,   174,   225,     0,     0
327, BEAM  ,    1,     8,   225,   226,     0,     0
328, BEAM  ,    3,     6,   225,   276,     0,     0
329, BEAM  ,    3,     6,    73,   124,     0,     0
330, BEAM  ,    3,     6,   124,   175,     0,     0
331, BEAM  ,    3,     6,   175,   226,     0,     0
332, BEAM  ,    3,     6,   226,   277,     0,     0
333, BEAM  ,    3,     6,    74,   125,     0,     0
334, BEAM  ,    1,     8,   125,   126,     0,     0
335, BEAM  ,    3,     6,   125,   176,     0,     0
336, BEAM  ,    1,     3,   176,   177,     0,     0
337, BEAM  ,    3,     6,   176,   227,     0,     0
338, BEAM  ,    1,     8,   227,   228,     0,     0
339, BEAM  ,    3,     6,   227,   278,     0,     0
340, BEAM  ,    3,     6,    75,   126,     0,     0
341, BEAM  ,    1,     8,   126,   127,     0,     0
342, BEAM  ,    3,     6,   126,   177,     0,     0
343, BEAM  ,    1,     3,   177,   178,     0,     0
344, BEAM  ,    3,     6,   177,   228,     0,     0
345, BEAM  ,    1,     8,   228,   229,     0,     0
346, BEAM  ,    3,     6,   228,   279,     0,     0
347, BEAM  ,    3,     6,    76,   127,     0,     0
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348, BEAM  ,    1,     8,   127,   128,     0,     0
349, BEAM  ,    3,     6,   127,   178,     0,     0
350, BEAM  ,    1,     3,   178,   179,     0,     0
351, BEAM  ,    3,     6,   178,   229,     0,     0
352, BEAM  ,    1,     8,   229,   230,     0,     0
353, BEAM  ,    3,     6,   229,   280,     0,     0
354, BEAM  ,    3,     6,    77,   128,     0,     0
355, BEAM  ,    1,     8,   128,   129,     0,     0
356, BEAM  ,    3,     6,   128,   179,     0,     0
357, BEAM  ,    1,     3,   179,   180,     0,     0
358, BEAM  ,    3,     6,   179,   230,     0,     0
359, BEAM  ,    1,     8,   230,   231,     0,     0
360, BEAM  ,    3,     6,   230,   281,     0,     0
361, BEAM  ,    3,     6,    78,   129,     0,     0
362, BEAM  ,    3,     6,   129,   180,     0,     0
363, BEAM  ,    3,     6,   180,   231,     0,     0
364, BEAM  ,    3,     6,   231,   282,     0,     0
365, BEAM  ,    3,     6,    79,   130,     0,     0
366, BEAM  ,    1,     8,   130,   131,     0,     0
367, BEAM  ,    3,     6,   130,   181,     0,     0
368, BEAM  ,    1,     3,   181,   182,     0,     0
369, BEAM  ,    3,     6,   181,   232,     0,     0
370, BEAM  ,    1,     8,   232,   233,     0,     0
371, BEAM  ,    3,     6,   232,   283,     0,     0
372, BEAM  ,    3,     6,    80,   131,     0,     0
373, BEAM  ,    1,     8,   131,   132,     0,     0
374, BEAM  ,    3,     6,   131,   182,     0,     0
375, BEAM  ,    1,     3,   182,   183,     0,     0
376, BEAM  ,    3,     6,   182,   233,     0,     0
377, BEAM  ,    1,     8,   233,   234,     0,     0
378, BEAM  ,    3,     6,   233,   284,     0,     0
379, BEAM  ,    3,     6,    81,   132,     0,     0
380, BEAM  ,    1,     7,   132,   133,     0,     0
381, BEAM  ,    3,     6,   132,   183,     0,     0
382, BEAM  ,    1,     3,   183,   184,     0,     0
383, BEAM  ,    3,     6,   183,   234,     0,     0
384, BEAM  ,    1,     7,   234,   235,     0,     0
385, BEAM  ,    3,     6,   234,   285,     0,     0
386, BEAM  ,    3,     6,    82,   133,     0,     0
387, BEAM  ,    1,     7,   133,   134,     0,     0
388, BEAM  ,    3,     6,   133,   184,     0,     0
389, BEAM  ,    1,     3,   184,   185,     0,     0
390, BEAM  ,    3,     6,   184,   235,     0,     0
391, BEAM  ,    1,     7,   235,   236,     0,     0
392, BEAM  ,    3,     6,   235,   286,     0,     0
393, BEAM  ,    3,     6,    83,   134,     0,     0
394, BEAM  ,    3,     6,   134,   185,     0,     0
395, BEAM  ,    3,     6,   185,   236,     0,     0
396, BEAM  ,    3,     6,   236,   287,     0,     0
397, BEAM  ,    3,     6,    84,   135,     0,     0
398, BEAM  ,    1,     7,   135,   136,     0,     0
399, BEAM  ,    3,     6,   135,   186,     0,     0
400, BEAM  ,    1,     3,   186,   187,     0,     0
401, BEAM  ,    3,     6,   186,   237,     0,     0
402, BEAM  ,    1,     7,   237,   238,     0,     0
403, BEAM  ,    3,     6,   237,   288,     0,     0
404, BEAM  ,    3,     6,    85,   136,     0,     0
405, BEAM  ,    1,     7,   136,   137,     0,     0
406, BEAM  ,    3,     6,   136,   187,     0,     0
407, BEAM  ,    1,     3,   187,   188,     0,     0
408, BEAM  ,    3,     6,   187,   238,     0,     0
409, BEAM  ,    1,     7,   238,   239,     0,     0
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```
   410, BEAM  ,     3,      6,    238,    289,      0,      0
   411, BEAM  ,     3,      6,     86,    137,      0,      0
   412, BEAM  ,     1,      7,    137,    138,      0,      0
   413, BEAM  ,     3,      6,    137,    188,      0,      0
   414, BEAM  ,     1,      3,    188,    189,      0,      0
   415, BEAM  ,     3,      6,    188,    239,      0,      0
   416, BEAM  ,     1,      7,    239,    240,      0,      0
   417, BEAM  ,     3,      6,    239,    290,      0,      0
   418, BEAM  ,     3,      6,     87,    138,      0,      0
   419, BEAM  ,     1,      7,    138,    139,      0,      0
   420, BEAM  ,     3,      6,    138,    189,      0,      0
   421, BEAM  ,     1,      3,    189,    190,      0,      0
   422, BEAM  ,     3,      6,    189,    240,      0,      0
   423, BEAM  ,     1,      7,    240,    241,      0,      0
   424, BEAM  ,     3,      6,    240,    291,      0,      0
   425, BEAM  ,     3,      6,     88,    139,      0,      0
   426, BEAM  ,     3,      6,    139,    190,      0,      0
   427, BEAM  ,     3,      6,    190,    241,      0,      0
   428, BEAM  ,     3,      6,    241,    292,      0,      0
   429, TRUSS ,     1,      5,    191,     94,      0,      0
   430, TRUSS ,     1,      5,     89,    196,      0,      0
   431, TRUSS ,     1,      5,    196,     99,      0,      0
   432, TRUSS ,     1,      5,     94,    201,      0,      0
   433, TRUSS ,     1,      5,    201,    104,      0,      0
   434, TRUSS ,     1,      5,     99,    206,      0,      0
   435, TRUSS ,     1,      5,    206,    109,      0,      0
   436, TRUSS ,     1,      5,    104,    211,      0,      0
   437, TRUSS ,     1,      5,    211,    114,      0,      0
   438, TRUSS ,     1,      5,    109,    216,      0,      0
   439, TRUSS ,     1,      5,    216,    119,      0,      0
   440, TRUSS ,     1,      5,    114,    221,      0,      0
   441, TRUSS ,     1,      5,    221,    124,      0,      0
   442, TRUSS ,     1,      5,    119,    226,      0,      0
   443, TRUSS ,     1,      5,    226,    129,      0,      0
   444, TRUSS ,     1,      5,    124,    231,      0,      0
   445, TRUSS ,     1,      5,    231,    134,      0,      0
   446, TRUSS ,     1,      5,    129,    236,      0,      0
   447, TRUSS ,     1,      5,    236,    139,      0,      0
   448, TRUSS ,     1,      5,    134,    241,      0,      0

*GROUP    ; Group
; NAME, NODE LIST, ELEM LIST, PLANE TYPE
   FASE 1    , 1to37 89to241, 4to334by110 5to320by105 57to59 62to108 \
        112to133by7 117to242by25 121to163by14 124to412by32 128to176by16 \
        131to281by50 146to402by64 151to391by48 153to373by55 158to302by16 \
        165to421by32 178 183 185to377by64 195to419by32 213to341by32 240to304by16 \
        279to423by48 306 311 336to416by16 345 350to414by16 359 370 405 407 409 \
        429to448, 0
   FASE 2    , 38to292, 53to56 109to115by2 116to404by32 118to406by32 \
        120to408by32 122to410by32 123to411by32 125to413by32 127to415by32 \
        129to417by32 130to418by32 132to420by32 134to422by32 136to424by32 \
        137to393by32 138to394by32 139to395by32 140to396by32 141to397by32 \
        143to399by32 145to401by32 147to403by32 425to428, 0

*BNDR-GROUP    ; Boundary Group
; NAME, AUTOTYPE
 FASE 1, 0

*LOAD-GROUP    ; Load Group
; NAME
 FASE 1
 FASE 2
```

```
 FASE 3

*MATERIAL    ; Material
; iMAT, TYPE, MNAME, SPHEAT, HEATCO, PLAST, TUNIT, bMASS, DAMPRATIO, [DATA1]
 ; STEEL, CONC, USER
; iMAT, TYPE, MNAME, SPHEAT, HEATCO, PLAST, TUNIT, bMASS, DAMPRATIO, [DATA2], [DATA2]
 ; SRC
; [DATA1] : 1, DB, NAME, CODE, USEELAST, ELAST
; [DATA1] : 2, ELAST, POISN, THERMAL, DEN, MASS
; [DATA1] : 3, Ex, Ey, Ez, Tx, Ty, Tz, Sxy, Sxz, Syz, Pxy, Pxz, Pyz, DEN, MASS
 ; Orthotropic
; [DATA2] : 1, DB, NAME, CODE, USEELAST, ELAST or 2, ELAST, POISN, THERMAL, DEN, MASS
    1, STEEL, S355              , 0, 0, , C, NO, 0.02, 1, EN05-PS(S) ,            , S3
55          , NO, 2.1e+008
    2, CONC , C32/40            , 0, 0, , C, YES, 0.05, 2, 3.3345e+007,   0.2, 1.0000e
-005,     0,     0
    3, CONC , C32/40_NOP        , 0, 0, , C, YES, 0.05, 2, 3.3345e+007,   0.2, 1.0000e
-005,     0,     0

*MATL-COLOR
; iMAT, W_R, W_G, W_B, HF_R, HF_G, HF_B, HE_R, HE_G, HE_B, bBLEND, FACT
    1, 115,   0,   0,  255,  87,  87,  115,   0,   0,  NO, 0.5
    2,   0,  66,  45,    0, 192, 128,    0,  66,  45,  NO, 0.5
    3,  38,  57,   0,  128, 192,   0,   38,  57,   0,  NO, 0.5

*TDM-TYPE    ; Time Dependent Material
; NAME=NAME, CODE, STR, HU, VOL, AGE, CFACTA, CFACTB, TYPE, [ACI1 or ACI2]     ; CODE=
ACI
; NAME=NAME, CODE, STR, HU, MSIZE, CTYPE, AGE                                  ; CODE=
CEB1990,KS,CEB1978,KSCE 2010,KCI-USD12
; NAME=NAME, CODE, N1, PHI1, N2, PHI2                                          ; CODE=
MEM
; NAME=NAME, CODE, STR, HU, USS, UCS, VOL, RR, MOD                             ; CODE=
PCA
; NAME=NAME, CODE, STR, HU, VOL, UCS, VSR1, LAF, US, VSR, PST, bRCE, RR, MOD   ; CODE=
COMBINED
; NAME=NAME, CODE, STR, HTYPE, HU, MSIZE, CTYPE, AGE, CM                       ; CODE=
JAPAN
; NAME=NAME, CODE, ELAST, HU, VOL, CC, WC, AGE                                 ; CODE=
JSCE
; NAME=NAME, CODE, STR, HTYPE, HU, MSIZE, AGE                                  ; CODE=
CHINA
; NAME=NAME, CODE, STR, HU, MSIZE, BSC, AGE                                    ; CODE=
JTG
; NAME=NAME, CODE, STR, HU, VSR, AGE, bEXPOSE                                  ; CODE=
AASHTO
; NAME=NAME, CODE, STR, HU, MSIZE, AGE                                         ; CODE=
INDIA(IRC:18-2000)
; NAME=NAME, CODE, STR, HU, MSIZE, CTYPE, AGE                                  ; CODE=
INDIA(IRC:112-2011)
; NAME=NAME, CODE, STR, HU, MSIZE, CTYPE, AGE, TCode, bSILICA                  ; CODE=
European
; NAME=NAME, CODE, STR, EE(Not Use), FS, HT, DSE, DSC, AGE                     ; CODE=
NZ Bridge(SP/M/022)
; NAME=NAME, CODE, STR, HU, AGE, M, CMETH, CTYPE, CREEP, CONCT, W, MAXS, A, PZ ; CODE=
Russian
; NAME=NAME, CODE, STR, HU, MSIZE, BSC, AGE, FLYASH                            ; CODE=
China(JTG D62-2016)
; NAME=NAME, CODE, STR, EE, HT, DSC, AGE                                       ; CODE=
Australia
; NAME=NAME, CODE, bSSF, SSFNAME                                               ; CODE=
USER(line1)
```

```
;       CREEPFUNC1, AGE1, CREEPFUNC2, AGE2, ...                                  ; USER(
from line 2)
; [ACI1] : CURE, SLUMP, FAP, AIR, CC
; [ACI2] : UCC, USS
   NAME=C+S, European, 35000, 70, 0.25, Class N, 3, 1, NO

*TDM-ELAST    ; Time Dependent Material(Comp. Strength)
; NAME=NAME, TYPE, CODE, STRENGTH, A, B                          ; TYPE=CODE(Korean St
andard, ACI)
; NAME=NAME, TYPE, CODE, STRENGTH, iCTYPE                        ; TYPE=CODE(CEB-FIP,
Ohzagi)
; NAME=NAME, TYPE, CODE, STRENGTH                                ; TYPE=CODE(Chinese S
tandard)
; NAME=NAME, TYPE, CODE, STRENGTH, bUSE, [DATA]                  ; TYPE=CODE(Japan(Hyd
ration))
; NAME=NAME, TYPE, CODE, STRENGTH, iTYPE                         ; TYPE=CODE(Japan(Ela
stic))
; NAME=NAME, TYPE, CODE, STRENGTH                                ; TYPE=CODE(INDIA(IRC
:18-2000))
; NAME=NAME, TYPE, CODE, STRENGTH, iCTYPE                        ; TYPE=CODE(INDIA(IRC
:112-2011))
; NAME=NAME, TYPE, CODE, STRENGTH, iCTYPE                        ; TYPE=CODE(European)

; NAME=NAME, TYPE, CODE, STRENGTH,                               ; TYPE=CODE(CEB-FIP(1
978))
; NAME=NAME, TYPE, CODE, STRENGTH, TYPE, CMETH, CTYPE, MAXS, PZ  ; TYPE=CODE(Russian))

; NAME=NAME, TYPE, CODE, STRENGTH,                               ; CODE=Australia
; NAME=NAME, TYPE, SCALE                                         ; TYPE=USER(line 1)
;       DAY1, COMP1, TENS1, ELAST1, DAY2, COMP2, ...             ;      USER(from line
 2)
; [DATA] : A, B, D, TSF or iCTYPE, TSF
   NAME=MATURAZIONE, CODE, EUROPEAN, 43000, 2

*TDM-LINK    ; Time Dependent Material Link
; iMAT, TDM-TYPE1(CREEP/SHRINKAGE), TDM-TYPE2(ELASTICITY)
    2, C+S, MATURAZIONE


*SECTION    ; Section
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, [DATA1], [DATA2]                  ;
1st line - DB/USER
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, BLT, D1, ..., D8, iCEL            ;
1st line - VALUE
;       AREA, ASy, ASz, Ixx, Iyy, Izz                                            ;
2nd line
;       CyP, CyM, CzP, CzM, QyB, QzB, PERI_OUT, PERI_IN, Cy, Cz                  ;
3rd line
;       Y1, Y2, Y3, Y4, Z1, Z2, Z3, Z4, Zyy, Zzz                                 ;
4th line
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, ELAST, DEN, POIS, POIC, SF, THERMAL ;
1st line - SRC
;       D1, D2, [SRC]                                                            ;
2nd line
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, 1, DB, NAME1, NAME2, D1, D2       ;
1st line - COMBINED
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, 2, D11, D12, D13, D14, D15, D21, D22,
D23, D24
; iSEC, TYPE, SNAME, [OFFSET2], bSD, bWE, SHAPE, iyVAR, izVAR, STYPE              ;
1st line - TAPERED
;       DB, NAME1, NAME2                                                         ;
2nd line(STYPE=DB)
```

```
;       [DIM1], [DIM2]                                                                  ;
2nd line(STYPE=USER)
;       D11, D12, D13, D14, D15, D16, D17, D18                                          ;
2nd line(STYPE=VALUE)
;       AREA1, ASy1, ASz1, Ixx1, Iyy1, Izz1                                            ;
3rd line(STYPE=VALUE)
;       CyP1, CyM1, CzP1, CzM1, QyB1, QzB1, PERI_OUT1, PERI_IN1, Cy1, Cz1              ;
4th line(STYPE=VALUE)
;       Y11, Y12, Y13, Y14, Z11, Z12, Z13, Z14, Zyy1, Zyy2                             ;
5th line(STYPE=VALUE)
;       D21, D22, D23, D24, D25, D26, D27, D28                                          ;
6th line(STYPE=VALUE)
;       AREA2, ASy2, ASz2, Ixx2, Iyy2, Izz2                                            ;
7th line(STYPE=VALUE)
;       CyP2, CyM2, CzP2, CzM2, QyB2, QzB2, PERI_OUT2, PERI_IN2, Cy2, Cz2              ;
8th line(STYPE=VALUE)
;       Y21, Y22, Y23, Y24, Z21, Z22, Z23, Z24, Zyy2, Zzz2                             ;
9th line(STYPE=VALUE)
;       OPT1, OPT2, [JOINT]                                                   ; 2nd l
ine(STYPE=PSC)
;       ELAST, DEN, POIS, POIC, THERMAL                                       ; 2nd l
ine(STYPE=PSC-CMPW)
;       bSHEARCHK, [SCHK-I], [SCHK-J], [WT-I], [WT-J], WI, WJ, bSYM, bSIDEHOLE ; 3rd l
ine(STYPE=PSC)
;       bSHEARCHK, bSYM, bHUNCH, [CMPWEB-I], [CMPWEB-J]                       ; 3rd l
ine(STYPE=PSC-CMPW)
;       bUSERDEFMESHSIZE, MESHSIZE, bUSERINPSTIFF, [STIFF-I], [STIFF-J]       ; 4th l
ine(STYPE=PSC)
;       [SIZE-A]-i                                                            ; 5th l
ine(STYPE=PSC)
;       [SIZE-B]-i                                                            ; 6th l
ine(STYPE=PSC)
;       [SIZE-C]-i                                                            ; 7th l
ine(STYPE=PSC)
;       [SIZE-D]-i                                                            ; 8th l
ine(STYPE=PSC)
;       [SIZE-A]-j                                                            ; 9th l
ine(STYPE=PSC)
;       [SIZE-B]-j                                                            ; 10th
line(STYPE=PSC)
;       [SIZE-C]-j                                                            ; 11th
line(STYPE=PSC)
;       [SIZE-D]-j                                                            ; 12th
line(STYPE=PSC)
;       GN, CTC, Bc, Tc, Hh, EsEc, DsDc, Ps, Pc, bMULTI, EsEc-L, EsEc-S       ; 2nd l
ine(STYPE=CMP-B/I)
;       SW_i, Hw_i, tw_i, B_i, Bf1_i, tf1_i, B2_i, Bf2_i, tf2_i               ; 3rd l
ine(STYPE=CMP-B/I)
;       SW_j, Hw_j, tw_j, B_j, Bf1_j, tf1_j, B2_j, Bf2_j, tf2_j               ; 4th l
ine(STYPE=CMP-B/I)
;       N1, N2, Hr, Hr2, tr1, tr2                                             ; 5th l
ine(STYPE=CMP-B)
;       GN, CTC, Bc, Tc, Hh, EgdEsb, DgdDsb, Pgd, Psb, bSYM, SW_i, SW_j       ; 2nd l
ine(STYPE=CMP-CI/CT)
;       OPT1, OPT2, [JOINT]                                                   ; 3rd l
ine(STYPE=CMP-CI/CT)
;       [SIZE-A]-i                                                            ; 4th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-B]-i                                                            ; 5th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-C]-i                                                            ; 6th l
ine(STYPE=CMP-CI/CT)
```

```
;       [SIZE-D]-i                                                          ; 7th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-A]-j                                                          ; 8th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-B]-j                                                          ; 9th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-C]-j                                                          ; 10th
line(STYPE=CMP-CI/CT)
;       [SIZE-D]-j                                                          ; 11th
line(STYPE=CMP-CI/CT)
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, STYPE1, STYPE2                     ; 1st l
ine - CONSTRUCT
;       SHAPE, ...(same with other type data from shape)                    ; Befor
e (STYPE1)
;       SHAPE, ...(same with other type data from shape)                    ; After
  (STYPE2)
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                              ; 1st l
ine - COMPOSITE-SB
;       Hw, tw, B, Bf1, tf1, B2, Bf2, tf2                                   ; 2nd l
ine
;       N1, N2, Hr, Hr2, tr1, tr2                                           ; 3rd l
ine
;       SW, GN, CTC, Bc, Tc, Hh, EsEc, DsDc, Ps, Pc, bMulti, Elong, Esh     ; 4th l
ine
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                              ; 1st l
ine - COMPOSITE-SI
;       Hw, tw, B, tf1, B2, tf2                                             ; 2nd l
ine
;       SW, GN, CTC, Bc, Tc, Hh, EsEc, DsDc, Ps, Pc, bMulti, Elong, Esh     ; 3rd l
ine
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                              ; 1st l
ine - COMPOSITE-CI/CT
;       OPT1, OPT2, [JOINT]                                                 ; 2nd l
ine
;       [SIZE-A]                                                            ; 3rd l
ine
;       [SIZE-B]                                                            ; 4th l
ine
;       [SIZE-C]                                                            ; 5th l
ine
;       [SIZE-D]                                                            ; 6th l
ine
;       SW, GN, CTC, Bc, Tc, Hh, EgdEsb, DgdDsb, Pgd, Psb                   ; 7th l
ine
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                              ; 1st l
ine - PSC
;       OPT1, OPT2, [JOINT]                                                 ; 2nd l
ine
;       bSHEARCHK, [SCHK], [WT], WIDTH, bSYM, bSIDEHOLE                     ; 3rd l
ine
;       bUSERDEFMESHSIZE, MESHSIZE, bUSERINPSTIFF, [STIFF]                  ; 4th l
ine
;       bWE, [WARPING POINT]-i, [WARPING POINT]-j                           ; 5th l
ine
;       [SIZE-A]                                                            ; 6th l
ine
;       [SIZE-B]                                                            ; 7th l
ine
;       [SIZE-C]                                                            ; 8th l
ine
;       [SIZE-D]                                                            ; 9th l
ine
```

```
; [DATA1] : 1, DB, NAME or 2, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10
; [DATA2] : CCSHAPE or iCEL or iN1, iN2
; [SRC]  : 1, DB, NAME1, NAME2 or 2, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, iN1, iN2

; [DIM1], [DIM2] : D1, D2, D3, D4, D5, D6, D7, D8
; [OFFSET] : OFFSET, iCENT, iREF, iHORZ, HUSER, iVERT, VUSER
; [OFFSET2]: OFFSET, iCENT, iREF, iHORZ, HUSERI, HUSERJ, iVERT, VUSERI, VUSERJ
; [JOINT]  :  8(1CELL, 2CELL), 13(3CELL),  9(PSCM),  8(PSCH), 9(PSCT),  2(PSCB), 0(nCE
LL),  2(nCEL2)
; [SIZE-A] :  6(1CELL, 2CELL), 10(3CELL), 10(PSCM),  6(PSCH), 8(PSCT), 10(PSCB), 5(nCE
LL), 11(nCEL2)
; [SIZE-B] :  6(1CELL, 2CELL), 12(3CELL),  6(PSCM),  6(PSCH), 8(PSCT),  6(PSCB), 8(nCE
LL), 18(nCEL2)
; [SIZE-C] : 10(1CELL, 2CELL), 13(3CELL),  9(PSCM), 10(PSCH), 7(PSCT),  8(PSCB), 0(nCE
LL), 11(nCEL2)
; [SIZE-D] :  8(1CELL, 2CELL), 13(3CELL),  6(PSCM),  7(PSCH), 8(PSCT),  5(PSCB), 0(nCE
LL), 18(nCEL2)
; [STIFF]  : AREA, ASy, ASz, Ixx, Iyy, Izz
; [SCHK]   : bAUTO_Z1, Z1, bAUTO_Z3, Z3
; [WT]     : bAUTO_TOR, TOR, bAUTO_SHR1, SHR1, bAUTO_SHR2, SHR2, bAUTO_SHR3, SHR3
; [CMPWEB] : EFD, LRF, A, B, H, T
; [WARPING POINT] : nWarpingCheck, X1,X2,X3,X4,X5,X6, Y1,Y2,Y3,Y4,Y5,Y6
    1, COMPOSITE , TRAVE PRINCIPALE CAMPATA, CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.13, 0.022, 0.7, 0.03, 1.2, 0.04
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.85, 1, 2.85,   2.85, 0.25, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    2, COMPOSITE , TRAVE PRINCIPALE APPOGGIO, CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.13, 0.022, 0.7, 0.03, 0.9, 0.04
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.85, 1, 2.85,   2.85, 0.25, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    3, COMPOSITE , TRAVE SPINA       , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       0.54, 0.013, 0.3, 0.025, 0.3, 0.025
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.8, 1, 2.8,   2.8, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    4, DBUSER    , TRAVERSO          , CC, 0, 0, 0, 0, 0, 0, YES, NO, H  , 2, 0.8, 0.3
5, 0.02, 0.028, 0.35, 0.028, 0, 0, 0, 0
    5, DBUSER    , CONTROVENTI       , CC, 0, 0, 0, 0, 0, 0, YES, NO, L  , 1, UNI, L70
x7
    6, DBUSER    , SOLETTA           , CC, 0, 0, 0, 0, 0, 0, YES, NO, SB , 2, 0.25, 0.
88, 0, 0, 0, 0, 0, 0, 0, 0
    7, COMPOSITE , CONCIO C1         , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.045, 0.02, 0.75, 0.025, 0.9, 0.03
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.84, 1, 2.84,   2.84, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    8, COMPOSITE , CONCIO C2         , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.032, 0.02, 0.75, 0.028, 1.2, 0.04
       0, 0, 0, 0, 0, 0
       0
       0
       0
```

```
       2.84, 1, 2.84,   2.84, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    9, COMPOSITE , CONCIO C3         , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.015, 0.02, 0.75, 0.03, 1.2, 0.055
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.84, 1, 2.84,   2.84, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,

*SECT-COLOR
; iSEC, W_R, W_G, W_B, HF_R, HF_G, HF_B, HE_R, HE_G, HE_B, bBLEND, FACT
    1,   0,  33,  66,    0, 128, 255,    0,  33,  66,  NO, 0.5
    2,  31,   0,  81,  148,  87, 255,   31,   0,  81,  NO, 0.5
    3, 108,  54,   0,  255, 128,   0,  108,  54,   0,  NO, 0.5
    4,   0,  66,  45,    0, 192, 128,    0,  66,  45,  NO, 0.5
    5,  65,  65,  65,  255, 255, 255,   65,  65,  65,  NO, 0.5
    6, 100,   0, 100,  192,   0, 192,  100,   0, 100,  NO, 0.5
    7,  85,   0,  57,  192,   0, 128,   85,   0,  57,  NO, 0.5
    8,   0,  45,  66,    0, 128, 192,    0,  45,  66,  NO, 0.5
    9,  96,   0,  96,  255, 160, 255,   96,   0,  96,  NO, 0.5

*COMP-GEN-SECT-PSC-DESIGN    ; Composite Section for PSC Design
; SECT, bCompPSC, (Z1, Z2, Z3, t1, t2, t3, TotT)-I, (Z1, Z2, Z3, t1, t2, t3, TotT)-J
     1, NO,  0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 0
     2, NO,  0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 0
     3, NO,  0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 0
     7, NO,  0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 0
     8, NO,  0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 0
     9, NO,  0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 0

*DGN-SECT
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, [DATA1], [DATA2]                    ;
1st line - DB/USER
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, BLT, D1, ..., D8, iCEL              ;
1st line - VALUE
;       AREA, ASy, ASz, Ixx, Iyy, Izz                                              ;
2nd line
;       CyP, CyM, CzP, CzM, QyB, QzB, PERI_OUT, PERI_IN, Cy, Cz                    ;
3rd line
;       Y1, Y2, Y3, Y4, Z1, Z2, Z3, Z4, Zyy, Zzz                                   ;
4th line
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, ELAST, DEN, POIS, POIC, SF, THERMAL ;
1st line - SRC
;       D1, D2, [SRC]                                                              ;
2nd line
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, 1, DB, NAME1, NAME2, D1, D2         ;
1st line - COMBINED
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE, 2, D11, D12, D13, D14, D15, D21, D22,
D23, D24
; iSEC, TYPE, SNAME, [OFFSET2], bSD, bWE, SHAPE, iyVAR, izVAR, STYPE                ;
1st line - TAPERED
;       DB, NAME1, NAME2                                                           ;
2nd line(STYPE=DB)
;       [DIM1], [DIM2]                                                             ;
2nd line(STYPE=USER)
;       D11, D12, D13, D14, D15, D16, D17, D18                                     ;
2nd line(STYPE=VALUE)
;       AREA1, ASy1, ASz1, Ixx1, Iyy1, Izz1                                        ;
3rd line(STYPE=VALUE)
;       CyP1, CyM1, CzP1, CzM1, QyB1, QzB1, PERI_OUT1, PERI_IN1, Cy1, Cz1          ;
4th line(STYPE=VALUE)
;       Y11, Y12, Y13, Y14, Z11, Z12, Z13, Z14, Zyy1, Zyy2                         ;
```

```
5th line(STYPE=VALUE)
;       D21, D22, D23, D24, D25, D26, D27, D28                                          ;
6th line(STYPE=VALUE)
;       AREA2, ASy2, ASz2, Ixx2, Iyy2, Izz2                                            ;
7th line(STYPE=VALUE)
;       CyP2, CyM2, CzP2, CzM2, QyB2, QzB2, PERI_OUT2, PERI_IN2, Cy2, Cz2              ;
8th line(STYPE=VALUE)
;       Y21, Y22, Y23, Y24, Z21, Z22, Z23, Z24, Zyy2, Zzz2                             ;
9th line(STYPE=VALUE)
;       OPT1, OPT2, [JOINT]                                                    ; 2nd l
ine(STYPE=PSC)
;       ELAST, DEN, POIS, POIC, THERMAL                                        ; 2nd l
ine(STYPE=PSC-CMPW)
;       bSHEARCHK, [SCHK-I], [SCHK-J], [WT-I], [WT-J], WI, WJ, bSYM, bSIDEHOLE ; 3rd l
ine(STYPE=PSC)
;       bSHEARCHK, bSYM, bHUNCH, [CMPWEB-I], [CMPWEB-J]                        ; 3rd l
ine(STYPE=PSC-CMPW)
;       bUSERDEFMESHSIZE, MESHSIZE, bUSERINPSTIFF, [STIFF-I], [STIFF-J]        ; 4th l
ine(STYPE=PSC)
;       [SIZE-A]-i                                                             ; 5th l
ine(STYPE=PSC)
;       [SIZE-B]-i                                                             ; 6th l
ine(STYPE=PSC)
;       [SIZE-C]-i                                                             ; 7th l
ine(STYPE=PSC)
;       [SIZE-D]-i                                                             ; 8th l
ine(STYPE=PSC)
;       [SIZE-A]-j                                                             ; 9th l
ine(STYPE=PSC)
;       [SIZE-B]-j                                                             ; 10th
line(STYPE=PSC)
;       [SIZE-C]-j                                                             ; 11th
line(STYPE=PSC)
;       [SIZE-D]-j                                                             ; 12th
line(STYPE=PSC)
;       GN, CTC, Bc, Tc, Hh, EsEc, DsDc, Ps, Pc, bMULTI, EsEc-L, EsEc-S        ; 2nd l
ine(STYPE=CMP-B/I)
;       SW_i, Hw_i, tw_i, B_i, Bf1_i, tf1_i, B2_i, Bf2_i, tf2_i                ; 3rd l
ine(STYPE=CMP-B/I)
;       SW_j, Hw_j, tw_j, B_j, Bf1_j, tf1_j, B2_j, Bf2_j, tf2_j                ; 4th l
ine(STYPE=CMP-B/I)
;       N1, N2, Hr, Hr2, tr1, tr2                                              ; 5th l
ine(STYPE=CMP-B)
;       GN, CTC, Bc, Tc, Hh, EgdEsb, DgdDsb, Pgd, Psb, bSYM, SW_i, SW_j        ; 2nd l
ine(STYPE=CMP-CI/CT)
;       OPT1, OPT2, [JOINT]                                                    ; 3rd l
ine(STYPE=CMP-CI/CT)
;       [SIZE-A]-i                                                             ; 4th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-B]-i                                                             ; 5th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-C]-i                                                             ; 6th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-D]-i                                                             ; 7th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-A]-j                                                             ; 8th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-B]-j                                                             ; 9th l
ine(STYPE=CMP-CI/CT)
;       [SIZE-C]-j                                                             ; 10th
line(STYPE=CMP-CI/CT)
;       [SIZE-D]-j                                                             ; 11th
```

```
line(STYPE=CMP-CI/CT)
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, STYPE1, STYPE2                          ; 1st l
ine - CONSTRUCT
;       SHAPE, ...(same with other type data from shape)                        ; Befor
e (STYPE1)
;       SHAPE, ...(same with other type data from shape)                        ; After
  (STYPE2)
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                                  ; 1st l
ine - COMPOSITE-SB
;       Hw, tw, B, Bf1, tf1, B2, Bf2, tf2                                       ; 2nd l
ine
;       N1, N2, Hr, Hr2, tr1, tr2                                               ; 3rd l
ine
;       SW, GN, CTC, Bc, Tc, Hh, EsEc, DsDc, Ps, Pc, bMulti, Elong, Esh         ; 4th l
ine
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                                  ; 1st l
ine - COMPOSITE-SI
;       Hw, tw, B, tf1, B2, tf2                                                 ; 2nd l
ine
;       SW, GN, CTC, Bc, Tc, Hh, EsEc, DsDc, Ps, Pc, bMulti, Elong, Esh         ; 3rd l
ine
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                                  ; 1st l
ine - COMPOSITE-CI/CT
;       OPT1, OPT2, [JOINT]                                                     ; 2nd l
ine
;       [SIZE-A]                                                                ; 3rd l
ine
;       [SIZE-B]                                                                ; 4th l
ine
;       [SIZE-C]                                                                ; 5th l
ine
;       [SIZE-D]                                                                ; 6th l
ine
;       SW, GN, CTC, Bc, Tc, Hh, EgdEsb, DgdDsb, Pgd, Psb                       ; 7th l
ine
; iSEC, TYPE, SNAME, [OFFSET], bSD, bWE, SHAPE                                  ; 1st l
ine - PSC
;       OPT1, OPT2, [JOINT]                                                     ; 2nd l
ine
;       bSHEARCHK, [SCHK], [WT], WIDTH, bSYM, bSIDEHOLE                         ; 3rd l
ine
;       bUSERDEFMESHSIZE, MESHSIZE, bUSERINPSTIFF, [STIFF]                      ; 4th l
ine
;       bWE, [WARPING POINT]-i, [WARPING POINT]-j                               ; 5th l
ine
;       [SIZE-A]                                                                ; 6th l
ine
;       [SIZE-B]                                                                ; 7th l
ine
;       [SIZE-C]                                                                ; 8th l
ine
;       [SIZE-D]                                                                ; 9th l
ine
; [DATA1] : 1, DB, NAME or 2, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10
; [DATA2] : CCSHAPE or iCEL or iN1, iN2
; [SRC]  : 1, DB, NAME1, NAME2 or 2, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, iN1, iN2

; [DIM1], [DIM2] : D1, D2, D3, D4, D5, D6, D7, D8
; [OFFSET] : OFFSET, iCENT, iREF, iHORZ, HUSER, iVERT, VUSER
; [OFFSET2]: OFFSET, iCENT, iREF, iHORZ, HUSERI, HUSERJ, iVERT, VUSERI, VUSERJ
; [JOINT]  :  8(1CELL, 2CELL), 13(3CELL),  9(PSCM),  8(PSCH), 9(PSCT),  2(PSCB), 0(nCE
LL),  2(nCEL2)
```

```
; [SIZE-A] :  6(1CELL, 2CELL), 10(3CELL), 10(PSCM),  6(PSCH), 8(PSCT), 10(PSCB), 5(nCE
LL), 11(nCEL2)
; [SIZE-B] :  6(1CELL, 2CELL), 12(3CELL),  6(PSCM),  6(PSCH), 8(PSCT),  6(PSCB), 8(nCE
LL), 18(nCEL2)
; [SIZE-C] : 10(1CELL, 2CELL), 13(3CELL),  9(PSCM), 10(PSCH), 7(PSCT),  8(PSCB), 0(nCE
LL), 11(nCEL2)
; [SIZE-D] :  8(1CELL, 2CELL), 13(3CELL),  6(PSCM),  7(PSCH), 8(PSCT),  5(PSCB), 0(nCE
LL), 18(nCEL2)
; [STIFF]  : AREA, ASy, ASz, Ixx, Iyy, Izz
; [SCHK]   : bAUTO_Z1, Z1, bAUTO_Z3, Z3
; [WT]     : bAUTO_TOR, TOR, bAUTO_SHR1, SHR1, bAUTO_SHR2, SHR2, bAUTO_SHR3, SHR3
; [CMPWEB] : EFD, LRF, A, B, H, T
; [WARPING POINT] : nWarpingCheck, X1,X2,X3,X4,X5,X6, Y1,Y2,Y3,Y4,Y5,Y6
    1, COMPOSITE , TRAVE PRINCIPALE CAMPATA, CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.13, 0.022, 0.7, 0.03, 1.2, 0.04
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.85, 1, 2.85,   2.85, 0.25, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    2, COMPOSITE , TRAVE PRINCIPALE APPOGGIO, CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.13, 0.022, 0.7, 0.03, 0.9, 0.04
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.85, 1, 2.85,   2.85, 0.25, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    3, COMPOSITE , TRAVE SPINA       , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       0.54, 0.013, 0.3, 0.025, 0.3, 0.025
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.8, 1, 2.8,   2.8, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    4, DBUSER    , TRAVERSO          , CC, 0, 0, 0, 0, 0, 0, YES, NO, H  , 2, 0.8, 0.3
5, 0.02, 0.028, 0.35, 0.028, 0, 0, 0, 0
    5, DBUSER    , CONTROVENTI       , CC, 0, 0, 0, 0, 0, 0, YES, NO, L  , 1, UNI, L70
x7
    6, DBUSER    , SOLETTA           , CC, 0, 0, 0, 0, 0, 0, YES, NO, SB , 2, 0.25, 0.
88, 0, 0, 0, 0, 0, 0, 0, 0
    7, COMPOSITE , CONCIO C1         , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.045, 0.02, 0.75, 0.025, 0.9, 0.03
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.84, 1, 2.84,   2.84, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    8, COMPOSITE , CONCIO C2         , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.032, 0.02, 0.75, 0.028, 1.2, 0.04
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.84, 1, 2.84,   2.84, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
    9, COMPOSITE , CONCIO C3         , CT, 0, 0, 0, 0, 0, 0, YES, NO, I
       2.015, 0.02, 0.75, 0.03, 1.2, 0.055
       0, 0, 0, 0, 0, 0
       0
       0
       0
       2.84, 1, 2.84,   2.84, 0.26, 0,   6.16251, 3.0792, 0.3, 0.2, 1.2, NO, ,
```

```
*STLDCASE    ; Static Load Cases
; LCNAME, LCTYPE, DESC
   PESO PROPRIO ACCIAIO, CS, PESO PROPRIO ACCIAIO
   PESO PROPRIO SOLETTA, CS, PESO PROPRIO SOLETTA
   PERMANENTE PORTATO, CS, PERMANENTE PORTATO
   VENTO A PONTE SCARICO, USER, VENTO A PONTE CARICO
   VENTO A PONTE CARICO, USER, VENTO A PONTE CARICO
   TERMICA UNIFORME +, T , TERMICA UNIFORME +
   TERMICA UNIFORME -, T , TERMICA UNIFORME -
   TERMICA GRADIENTE +, TPG, TERMICA GRADIENTE +
   TERMICA GRADIENTE -, TPG, TERMICA GRADIENTE -
   FRENATURA, USER, FRENATURA


*SPRING    ; Point Spring Supports
; NODE_LIST, Type, SDx, SDy, SDz, SRx, SRy, SRz, GROUP, FROMTYPE, EFFAREA, Kx, Ky, Kz
                                                  ; LINEAR
; NODE_LIST, Type, Direction, Vx, Vy, Vz, Stiffness, GROUP, FROMTYPE, EFFAREA
                                                  ; COMP, TENS
; NODE_LIST, Type, Multi-Linear Type, Direction, Vx, Vy, Vz, ax, ay, bx, by, cx, cy, d
x, dy, ex, ey, fx, fy, GROUP, FROMTYPE, EFFAREA  ; MULTI
   1to4, LINEAR, 4490, 4490, 4.33e+006, 0, 0, 0, NO, 0, 0, 0, 0, 0, 0, FASE 1, 0, 0, 0
, 0, 0

*RIGIDLINK    ; Rigid Link
; KEY, M-NODE, DOF, S-NODE LIST, GROUP
     2,     1, 111111, 5 89, FASE 1
     1,     2, 111111, 27 191, FASE 1
     3,     3, 111111, 15 139, FASE 1
     4,     4, 111111, 37 241, FASE 1
     8,     6, 111111, 94, FASE 1
    11,     7, 111111, 99, FASE 1
    14,     8, 111111, 104, FASE 1
    17,     9, 111111, 109, FASE 1
    20,    10, 111111, 114, FASE 1
    23,    11, 111111, 119, FASE 1
    26,    12, 111111, 124, FASE 1
    29,    13, 111111, 129, FASE 1
    32,    14, 111111, 134, FASE 1
    33,    16, 111111, 140, FASE 1
     7,    17, 111111, 145, FASE 1
    10,    18, 111111, 150, FASE 1
    13,    19, 111111, 155, FASE 1
    16,    20, 111111, 160, FASE 1
    19,    21, 111111, 165, FASE 1
    22,    22, 111111, 170, FASE 1
    25,    23, 111111, 175, FASE 1
    28,    24, 111111, 180, FASE 1
    31,    25, 111111, 185, FASE 1
     5,    26, 111111, 190, FASE 1
     6,    28, 111111, 196, FASE 1
     9,    29, 111111, 201, FASE 1
    12,    30, 111111, 206, FASE 1
    15,    31, 111111, 211, FASE 1
    18,    32, 111111, 216, FASE 1
    21,    33, 111111, 221, FASE 1
    24,    34, 111111, 226, FASE 1
    27,    35, 111111, 231, FASE 1
    30,    36, 111111, 236, FASE 1

; *LOADTOMASS, DIR, bNODAL, bBEAM, bFLOOR, bPRES, GRAV
```

```
;     LCNAME1, FACTOR1, LCNAME2, FACTOR2, ...   ; from line 1
*LOADTOMASS, XYZ, YES, YES, YES, YES, 9.806
   PESO PROPRIO SOLETTA, 1, PERMANENTE PORTATO, 1

*USE-STLD, PESO PROPRIO ACCIAIO

; *SELFWEIGHT, X, Y, Z, GROUP
*SELFWEIGHT, 0, 0, -1.12, FASE 1

; End of data for load case [PESO PROPRIO ACCIAIO] ------------------------

*USE-STLD, PESO PROPRIO SOLETTA

*BEAMLOAD    ; Element Beam Loads
; ELEM_LIST, CMD, TYPE, DIR, bPROJ, [ECCEN], [VALUE], GROUP
; ELEM_LIST, CMD, TYPE, TYPE, DIR, VX, VY, VZ, bPROJ, [ECCEN], [VALUE], GROUP
; [VALUE]       : D1, P1, D2, P2, D3, P3, D4, P4
; [ECCEN]       : bECCEN, ECCDIR, I-END, J-END, bJ-END
; [ADDITIONAL]  : bADDITIONAL, ADDITIONAL_I-END, ADDITIONAL_J-END, bADDITIONAL_J-END
    57, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    58, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    59, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    62, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    63, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    64, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    65, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    66, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    67, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    68, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    69, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    70, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    71, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    72, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    73, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    74, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    75, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    76, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    77, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    78, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    79, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    80, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
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, FASE 2, NO, 0, 0, NO,
     81, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     82, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     83, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     84, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     85, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     86, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     87, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
     88, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    110, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    112, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    114, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    117, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    119, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    121, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    124, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    126, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    128, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    131, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    133, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    135, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    142, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    144, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    146, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    149, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    151, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    153, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    156, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    158, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
    160, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    163, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
    165, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
```

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, FASE 2, NO, 0, 0, NO,
   167, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   174, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   176, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   178, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   181, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   183, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   185, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   188, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   190, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   192, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   195, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   197, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   199, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   206, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   208, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   210, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   213, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   215, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   217, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   220, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   222, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   224, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   227, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   229, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   231, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   238, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   240, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   242, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   245, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   247, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   249, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
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 0, FASE 2, NO, 0, 0, NO,
   252, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   254, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   256, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   259, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   261, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   263, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   270, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   272, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   274, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   277, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   279, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   281, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   284, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   286, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   288, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   291, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   293, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   295, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   302, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   304, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   306, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   309, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   311, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   313, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   316, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   318, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   320, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   323, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   325, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   327, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   334, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
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 0, FASE 2, NO, 0, 0, NO,
   336, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   338, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   341, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   343, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   345, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   348, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   350, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   352, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   355, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   357, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   359, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   366, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   368, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   370, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   373, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   375, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   377, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   380, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   382, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   384, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   387, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   389, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   391, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   398, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   400, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   402, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   405, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   407, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   409, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   412, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   414, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
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, FASE 2, NO, 0, 0, NO,
   416, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   419, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,
   421, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -16.85, 1, -16.85, 0, 0, 0, 0
, FASE 2, NO, 0, 0, NO,
   423, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -22.013, 1, -22.013, 0, 0, 0,
 0, FASE 2, NO, 0, 0, NO,

; End of data for load case [PESO PROPRIO SOLETTA] ------------------------

*USE-STLD, PERMANENTE PORTATO

*BEAMLOAD    ; Element Beam Loads
; ELEM LIST, CMD, TYPE, DIR, bPROJ, [ECCEN], [VALUE], GROUP
; ELEM_LIST, CMD, TYPE, TYPE, DIR, VX, VY, VZ, bPROJ, [ECCEN], [VALUE], GROUP
; [VALUE]       : D1, P1, D2, P2, D3, P3, D4, P4
; [ECCEN]       : bECCEN, ECCDIR, I-END, J-END, bJ-END
; [ADDITIONAL]  : bADDITIONAL, ADDITIONAL_I-END, ADDITIONAL_J-END, bADDITIONAL_J-END
    57, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    58, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    59, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    62, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    63, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
    66, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    67, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    68, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    69, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    70, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    71, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    72, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    73, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    74, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    75, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    76, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    77, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    78, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    79, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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    80, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    81, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    82, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    83, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    84, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    85, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    86, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    87, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
    88, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   110, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   112, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   114, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   117, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   119, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   121, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   124, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   126, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   128, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   131, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   133, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   135, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   142, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   144, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   146, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   149, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   151, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   153, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   156, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   158, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   160, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   163, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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   165, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   167, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   174, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   176, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   178, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   181, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   183, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   185, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   188, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   190, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   192, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   195, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   197, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   199, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   206, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   208, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   210, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   213, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   215, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   217, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   220, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   222, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   224, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   227, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   229, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   231, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   238, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   240, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   242, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   245, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   247, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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   249, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
   254, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   256, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   259, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   261, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
   274, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   277, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   279, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   281, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   284, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   286, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   288, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   291, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   293, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   295, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   302, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   304, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   306, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   309, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   311, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   313, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   316, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   318, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   320, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   323, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   325, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   327, BEAM    , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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   334, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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, FASE 3, NO, 0, 0, NO,
   338, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   341, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   343, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   345, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   348, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   350, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   352, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   355, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   357, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   359, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   366, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   368, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   370, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   373, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   375, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   377, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   380, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   382, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   384, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   387, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   389, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   391, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   398, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   400, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   402, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   405, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   407, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   409, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   412, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
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```
   414, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   416, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   419, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   421, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -8.566, 1, -8.566, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,
   423, BEAM   , UNILOAD, GZ, NO , NO, aDir[1], , , , 0, -6.957, 1, -6.957, 0, 0, 0, 0
, FASE 3, NO, 0, 0, NO,

; End of data for load case [PERMANENTE PORTATO] ------------------------

*USE-STLD, VENTO A PONTE SCARICO

*BEAMLOAD    ; Element Beam Loads
; ELEM_LIST, CMD, TYPE, DIR, bPROJ, [ECCEN], [VALUE], GROUP
; ELEM_LIST, CMD, TYPE, TYPE, DIR, VX, VY, VZ, bPROJ, [ECCEN], [VALUE], GROUP
; [VALUE]       : D1, P1, D2, P2, D3, P3, D4, P4
; [ECCEN]       : bECCEN, ECCDIR, I-END, J-END, bJ-END
; [ADDITIONAL]  : bADDITIONAL, ADDITIONAL_I-END, ADDITIONAL_J-END, bADDITIONAL_J-END
    57, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    58, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
    58, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    62, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    63, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    64, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    65, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    66, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    67, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    68, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    69, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    70, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
    71, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    71, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
    72, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    72, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
    73, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    73, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
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, NO, 0, 0, NO,
    74, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    75, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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, NO, 0, 0, NO,
    75, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
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    76, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    77, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
    77, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    78, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
    78, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
    79, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
    79, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
   110, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
   114, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   114, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
   117, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
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   121, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
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   128, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   128, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
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   135, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
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   146, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   146, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
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, , NO, 0, 0, NO,
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   178, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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   192, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
   195, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
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   199, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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, , NO, 0, 0, NO,
   217, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
   217, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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   220, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
   224, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   224, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
   227, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
   231, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
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, NO, 0, 0, NO,
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, , NO, 0, 0, NO,
   242, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , NO, 0, 0, NO,
   242, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   245, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
, , NO, 0, 0, NO,
   249, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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, NO, 0, 0, NO,
   249, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
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   256, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , , NO, 0, 0, NO,
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   263, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   263, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , , NO, 0, 0, NO,
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, , , NO, 0, 0, NO,
   274, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
, NO, 0, 0, NO,
   274, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , , NO, 0, 0, NO,
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, , , NO, 0, 0, NO,
   281, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , , NO, 0, 0, NO,
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, , , NO, 0, 0, NO,
   288, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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   295, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
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, , , NO, 0, 0, NO,
   313, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.789, 1, 0.789, 0, 0, 0, 0,
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   327, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -4.507, 1, -4.507, 0, 0, 0, 0
, , , NO, 0, 0, NO,
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   334, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.789, 1, -0.789, 0, 0, 0, 0
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,

; End of data for load case [VENTO A PONTE SCARICO] ------------------------

*USE-STLD, VENTO A PONTE CARICO

*BEAMLOAD    ; Element Beam Loads
; ELEM_LIST, CMD, TYPE, DIR, bPROJ, [ECCEN], [VALUE], GROUP
; ELEM_LIST, CMD, TYPE, TYPE, DIR, VX, VY, VZ, bPROJ, [ECCEN], [VALUE], GROUP
; [VALUE]       : D1, P1, D2, P2, D3, P3, D4, P4
; [ECCEN]       : bECCEN, ECCDIR, I-END, J-END, bJ-END
; [ADDITIONAL]  : bADDITIONAL, ADDITIONAL_I-END, ADDITIONAL_J-END, bADDITIONAL_J-END
    57, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, -0.406, 1, -0.406, 0, 0, 0, 0
, , NO, 0, 0, NO,
    58, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.406, 1, 0.406, 0, 0, 0, 0,
, NO, 0, 0, NO,
    58, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -10.142, 1, -10.142, 0, 0, 0,
 0, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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, , NO, 0, 0, NO,
    71, BEAM   , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -10.142, 1, -10.142, 0, 0, 0,
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, NO, 0, 0, NO,
    72, BEAM   , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.406, 1, 0.406, 0, 0, 0, 0,
, NO, 0, 0, NO,
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   224, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -10.142, 1, -10.142, 0, 0, 0,
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   224, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.406, 1, 0.406, 0, 0, 0, 0,
, NO, 0, 0, NO,
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, NO, 0, 0, NO,
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, , NO, 0, 0, NO,
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   384, BEAM    , UNILOAD, LZ, NO , NO, aDir[1], , , , 0, 0.406, 1, 0.406, 0, 0, 0, 0,
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, NO, 0, 0, NO,
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   409, BEAM    , UNILOAD, LY, NO , NO, aDir[1], , , , 0, -10.142, 1, -10.142, 0, 0, 0,
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, NO, 0, 0, NO,
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; End of data for load case [VENTO A PONTE CARICO] ------------------------

*USE-STLD, TERMICA UNIFORME +

*ELTEMPER    ; Element Temperatures
; ELEM_LIST, TEMPER, GROUP
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    69, 49,
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   421, 49,
   423, 49,

; End of data for load case [TERMICA UNIFORME +] -------------------------

*USE-STLD, TERMICA UNIFORME -

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   106, -11,
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   421, -11,
   423, -11,

; End of data for load case [TERMICA UNIFORME -] -------------------------
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*USE-STLD, TERMICA GRADIENTE +

*THERGRAD    ; Temperature Gradient
; ELEM_LIST, iETYP, TZ, bUSEHZ, HZ, TY, bUSEHY, HY, GROUP
; ELEM_LIST, iETYP, TZ, bUSEHZ, HZ, GROUP
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    58, 1, 15, YES, 0, 0, YES, 0,
    59, 1, 15, YES, 0, 0, YES, 0,
    62, 1, 15, YES, 0, 0, YES, 0,
    63, 1, 15, YES, 0, 0, YES, 0,
    64, 1, 15, YES, 0, 0, YES, 0,
    65, 1, 15, YES, 0, 0, YES, 0,
    66, 1, 15, YES, 0, 0, YES, 0,
    67, 1, 15, YES, 0, 0, YES, 0,
    68, 1, 15, YES, 0, 0, YES, 0,
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    71, 1, 15, YES, 0, 0, YES, 0,
    72, 1, 15, YES, 0, 0, YES, 0,
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    76, 1, 15, YES, 0, 0, YES, 0,
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    94, 1, 15, YES, 0, 0, YES, 0,
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   100, 1, 15, YES, 0, 0, YES, 0,
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   114, 1, 15, YES, 0, 0, YES, 0,
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; End of data for load case [TERMICA GRADIENTE +] -------------------------

*USE-STLD, TERMICA GRADIENTE -

*THERGRAD    ; Temperature Gradient
; ELEM_LIST, iETYP, TZ, bUSEHZ, HZ, TY, bUSEHY, HY, GROUP
; ELEM_LIST, iETYP, TZ, bUSEHZ, HZ, GROUP
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291, 1, -18, YES, 0, 0, YES, 0,
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   304, 1, -18, YES, 0, 0, YES, 0,
   306, 1, -18, YES, 0, 0, YES, 0,
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   318, 1, -18, YES, 0, 0, YES, 0,
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; End of data for load case [TERMICA GRADIENTE -] -------------------------

*USE-STLD, FRENATURA

*BEAMLOAD    ; Element Beam Loads
; ELEM LIST, CMD, TYPE, DIR, bPROJ, [ECCEN], [VALUE], GROUP
; ELEM_LIST, CMD, TYPE, TYPE, DIR, VX, VY, VZ, bPROJ, [ECCEN], [VALUE], GROUP
; [VALUE]       : D1, P1, D2, P2, D3, P3, D4, P4
; [ECCEN]       : bECCEN, ECCDIR, I-END, J-END, bJ-END
; [ADDITIONAL]  : bADDITIONAL, ADDITIONAL_I-END, ADDITIONAL_J-END, bADDITIONAL_J-END
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; End of data for load case [FRENATURA] -------------------------

*STAGE    ; Define Construction Stage
; NAME=NAME, DURATION, bSAVESTAGE, bSAVESTEP, bINCRESTEP, INCRESTEP  ; line 1
; STEP=DAY1, DAY2, ...                                               ; line 2
; AELEM=GROUP1, AGE1, GROUP2, AGE2, ...                              ; line 3
; DELEM=GROUP1, REDIST1, GROUP2, REDIST2, ...                        ; line 4
; ABNDR=BGROUP1, POS1, BGROUP2, POS2, ...                            ; line 5
; DBNDR=BGROUP1, BGROUP2, ...                                        ; line 6
; ALOAD=LGROUP1, DAY1, LGROUP2, DAY2, ...                            ; line 7
; DLOAD=LGROUP1, DAY1, LGROUP2, DAY2, ...                            ; line 8
  NAME=FASE 1, 2, YES, NO, NO, 5
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  AELEM=FASE 1, 0
  ABNDR=FASE 1, DEFORMED
  ALOAD=FASE 1, FIRST
  NAME=FASE 2, 28, YES, NO, NO, 5
  AELEM=FASE 2, 0
  ALOAD=FASE 2, FIRST
  NAME=FASE 3, 10000, YES, NO, NO, 5
  ALOAD=FASE 3, FIRST

*SFUNCTION    ; Spectrum Function
; FUNC=NAME, iTYPE, iMETHOD, SCALE/MAX, GRAV, DRATIO, DESC, RMF      ; line 1
;   SPEC_CODE, [CODE_DATA]                                           ; line 2
;      PERIOD1, VALUE1, PERIOD2, VALUE2, ...                         ; from line 3
;[CODE_DATA] : NSC, SFI, SC, EQ, TG, DP, MaxEQ
        ; CH2001
;[CODE_DATA] : NSC, SFI, SC, EQ, TG, DP, MaxEQ, nLForce              ; CH2010
;[CODE_DATA] : SFI, SC, EQ, TG, DP, MaxEQ                            ; CHSH2003
;[CODE_DATA] : DIV, SC, SFI, EQ, TG, G                               ; GB50111_2006
;[CODE_DATA] : BT, ZM, ST, SI, SC, TG, CI, CS, CD, EPA, SMAX, PERIOD ; JTG/T B02-01-20
08
;[CODE_DATA] : iSPE, SParam, TB, TC, TD, AG, Q, IF, FPX, FPY         ; P100-1(2013)
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          0.022432,   0.703495568,   0.023870,   0.717583018
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          0.060632,   1.077646023,   0.064519,   1.115723178
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          0.185573,   1.613050779,   0.197472,   1.613050779
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          0.237944,   1.613050779,   0.253200,   1.613050779
          0.269435,   1.613050779,   0.286711,   1.613050779
          0.305094,   1.613050779,   0.324656,   1.613050779
          0.345472,   1.613050779,   0.367623,   1.517677475
          0.391194,   1.426231349,   0.416277,   1.340292993
          0.442967,   1.259536594,   0.471369,   1.183644123
          0.501593,   1.112322434,   0.533754,   1.045300169
          0.567977,   0.982316443,   0.604394,   0.923128202
          0.643146,   0.867506206,   0.684384,   0.815234059
          0.728265,   0.766112811,   0.774959,   0.719951825
          0.824648,   0.676571272,   0.877523,   0.635804584
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          1.057370,   0.527661222,   1.125170,   0.495865644
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        1.738380,   0.320950049,   1.849840,    0.30161157
        1.968450,   0.283437805,   2.094660,   0.266359765
        2.228970,    0.25030985,   2.371880,   0.235228235
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        2.858000,   0.195218036,   3.041250,   0.183455206
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        3.664560,   0.146874228,   3.899520,   0.129708061
        4.149550,   0.114547936,   4.415620,   0.101159317
        4.698740,   0.089335987,   5.000000,    0.07889496
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        6.024750,   0.054338946,   6.411040,   0.047987961
        6.822120,   0.042378986,   7.259530,   0.037425901
        7.724990,   0.033051671,   8.220300,   0.029188645
        8.747380,   0.025777054,   9.308210,   0.022764438
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USER
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        0.013644,   0.172325476,   0.014519,   0.175562186
        0.015450,   0.179006834,   0.016441,   0.182671997
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        0.047287,   0.296802297,   0.050319,   0.308020155
        0.053545,   0.319957652,   0.056979,   0.332660297
        0.060632,     0.3461773,   0.064519,   0.360561199
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        0.088032,   0.410237489,   0.093676,   0.410237489
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        0.112875,   0.410237489,   0.120112,   0.410237489
        0.127814,   0.410237489,   0.136009,   0.410237489
        0.144730,   0.410237489,   0.154009,   0.410237489
        0.163884,   0.410237489,   0.174392,   0.410237489
        0.185573,   0.410237489,   0.197472,   0.410237489
        0.210134,   0.410237489,   0.223607,   0.410237489
        0.237944,   0.403156969,   0.253200,   0.378865647
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        0.501593,   0.191248247,   0.533754,   0.179724708
        0.567977,   0.168895539,   0.604394,   0.158718951
        0.643146,   0.149155529,   0.684384,   0.140168066
        0.728265,   0.131722356,   0.774959,   0.123785622
        0.824648,   0.116326944,   0.877523,   0.109317684
        0.933788,   0.102730793,   0.993660,   0.096540851
        1.057370,   0.090723949,   1.125170,   0.085257145
        1.197310,   0.080120254,   1.274080,   0.075292589
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        4.149550,   0.011629112,   4.415620,   0.010269875
        4.698740,   0.009069549,   5.000000,   0.008009558
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        6.822120,   0.004302391,   7.259530,   0.003799544
        7.724990,   0.003355465,   8.220300,   0.002963284
        8.747380,   0.002616933,   9.308210,   0.002311086
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USER
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        0.015450,   0.880701192,   0.016441,   0.893969737
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        0.019810,   0.939102343,   0.021080,   0.956115976
        0.022432,   0.974219917,   0.023870,   0.993485158
        0.025401,   1.013985367,   0.027029,   1.035799571
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        0.053545,   1.390968202,   0.056979,   1.436954035
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        0.163884,   2.374673468,   0.174392,   2.374673468
        0.185573,   2.374673468,   0.197472,   2.374673468
        0.210134,   2.374673468,   0.223607,   2.374673468
        0.237944,   2.374673468,   0.253200,   2.374673468
        0.269435,   2.374673468,   0.286711,   2.374673468
        0.305094,   2.374673468,   0.324656,   2.374673468
        0.345472,   2.374673468,   0.367623,   2.374673468
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        3.664560,   0.246866053,   3.899520,   0.231991493
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        4.698740,   0.175989333,   5.000000,   0.155420809
        5.320590,   0.137255446,   5.661740,   0.121213036
        6.024750,   0.107046165,   6.411040,   0.094534907
        6.822120,   0.083485387,   7.259530,   0.073727951
        7.724990,   0.065110843,   8.220300,   0.057500794
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USER
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        0.022432,   0.351747784,   0.023870,   0.358791509
        0.025401,   0.366286761,   0.027029,   0.374262435
        0.028762,   0.382749871,   0.030607,   0.391781393
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        0.036879,   0.422500908,   0.039244,   0.434080963
        0.041760,   0.446403931,   0.044438,   0.459516338
        0.047287,   0.473470093,   0.050319,   0.488318087
        0.053545,   0.504118598,   0.056979,   0.520931862
        0.060632,   0.538823011,   0.064519,   0.557861589
        0.068656,   0.578120563,   0.073058,   0.599678779
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        0.163884,    0.80652539,   0.174392,    0.80652539
        0.185573,    0.80652539,   0.197472,    0.80652539
        0.210134,    0.80652539,   0.223607,    0.80652539
        0.237944,    0.80652539,   0.253200,    0.80652539
        0.269435,    0.80652539,   0.286711,    0.80652539
        0.305094,    0.80652539,   0.324656,    0.80652539
        0.345472,    0.80652539,   0.367623,   0.758838738
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        1.057370,   0.263830611,   1.125170,   0.247932822
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          6.024750,   0.027169473,   6.411040,   0.023993981
          6.822120,   0.021189493,   7.259530,    0.01871295
          7.724990,   0.016525835,   8.220300,   0.014594323
          8.747380,   0.012888527,   9.308210,   0.011382219
          9.905010,    0.01005193,  10.000000,    0.00986187

*SPLDCASE    ; Spectrum Load Cases
; TYPE, bADDSIGN, iSIGNTYPE
; NAME=NAME, DIR, ANGLE, SCALE, PMFT, bDAMP, bECC, INTERP, DESC,       ; line 1
;      COMTYPE, bADDSIGN, iSIGNTYPE, bMODE                             ; line 2
;      FUNC1, FUNC2, FUNC3, ...                                        ; line 3
;      bUSE1, dFACTOR1, bUSE2, dFACTOR2, ..., bUSEn, dFACTORn          ; line 4 (bMODE
=YES)
;      bCDR, [DR-DC]                                                   ; line 5 (bDAMP
=YES)
; [DR-DC] : iMDTYPE, DALL, iMODE1, DAMPING1, iMODE2, DAMPING2, ...     ; iMDTYPE=1
;         : iMDTYPE, iCOEF, bMASSP, MASSC, bSTIFFP, STIFFC             ; iMDTYPE=2, iC
OEF=1
;         : iMDTYPE, iCOEF, iCALC, bMASSP, FP1, DR1, bSTIFFP, FP2, DR2 ; iMDTYPE=2, iC
OEF=2
   NAME=EX, XY, 0, 1, 1, NO, NO, LOG, EX
        CQC, NO, 0, YES
        SLV-H
        YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1
   NAME=EY, XY, 90, 1, 1, NO, NO, LOG, EX
        CQC, NO, 0, YES
        SLV-H
        YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1
   NAME=EZ, Z, 0, 1, 1, NO, NO, LOG, EX
        CQC, NO, 0, YES
        SLV-V
        YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1
   NAME=DX, XY, 0, 1, 1, NO, NO, LOG, DX
        CQC, NO, 0, YES
        SLD-H
        YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1
   NAME=CX, XY, 0, 1, 1, NO, NO, LOG, CX
        CQC, NO, 0, YES
        SLC-H
        YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1
   NAME=CY, XY, 90, 1, 1, NO, NO, LOG, CY
        CQC, NO, 0, YES
        SLC-H
        YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1,YES, 1

*MVLDCODE    ; Moving Load Code
; CODE=CODE
   CODE=EUROCODE

*LINELANE    ; Traffic Line Lanes
; NAME=NAME, LDIST, GROUP, SKEWS, SKEWE, MOVING, LW, WS, bLANEOPT, ALLOWWIDTH  ; line
1
;      iELEM1, ECC1, FACT1, bSPAN1, ECCVL...                           ; from
line 2
   NAME=LC01, CROSS, FASE 2, 0, 0, BOTH, 3, 2, NO, 3
           57, -1, 0, NO, 0,   110, -1, 0, NO, 0,   117, -1, 0, NO, 0
          124, -1, 0, NO, 0,   131, -1, 0, NO, 0,    62, -1, 0, NO, 0
          142, -1, 0, NO, 0,   149, -1, 0, NO, 0,   156, -1, 0, NO, 0
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          163, -1, 0, NO, 0,    63, -1, 0, NO, 0,   174, -1, 0, NO, 0
          181, -1, 0, NO, 0,   188, -1, 0, NO, 0,   195, -1, 0, NO, 0
           64, -1, 0, NO, 0,   206, -1, 0, NO, 0,   213, -1, 0, NO, 0
          220, -1, 0, NO, 0,   227, -1, 0, NO, 0,    65, -1, 0, NO, 0
          238, -1, 0, NO, 0,   245, -1, 0, NO, 0,   252, -1, 0, NO, 0
          259, -1, 0, NO, 0,    66, -1, 0, NO, 0,   270, -1, 0, NO, 0
          277, -1, 0, NO, 0,   284, -1, 0, NO, 0,   291, -1, 0, NO, 0
           67, -1, 0, NO, 0,   302, -1, 0, NO, 0,   309, -1, 0, NO, 0
          316, -1, 0, NO, 0,   323, -1, 0, NO, 0,    68, -1, 0, NO, 0
          334, -1, 0, NO, 0,   341, -1, 0, NO, 0,   348, -1, 0, NO, 0
          355, -1, 0, NO, 0,    69, -1, 0, NO, 0,   366, -1, 0, NO, 0
          373, -1, 0, NO, 0,   380, -1, 0, NO, 0,   387, -1, 0, NO, 0
           70, -1, 0, NO, 0,   398, -1, 0, NO, 0,   405, -1, 0, NO, 0
          412, -1, 0, NO, 0,   419, -1, 0, NO, 0
   NAME=LC02, CROSS, FASE 2, 0, 0, BOTH, 3, 2, NO, 3
           57, -4, 0, NO, 0,   110, -4, 0, NO, 0,   117, -4, 0, NO, 0
          124, -4, 0, NO, 0,   131, -4, 0, NO, 0,    62, -4, 0, NO, 0
          142, -4, 0, NO, 0,   149, -4, 0, NO, 0,   156, -4, 0, NO, 0
          163, -4, 0, NO, 0,    63, -4, 0, NO, 0,   174, -4, 0, NO, 0
          181, -4, 0, NO, 0,   188, -4, 0, NO, 0,   195, -4, 0, NO, 0
           64, -4, 0, NO, 0,   206, -4, 0, NO, 0,   213, -4, 0, NO, 0
          220, -4, 0, NO, 0,   227, -4, 0, NO, 0,    65, -4, 0, NO, 0
          238, -4, 0, NO, 0,   245, -4, 0, NO, 0,   252, -4, 0, NO, 0
          259, -4, 0, NO, 0,    66, -4, 0, NO, 0,   270, -4, 0, NO, 0
          277, -4, 0, NO, 0,   284, -4, 0, NO, 0,   291, -4, 0, NO, 0
           67, -4, 0, NO, 0,   302, -4, 0, NO, 0,   309, -4, 0, NO, 0
          316, -4, 0, NO, 0,   323, -4, 0, NO, 0,    68, -4, 0, NO, 0
          334, -4, 0, NO, 0,   341, -4, 0, NO, 0,   348, -4, 0, NO, 0
          355, -4, 0, NO, 0,    69, -4, 0, NO, 0,   366, -4, 0, NO, 0
          373, -4, 0, NO, 0,   380, -4, 0, NO, 0,   387, -4, 0, NO, 0
           70, -4, 0, NO, 0,   398, -4, 0, NO, 0,   405, -4, 0, NO, 0
          412, -4, 0, NO, 0,   419, -4, 0, NO, 0
   NAME=LC03, CROSS, FASE 2, 0, 0, BOTH, 1, 1, NO, 3
           57, -5, 0, NO, 0,   110, -5, 0, NO, 0,   117, -5, 0, NO, 0
          124, -5, 0, NO, 0,   131, -5, 0, NO, 0,    62, -5, 0, NO, 0
          142, -5, 0, NO, 0,   149, -5, 0, NO, 0,   156, -5, 0, NO, 0
          163, -5, 0, NO, 0,    63, -5, 0, NO, 0,   174, -5, 0, NO, 0
          181, -5, 0, NO, 0,   188, -5, 0, NO, 0,   195, -5, 0, NO, 0
           64, -5, 0, NO, 0,   206, -5, 0, NO, 0,   213, -5, 0, NO, 0
          220, -5, 0, NO, 0,   227, -5, 0, NO, 0,    65, -5, 0, NO, 0
          238, -5, 0, NO, 0,   245, -5, 0, NO, 0,   252, -5, 0, NO, 0
          259, -5, 0, NO, 0,    66, -5, 0, NO, 0,   270, -5, 0, NO, 0
          277, -5, 0, NO, 0,   284, -5, 0, NO, 0,   291, -5, 0, NO, 0
           67, -5, 0, NO, 0,   302, -5, 0, NO, 0,   309, -5, 0, NO, 0
          316, -5, 0, NO, 0,   323, -5, 0, NO, 0,    68, -5, 0, NO, 0
          334, -5, 0, NO, 0,   341, -5, 0, NO, 0,   348, -5, 0, NO, 0
          355, -5, 0, NO, 0,    69, -5, 0, NO, 0,   366, -5, 0, NO, 0
          373, -5, 0, NO, 0,   380, -5, 0, NO, 0,   387, -5, 0, NO, 0
           70, -5, 0, NO, 0,   398, -5, 0, NO, 0,   405, -5, 0, NO, 0
          412, -5, 0, NO, 0,   419, -5, 0, NO, 0

*VEHICLE    ; Vehicles
; if Moving Load Code is China
; NAME=NAME, 1, TYPE-NAME, CODE
; standard
; NAME=NAME, 2, LTYPE, [TRUCK/LANE] or [TRAIN/SUBWAY] or [CROWD]
; user: line 1
;      LOAD1, DIST1, LOAD2, DIST2, ...
; user: from line 2
; [TRUCK/LANE] : 1, P, Qm, Qq
; truck(JTG)
; [TRUCK/LANE] : 2, P, Qm, Qq
```

```
; lane load1
; [TRUCK/LANE] : 3, Qk, Pk1, L1, Pk2, L2
; lane load2
; [TRUCK/LANE] : 4, dW, dD
; crawler type
; [TRUCK/LANE] : 5
; GC type load
; [TRAIN/SUBWAY] : iTYPE, W1, D1, W2, D2
; train-type1,3
; [TRAIN/SUBWAY] : iTYPE, DD, FD, BD, MAINCOUNT
; train-type2
; [TRAIN/SUBWAY] : 4, P1, D1, P2, D2, P3, D3, P4, dD, Po, n, IFR
; subway
; [CROWD] : 1, dW1
; crowd-type1
; [CROWD] : 2, dW1, dL1, dW2, dL2, WIDTH
; crowd-type2
; if Moving Load Type is India
; NAME=NAME, 1, TYPE-NAME, CODE
; standard
; NAME=NAME, 2, bWTB, P, D, Pb, Db, dD1, dD2, NDIST
; user: line 1
; NAME=NAME, 2, bWTB, dD1, dD2, NDIST
; user: line 1
;      LOAD1, DIST1, LOAD2, DIST2, ...
; user: from line 2
; if Moving Load Code is CANADA
; NAME=NAME, 1, TYPE-NAME, DLA, CODE, [DYNA]
; standard
; NAME=NAME, 2, bTRAIN, W(W1), PL(D1), PLM(W2), PLV(D2), NDIST, [DYNA]
; user: line 1
;      LOAD1, DIST1, LOAD2, DIST2, ...
; user: from line 2
; [DYNA] : nDYNA, FACT1AXLE, FACT2AXLE, FACT3AXLE
; Dynamic Load Allowance
; if Moving Load Code is BS
; NAME=NAME, 1, TYPE-NAME, CODE, UNITNUM
; standard
; NAME=nLane, FACTOR1, FACTOR2, FACTOR3, FACTOR4, ADDDATA, AL, CA, LL
; HA, HA & HB, HA & HB(Auto)
; NAME=NAME, 2, iSTYPE, W1, W2, W3, L, Pa, Pb, D1, D2, d, UNITNUM
; user(BS 5400)
; NAME=NAME, 2, iSTYPE, [BD37/01-HA], [BS-DATA-LF]
; user(HA)
; NAME=NAME, 2, iSTYPE, [BS-DATA-HB]
; user(HB)
; NAME=NAME, 2, iSTYPE, [BD37/01-HA2], [BS-DATA-HB2], [BS-DATA-LF]
; user(HA&HB)
; NAME=NAME, 2, iSTYPE, [BD37/01-HA], [BD37/01-HB], [BS-DATA-LF]
; user(HA&HB(AUTO))
; NAME=NAME, 2, iSTYPE, W, L
; user(Pedestrian)
; NAME=NAME, 2, iSTYPE, V, AN, MINS, MAXS, P1, D1, P2, D2, ...
; user(Special Vehicle)
; [BS-DATA-HA]  : W1, W2, W3, EXP, EXP2, L1, L2, Pa
; [BS-DATA-HA2] : W1, W2, W3, EXP, EXP2, L1, L2
; [BS-DATA-HB]  : Pb, D1, D2, d, UNITNUM
; [BS-DATA-HB2] : Pb, D1, D2, d, dd, UNITNUM
; [BS-DATA-LF] : nLT, LF1, LF2, LF3, LF4
; if Moving Load Code is EUROCODE
; NAME=NAME, 1, iTYPE, TYPE-NAME, PSY1, PSY2, PHI, [AF7]
; standard (LM1, FLM1)
```

```
; NAME=NAME, 1, iTYPE, TYPE-NAME, bDF, bU, PHI, PSY, ADJ, IN
; standard (others)
; NAME=NAME, 2, 1, [AF7]
; user(Type 1)
;      [LOAD7], D, PHI, TPSY, UPSY
; user(Type 1): line 2
; NAME=NAME, 2, 2, ALP, TPSY, W, BET, LPSY, P1, D1, P2, D2, ...
; user(Type 2)
; NAME=NAME, 2, 3
; user(Type 3)
;      [LOADCASE1]
; user(Type 3): line 2
;      [LOADCASE2]
; user(Type 3): line 3
;      [LOADCASE3]
; user(Type 3): line 4
; NAME=NAME, 2, 4, WS, V, AN, MINS, MAXS, DYF, UI, F, P1, D1, P2, D2, ...
; user(Type 4)
; NAME=NAME, 2, 5, INT, bPHI1, PHI1, bPHI2, PHI2
; user(Type 5)
;      [VEHICLE1]
; user(Type 5): line 2
;      [VEHICLE2]
; user(Type 5): line 3
;      [VEHICLE3]
; user(Type 5): line 4
; [AF7] : TF1, TF2, TF3, UF1, UF2, UF3, UF4
; adjustment factor
; [LOAD7] : TL1, TL2, TL3, UL1, UL2, UL3, UL4
; tandem/udl loads
; [LOADCASE] : bUSE, N, bDF, bUI, PHI, P1, L1, P2, L2, ...
; load case
; [VEHICLE] : bUSE, N, P1, L1, P2, L2, ...
; vehicle
; if Moving Load Code is RUSSIA
; NAME=NAME, 1, iTYPE, K, nDYNAFAC, dDYNAFAC, bFATI, nLOADFAC, dLOADFAC
; standard (SK)
; NAME=NAME, 1, iTYPE, K, nDYNAFAC, dDYNAFAC, bFATI, nLOADFAC, dLOADFAC
; standard (SK FATIGUE)
; NAME=NAME, 1, iTYPE, K, nDYNAFAC, dDYNAFAC, dDYNAFAC_UDL

;                  bFATI, nLOADFAC, dLOADFAC, dLOADFAC_UDL, s1[3], s1_UDL[3]
; standard (AK)
; NAME=NAME, 1, iTYPE, K, nDYNAFAC, dDYNAFAC, nLOADFAC, dLOADFAC,

;                  bTWOVEHI, TWOVEHI_FACT, b2NDREDUC, 2NDREDUC_FACT
; standard (N14)
; NAME=NAME, 1, iTYPE, K, nDYNAFAC, dDYNAFAC, nLOADFAC, dLOADFAC,

;                  bTWOVEHI, TWOVEHI_FACT, b2NDREDUC, 2NDREDUC_FACT
; standard (N11)
; NAME=NAME, 1, iTYPE, nDYNAFAC, dDYNAFAC, dEMPTYCAR

;               bFATI, nLOADFAC, dLOADFAC,
; standard (SUBWAY TRAINS)
; NAME=NAME, 1, iTYPE, VARIABLE, nDYNAFAC, dDYNAFAC, dEMPTYCAR

;                         bFATI, nLOADFAC, dLOADFAC,
; standard (TRAMCARS)
; NAME=NAME, 1, iTYPE, nDYNAFAC, dDYNAFAC, bFATI, nLOADFAC, dLOADFAC
; standard (NK-80)
; NAME=NAME, 1, iTYPE, W, D, nDYNAFAC, dDYNAFAC, bFATI, nLOADFAC, dLOADFAC
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; standard (NG-60)
; NAME=NAME, 1, iTYPE, BRIDGETYPE, W, bFATI, nLOADFAC, dLOADFAC
; standard (UNIFORM LOAD)
; NAME=NAME, 1, iTYPE, BRIDGETYPE, W, bFATI, nLOADFAC, dLOADFAC
; standard (UNIFORM LOAD(W/O OTHER LOADS))
; NAME=NAME, 1, iTYPE, BRIDGETYPE, P
; standard (CONCENTRATED LOAD (W/O OTHER LOADS))
; NAME=NAME, 2, iTYPE, W, nDYNAFAC, dDYNAFAC, dDYNAFAC_UDL

;                   bFATI, nLOADFAC, dLOADFAC, dLOADFAC_UDL, s1[3], s1_UDL[3]
; user (Type 1)
; NAME=NAME, 2, iTYPE, nDYNAFAC, dDYNAFAC, dEMPTYCAR

;                bFATI, nLOADFAC, dLOADFAC,
; user (Type 2)
; NAME=NAME, 2, iTYPE, Variable, nDYNAFAC, dDYNAFAC, dEMPTYCAR

;                          bFATI, nLOADFAC, dLOADFAC,
; user (Type 3)
; NAME=NAME, 2, iTYPE, nDYNAFAC, dDYNAFAC, nLOADFAC, dLOADFAC

;                          bTWOVEHI, TWOVEHI_FACT, b2NDREDUC, 2NDREDUC_FACT
; user (Type 4)
; NAME=NAME, 2, iTYPE, nDYNAFAC, dDYNAFAC, nLOADFAC, dLOADFAC

;                          bTWOVEHI, TWOVEHI_FACT, b2NDREDUC, 2NDREDUC_FACT
; user (Type 5)
; NAME=NAME, 2, iTYPE, W, D, nDYNAFAC, dDYNAFAC, bFATI, nLOADFAC, dLOADFAC
; user (Type 6)
; NAME=NAME, 2, iTYPE, P, W, bFATI, nLOADFAC, dLOADFAC
; user (Type 7)
; if Moving Load Code is KSCE-LSD15
; NAME=NAME, 1, TYPE-NAME, nLANETYPE, dDYNAFAC,  CODE, nLANELOAD, L, CONVERTDIST
; standard
; NAME=NAME, 2, 8, L1, W1, W2, EXP, dDYNAFAC, nLANELOAD, L, CONVERTDIST
; user: line 1 (Type 1)
; NAME=NAME, 2, 1, W1, W2, D1, D2, 0, 0, 0, NO
; user: line 1 (Type 2)
; NAME=NAME, 2, 6, LOADNUM, DIST, W, L, 0, 0, 0, NO
; user: line 1 (Type 3)
;      LOAD1, DIST1, (DIST2_1), LOAD2, DIST2, (DIST2_2), ...
; user: from line 2
; if Moving Load Code is South Africa
; NAME=NAME, 1, TYPE-NAME, CODE, bINCREL, dINCREL
; standard NA
; NAME=NAME, 1, TYPE-NAME, CODE, UNITNUM
; standard NB
; NAME=NAME, 1, TYPE-NAME, CODE, OPPOSITE
; standard NC
; NAME=NAME, 2, TYPE, W1, L, W2, W3, PA, bINCREL, dINCREL
; user NA
; NAME=NAME, 2, TYPE, PB, UNITNUM, DELTA, D1, D2
; user NB
; NAME=NAME, 2, TYPE, P, OPPOSITE, NUM1, NUM2, NUM3 [DIST1], [DIST2], [DIST3]
; user NC
; if Load Type is Permit Truck
; NAME=NAME, 3, AXLE-TYPE-NUM, IMP-FACTOR
; user(Permit Truck)
;      AXLE-TYPE-NAME1, bEDWL1, bSV1, P1, D1, P2, D2, ..., Pn, Dn
; user(from line 2)
;      ...
;      AXLE-TYPE-NAMEn, bEDWLn, bSVn, P1, D1, P2, D2, ..., Pn, Dn
```

```
;       AXLE-TYPE1, SPACING1, bVS1, AXLE-TYPE2, SPACING2, bVS2 ...
; line 2+AXLE-TYPE-NUM
; if Moving Load Code is not one of those specified above.
; NAME=NAME, 1, TYPE-NAME, DLA, CODE
; standard
; NAME=NAME, 2, bTRAIN, W(W1), PL(D1), PLM(W2), PLV(D2), NDIST
; user: line 1
;       LOAD1, DIST1, LOAD2, DIST2, ...
; user: from line 2
  NAME=Q1A_q1a, 2, 1, 1, 1, 0, 1, 0, 0, 0
       300, 0, 0, 9, 0, 0, 0, 1.2, 1, 1, 1
  NAME=Q2A_q2a, 2, 1, 1, 0, 0, 1, 0, 0, 0
       200, 0, 0, 2.5, 0, 0, 0, 1.2, 1, 1, 1
  NAME=q3a, 2, 1, 0, 0, 0, 1, 0, 0, 0
       0, 0, 0, 2.5, 0, 0, 0, 1.2, 1, 1, 1

*MVLDCASE(EURO)    ; Moving Load Cases
; NAME=NAME, bOPTIM, iTYPE, DESC, VHL1, VHL2, bLEAD, SERIAL
                                  ; type 1, 3
;       nType, SLN1, SLN2, SLN3, ...
                                  ;   line 2   (nType=1)
;       nType, SRA1, SRA2, SRA3, ...
                                  ;   line 2/3 (nType=2)
;       nType, FLN1, FLN2, FLN3, ...
                                  ;   line 4   (nType=3)
; NAME=NAME, bOPTIM, iTYPE, DESC, iOPT, bLEAD, SERIAL
                                  ; type 2
;       [SUB1]
                                  ;   line 2
;       ...
                                  ;   ...
;       [SUBn]
                                  ;   line n+1
; [SUB] : VCLA, SCA, MIN, MAX, SLN1, SLN2, ...
                                  ; sub-loadcase
; NAME=NAME, bOPTIM, iTYPE, DESC, iOPT, bLEAD, SERIAL
                                  ; type 4
;       0, SLN1, SLN2, SLN3, ...
                                  ;   line 2
;       1, SRA1, SRA2, SRA3, ...
                                  ;   line 3
;       2, STradd1, STradd2, STradd3, ...
                                  ;   line 4
; NAME=NAME, bOPTIM, iTYPE, DESC, iOPT, SF1, SF2, SF3, bPSI1, MULF1, MULF2, MULF3, SER
IAL                               ; type 5
;       [SUB1]
                                  ;   line 2
;       ...
                                  ;   ...
;       [SUBn]
                                  ;   line n+1
; ////////////////////////////////////////////////////////////////////////////////////
////////////////////////////////;
; Moving Load Optimization
                                  ;
; NAME=NAME, bOPTIM, iTYPE, DESC, VHL1, VHL2, bLEAD, MINVEHL, LANEOP, LOADEDLANE, SERI
AL                                ; type 1, 3
;       nType, SRA1, SRA2, SRA3, ...
                                  ;   line 2 (nType=2)
;       nType, FLN1, FLN2, FLN3, ...
                                  ;   line 3 (nType=3)
; NAME=NAME, bOPTIM, iTYPE, DESC, iOPT, bLEAD, MINVEHL, LANEOP, MIN, MAX, SERIAL
```

```
                                    ; type 2
;       [ASSGNVEHL1]
                                    ;   line 2
;       ...
                                    ;   ...
;       [ASSGNVEHLn]
                                    ;   line n+1
; [ASSGNVEHL] : VC, VCLA, SCA ...
                                    ; Assignment-Vehicle
; NAME=NAME, bOPTIM, iTYPE, DESC, iOPT, bLEAD, MINVEHL, LANEOP, LOADEDLANE, SERIAL
                                    ; type 4
;       1, SRA1, SRA2, SRA3, ...
                                    ;   line 3
; NAME=NAME, bOPTIM, iTYPE, DESC, iOPT, SF1, SF2, SF3, bPSI1, MULF1, MULF2, MULF3, MIN
VEHL, LANEOP, MIN, MAX, SERIAL  ; type 5
;       [ASSGNVEHL1]
                                    ;   line 2
;       ...
                                    ;   ...
;       [ASSGNVEHLn]
                                    ;   line n+1
   NAME=LM01, NO, 1, , Q1A_q1a, , YES, 1
        1, LC01
   NAME=LM02, NO, 1, , Q2A_q2a, , YES, 2
        1, LC02
   NAME=LM03, NO, 1, , q3a, , YES, 3
        1, LC03

*CPOSECT4CS    ; Composite Section for Construction Stage
; SEC=SEC, ASTAGE, TYPE, bTAP                                                    //
line 1
;     [PART-INFO]-1                                                              //
from line 2
;     ...
;     [PART-INFO]-n
; [PART-INFO] : [COMMON], [SCALE], H, VS                                         //
TYPE=A,B,NORMAL
;               [COMMON], [SCALE], CY, CZ, [STIFF], H, VS                      //
TYPE=USER
;               [COMMON], [SCALE], CYI, CZI, CYJ, CZJ, [STIFF]-I, [STIFF]-J, H, VS //
TYPE=USER, bTAP=YES
; [COMMON]: PART, MTYPE, MAT, CSTAGE, AGE
; [SCALE] : AREA, ASY, ASZ, IXX, IYY, IZZ, WAREA
; [STIFF] : AREA, ASY, ASZ, IXX, IYY, CYP, CYM, CZP, CZM, QYB, QZB, \
;           X1, X2, X3, X4, Y1, Y2, Y3, Y4
   SEC=7, FASE 1, NORMAL, NO
        1, ELEM, , , 0, 1, 1, 1, 1, 1, 1, 1, 0.0233196, 0
        2, MATL, 2, FASE 3, 0, 1, 1, 1, 1, 1, 1, 1, 0.229839, 0
   SEC=9, FASE 1, NORMAL, NO
        1, ELEM, , , 0, 1, 1, 1, 1, 1, 1, 1, 0.0321717, 0
        2, MATL, 2, FASE 3, 0, 1, 1, 1, 1, 1, 1, 1, 0.229839, 0
   SEC=8, FASE 1, NORMAL, NO
        1, ELEM, , , 0, 1, 1, 1, 1, 1, 1, 1, 0.027365, 0
        2, MATL, 2, FASE 3, 0, 1, 1, 1, 1, 1, 1, 1, 0.229839, 0
   SEC=3, FASE 1, NORMAL, NO
        1, ELEM, , , 0, 1, 1, 1, 1, 1, 1, 1, 0.0187086, 0
        2, MATL, 2, FASE 3, 0, 1, 1, 1, 1, 1, 1, 1, 0.229508, 0

*STAGE-COLOR    ; Diagram Color for Construction Stage
; STAGENAME, iR(COLOR), iG(COLOR), iB(COLOR)
 FASE 1, 210, 210, 210
 FASE 2, 0, 128, 128
```

```
 FASE 3, 0, 192, 192

*LOADCOMB    ; Combinations
; NAME=NAME, KIND, ACTIVE, bES, iTYPE, DESC, iSERV-TYPE, nLCOMTYPE   ; line 1
;      ANAL1, LCNAME1, FACT1, ...                                    ; from line 2
   NAME=SLU1, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA UNIFORME +, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU2, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA UNIFORME -, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU3, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA GRADIENTE +, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU4, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA GRADIENTE -, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU5, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA UNIFORME +, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU6, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA UNIFORME -, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU7, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA GRADIENTE +, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU8, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA GRADIENTE -, 0.9
        ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
        MV, LM03, 1.0125, CS, Summation, 1.35
   NAME=SLU9, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU10, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU11, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU12, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU13, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU14, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU15, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU16, GEN, ACTIVE, 0, 0, , 0, 0
        ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
        ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
   NAME=SLU17, GEN, ACTIVE, 0, 0, , 0, 0
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      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU18, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU19, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU20, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU21, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU22, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU23, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU24, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLV1, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV2, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV3, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV4, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV5, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV6, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV7, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV8, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV9, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV10, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV11, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV12, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV13, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV14, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV15, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV16, GEN, ACTIVE, 0, 0, , 0, 0
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     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV17, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV18, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV19, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV20, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -1, RS, EY, -0.3
     CS, Summation, 1
NAME=SLV21, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV22, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV23, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV24, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -1
     CS, Summation, 1
NAME=SLV25, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 1, RS, EY, 0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV26, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -1, RS, EY, 0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV27, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 1, RS, EY, -0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV28, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -1, RS, EY, -0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV29, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 0.3, RS, EY, 1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV30, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 0.3, RS, EY, -1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV31, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -0.3, RS, EY, 1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV32, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -0.3, RS, EY, -1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV33, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV34, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV35, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV36, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV37, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV38, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV39, GEN, ACTIVE, 0, 0, , 0, 0
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      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV40, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV41, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV42, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV43, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV44, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV45, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV46, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV47, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV48, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV49, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV50, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV51, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV52, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV53, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV54, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV55, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV56, GEN, ACTIVE, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=RARA_1, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA UNIFORME +, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_2, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA UNIFORME -, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_3, GEN, ACTIVE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA GRADIENTE +, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
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NAME=RARA_4, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_5, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_6, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_7, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_8, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA 9, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_10, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_11, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_12, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_13, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_14, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_15, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_16, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=FREQ_1, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_2, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_3, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_4, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_5, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ 6, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_7, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_8, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
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     CS, Summation, 1
NAME=FREQ_9, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_10, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_11, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_12, GEN, ACTIVE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_13, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_14, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_15, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_16, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=QP_1, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, CS, Summation, 1
NAME=QP_2, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, CS, Summation, 1
NAME=QP_3, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, CS, Summation, 1
NAME=QP_4, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, CS, Summation, 1
NAME=SLD1, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, 1, CS, Summation, 1
NAME=SLD2, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, -1, CS, Summation, 1
NAME=SLD3, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, 1, CS, Summation, 1
NAME=SLD4, GEN, ACTIVE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, -1, CS, Summation, 1
NAME=ENVESLU-SLV, GEN, ACTIVE, 0, 1, , 0, 0
     CB, SLU1, 1, CB, SLU2, 1, CB, SLU3, 1, CB, SLU4, 1, CB, SLU5, 1
     CB, SLU6, 1, CB, SLU7, 1, CB, SLU8, 1, CB, SLU9, 1, CB, SLU10, 1
     CB, SLU11, 1, CB, SLU12, 1, CB, SLU13, 1, CB, SLU14, 1, CB, SLU15, 1
     CB, SLU16, 1, CB, SLU17, 1, CB, SLU18, 1, CB, SLU19, 1, CB, SLU20, 1
     CB, SLU21, 1, CB, SLU22, 1, CB, SLU23, 1, CB, SLU24, 1, CB, SLV1, 1
     CB, SLV2, 1, CB, SLV3, 1, CB, SLV4, 1, CB, SLV5, 1, CB, SLV6, 1
     CB, SLV7, 1, CB, SLV8, 1, CB, SLV9, 1, CB, SLV10, 1, CB, SLV11, 1
     CB, SLV12, 1, CB, SLV13, 1, CB, SLV14, 1, CB, SLV15, 1, CB, SLV16, 1
     CB, SLV17, 1, CB, SLV18, 1, CB, SLV19, 1, CB, SLV20, 1, CB, SLV21, 1
     CB, SLV22, 1, CB, SLV23, 1, CB, SLV24, 1, CB, SLV25, 1, CB, SLV26, 1
     CB, SLV27, 1, CB, SLV28, 1, CB, SLV29, 1, CB, SLV30, 1, CB, SLV31, 1
     CB, SLV32, 1, CB, SLV33, 1, CB, SLV34, 1, CB, SLV35, 1, CB, SLV36, 1
     CB, SLV37, 1, CB, SLV38, 1, CB, SLV39, 1, CB, SLV40, 1, CB, SLV41, 1
     CB, SLV42, 1, CB, SLV43, 1, CB, SLV44, 1, CB, SLV45, 1, CB, SLV46, 1
     CB, SLV47, 1, CB, SLV48, 1, CB, SLV49, 1, CB, SLV50, 1, CB, SLV51, 1
     CB, SLV52, 1, CB, SLV53, 1, CB, SLV54, 1, CB, SLV55, 1, CB, SLV56, 1
NAME=ENVE-RARA, GEN, ACTIVE, 0, 1, , 0, 0
     CB, RARA_1, 1, CB, RARA_2, 1, CB, RARA_3, 1, CB, RARA_4, 1
     CB, RARA_5, 1, CB, RARA_6, 1, CB, RARA_7, 1, CB, RARA_8, 1
     CB, RARA_9, 1, CB, RARA_10, 1, CB, RARA_11, 1, CB, RARA_12, 1
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     CB, RARA_13, 1, CB, RARA_14, 1, CB, RARA_15, 1, CB, RARA_16, 1
NAME=ENVE-FREQ, GEN, ACTIVE, 0, 1, , 0, 0
     CB, FREQ_1, 1, CB, FREQ_2, 1, CB, FREQ_3, 1, CB, FREQ_4, 1
     CB, FREQ_5, 1, CB, FREQ_6, 1, CB, FREQ_7, 1, CB, FREQ_8, 1
     CB, FREQ_9, 1, CB, FREQ_10, 1, CB, FREQ_11, 1, CB, FREQ_12, 1
     CB, FREQ_13, 1, CB, FREQ_14, 1, CB, FREQ_15, 1, CB, FREQ_16, 1
NAME=ENVE-QP, GEN, ACTIVE, 0, 1, , 0, 0
     CB, QP_1, 1, CB, QP_2, 1, CB, QP_3, 1, CB, QP_4, 1
NAME=ENVE-SLD, GEN, ACTIVE, 0, 1, , 0, 0
     CB, SLD1, 1, CB, SLD2, 1, CB, SLD3, 1, CB, SLD4, 1
NAME=SLC_X, GEN, ACTIVE, 0, 0, , 0, 0
     RS, CX, 1, RS, CY, 0.3
NAME=SLC_Y, GEN, ACTIVE, 0, 0, , 0, 0
     RS, CY, 1, RS, CX, 0.3
NAME=SLU1, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA UNIFORME +, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU2, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA UNIFORME -, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU3, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA GRADIENTE +, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU4, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA GRADIENTE -, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU5, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA UNIFORME +, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU6, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA UNIFORME -, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU7, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA GRADIENTE +, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU8, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA GRADIENTE -, 0.9
     ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
     MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU9, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
     ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU10, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
     ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU11, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
     ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU12, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
     ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU13, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
     ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU14, STEEL, STRENGTH, 0, 0, , 0, 0
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      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU15, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU16, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU17, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU18, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU19, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU20, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU21, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU22, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU23, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU24, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLV1, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV2, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV3, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV4, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV5, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV6, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV7, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV8, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV9, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV10, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV11, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
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NAME=SLV12, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV13, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV14, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV15, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV16, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV17, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV18, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV19, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV20, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -1, RS, EY, -0.3
     CS, Summation, 1
NAME=SLV21, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV22, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV23, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV24, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -1
     CS, Summation, 1
NAME=SLV25, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 1, RS, EY, 0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV26, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -1, RS, EY, 0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV27, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 1, RS, EY, -0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV28, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -1, RS, EY, -0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV29, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 0.3, RS, EY, 1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV30, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 0.3, RS, EY, -1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV31, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -0.3, RS, EY, 1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV32, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -0.3, RS, EY, -1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV33, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV34, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV35, STEEL, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV36, STEEL, STRENGTH, 0, 0, , 0, 0
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      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV37, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV38, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV39, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV40, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV41, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV42, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV43, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV44, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
      CS, Summation, 1
NAME=SLV45, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV46, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV47, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV48, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV49, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV50, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV51, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV52, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV53, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV54, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV55, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV56, STEEL, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
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NAME=RARA_1, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_2, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_3, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_4, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 1, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_5, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA 6, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_7, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_8, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 1, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_9, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_10, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_11, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_12, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_13, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA UNIFORME +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_14, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA UNIFORME -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_15, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA GRADIENTE +, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_16, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA GRADIENTE -, 0.6
     ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=FREQ_1, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_2, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ 3, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_4, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_5, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
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     CS, Summation, 1
NAME=FREQ_6, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_7, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_8, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_9, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_10, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_11, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_12, STEEL, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_13, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_14, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ 15, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_16, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=QP_1, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, CS, Summation, 1
NAME=QP_2, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, CS, Summation, 1
NAME=QP_3, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, CS, Summation, 1
NAME=QP_4, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, CS, Summation, 1
NAME=SLD1, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, 1, CS, Summation, 1
NAME=SLD2, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, -1, CS, Summation, 1
NAME=SLD3, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, 1, CS, Summation, 1
NAME=SLD4, STEEL, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, -1, CS, Summation, 1
NAME=ENVESLU-SLV, STEEL, STRENGTH, 0, 1, , 0, 0
     CBS, SLU1, 1, CBS, SLU2, 1, CBS, SLU3, 1, CBS, SLU4, 1, CBS, SLU5, 1
     CBS, SLU6, 1, CBS, SLU7, 1, CBS, SLU8, 1, CBS, SLU9, 1, CBS, SLU10, 1
     CBS, SLU11, 1, CBS, SLU12, 1, CBS, SLU13, 1, CBS, SLU14, 1
     CBS, SLU15, 1, CBS, SLU16, 1, CBS, SLU17, 1, CBS, SLU18, 1
     CBS, SLU19, 1, CBS, SLU20, 1, CBS, SLU21, 1, CBS, SLU22, 1
     CBS, SLU23, 1, CBS, SLU24, 1, CBS, SLV1, 1, CBS, SLV2, 1, CBS, SLV3, 1
     CBS, SLV4, 1, CBS, SLV5, 1, CBS, SLV6, 1, CBS, SLV7, 1, CBS, SLV8, 1
     CBS, SLV9, 1, CBS, SLV10, 1, CBS, SLV11, 1, CBS, SLV12, 1
     CBS, SLV13, 1, CBS, SLV14, 1, CBS, SLV15, 1, CBS, SLV16, 1
     CBS, SLV17, 1, CBS, SLV18, 1, CBS, SLV19, 1, CBS, SLV20, 1
     CBS, SLV21, 1, CBS, SLV22, 1, CBS, SLV23, 1, CBS, SLV24, 1
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      CBS, SLV25, 1, CBS, SLV26, 1, CBS, SLV27, 1, CBS, SLV28, 1
      CBS, SLV29, 1, CBS, SLV30, 1, CBS, SLV31, 1, CBS, SLV32, 1
      CBS, SLV33, 1, CBS, SLV34, 1, CBS, SLV35, 1, CBS, SLV36, 1
      CBS, SLV37, 1, CBS, SLV38, 1, CBS, SLV39, 1, CBS, SLV40, 1
      CBS, SLV41, 1, CBS, SLV42, 1, CBS, SLV43, 1, CBS, SLV44, 1
      CBS, SLV45, 1, CBS, SLV46, 1, CBS, SLV47, 1, CBS, SLV48, 1
      CBS, SLV49, 1, CBS, SLV50, 1, CBS, SLV51, 1, CBS, SLV52, 1
      CBS, SLV53, 1, CBS, SLV54, 1, CBS, SLV55, 1, CBS, SLV56, 1
NAME=ENVE-RARA, STEEL, SERVICE, 0, 1, , 0, 0
      CBS, RARA_1, 1, CBS, RARA_2, 1, CBS, RARA_3, 1, CBS, RARA_4, 1
      CBS, RARA_5, 1, CBS, RARA_6, 1, CBS, RARA_7, 1, CBS, RARA_8, 1
      CBS, RARA_9, 1, CBS, RARA_10, 1, CBS, RARA_11, 1, CBS, RARA_12, 1
      CBS, RARA_13, 1, CBS, RARA_14, 1, CBS, RARA_15, 1, CBS, RARA_16, 1
NAME=ENVE-FREQ, STEEL, SERVICE, 0, 1, , 0, 0
      CBS, FREQ_1, 1, CBS, FREQ_2, 1, CBS, FREQ_3, 1, CBS, FREQ_4, 1
      CBS, FREQ_5, 1, CBS, FREQ_6, 1, CBS, FREQ_7, 1, CBS, FREQ_8, 1
      CBS, FREQ_9, 1, CBS, FREQ_10, 1, CBS, FREQ_11, 1, CBS, FREQ_12, 1
      CBS, FREQ_13, 1, CBS, FREQ_14, 1, CBS, FREQ_15, 1, CBS, FREQ_16, 1
NAME=ENVE-QP, STEEL, SERVICE, 0, 1, , 0, 0
      CBS, QP_1, 1, CBS, QP_2, 1, CBS, QP_3, 1, CBS, QP_4, 1
NAME=ENVE-SLD, STEEL, SERVICE, 0, 1, , 0, 0
      CBS, SLD1, 1, CBS, SLD2, 1, CBS, SLD3, 1, CBS, SLD4, 1
NAME=SLU1, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU2, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU3, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU4, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1.5, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU5, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU6, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU7, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU8, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1.5, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.0125, MV, LM01, 1.0125, MV, LM02, 1.0125
      MV, LM03, 1.0125, CS, Summation, 1.35
NAME=SLU9, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU10, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU11, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
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      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU12, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU13, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU14, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU15, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU16, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, CS, Summation, 1.35
NAME=SLU17, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU18, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU19, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU20, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU21, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU22, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA UNIFORME -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU23, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE +, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLU24, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.9, ST, TERMICA GRADIENTE -, 0.9
      ST, FRENATURA, 1.35, MV, LM01, 1.35, MV, LM02, 1.35, MV, LM03, 1.35
      CS, Summation, 1.35
NAME=SLV1, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV2, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV3, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV4, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV5, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV6, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV7, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
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NAME=SLV8, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV9, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV10, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV11, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV12, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV13, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV14, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV15, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV16, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV17, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV18, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -1, RS, EY, 0.3, CS, Summation, 1
NAME=SLV19, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 1, RS, EY, -0.3, CS, Summation, 1
NAME=SLV20, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -1, RS, EY, -0.3
     CS, Summation, 1
NAME=SLV21, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV22, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -1, CS, Summation, 1
NAME=SLV23, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 1, CS, Summation, 1
NAME=SLV24, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -1
     CS, Summation, 1
NAME=SLV25, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 1, RS, EY, 0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV26, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -1, RS, EY, 0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV27, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 1, RS, EY, -0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV28, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -1, RS, EY, -0.3, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV29, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 0.3, RS, EY, 1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV30, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, 0.3, RS, EY, -1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV31, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -0.3, RS, EY, 1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV32, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, RS, EX, -0.3, RS, EY, -1, MV, LM03, 0.75
     CS, Summation, 1
NAME=SLV33, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
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     CS, Summation, 1
NAME=SLV34, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV35, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV36, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV37, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV38, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV39, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV40, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV41, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV42, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV43, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV44, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, 1
     CS, Summation, 1
NAME=SLV45, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV46, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV47, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV48, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV49, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV50, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV51, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV52, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV53, STLCOMP, STRENGTH, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, 0.3, RS, EZ, -1
     CS, Summation, 1
NAME=SLV54, STLCOMP, STRENGTH, 0, 0, , 0, 0
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      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, 0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV55, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, 0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=SLV56, STLCOMP, STRENGTH, 0, 0, , 0, 0
      ST, TERMICA GRADIENTE +, 0.5, RS, EX, -0.3, RS, EY, -0.3, RS, EZ, -1
      CS, Summation, 1
NAME=RARA_1, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA UNIFORME +, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_2, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA UNIFORME -, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_3, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA GRADIENTE +, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_4, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 1, ST, TERMICA GRADIENTE -, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_5, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1, ST, TERMICA UNIFORME +, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_6, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1, ST, TERMICA UNIFORME -, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_7, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1, ST, TERMICA GRADIENTE +, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_8, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 1, ST, TERMICA GRADIENTE -, 0.6
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=RARA_9, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA UNIFORME +, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_10, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA UNIFORME -, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_11, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA GRADIENTE +, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA 12, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.6, ST, TERMICA GRADIENTE -, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_13, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA UNIFORME +, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_14, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA UNIFORME -, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_15, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA GRADIENTE +, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=RARA_16, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE CARICO, 0.6, ST, TERMICA GRADIENTE -, 0.6
      ST, FRENATURA, 1, MV, LM01, 1, CS, Summation, 1
NAME=FREQ_1, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME +, 0.5
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_2, STLCOMP, SERVICE, 0, 0, , 0, 0
      ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME -, 0.5
      ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
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NAME=FREQ_3, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_4, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, CS, Summation, 1
NAME=FREQ_5, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_6, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_7, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ 8, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     CS, Summation, 1
NAME=FREQ_9, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_10, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA UNIFORME -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_11, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE +, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_12, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, VENTO A PONTE SCARICO, 0.2, ST, TERMICA GRADIENTE -, 0.5
     ST, FRENATURA, 0.75, MV, LM01, 0.75, MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_13, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_14, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_15, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=FREQ_16, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, ST, FRENATURA, 0.75, MV, LM01, 0.75
     MV, LM02, 0.75, CS, Summation, 1
NAME=QP_1, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, CS, Summation, 1
NAME=QP_2, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME -, 0.5, CS, Summation, 1
NAME=QP_3, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE +, 0.5, CS, Summation, 1
NAME=QP_4, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA GRADIENTE -, 0.5, CS, Summation, 1
NAME=SLD1, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, 1, CS, Summation, 1
NAME=SLD2, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, -1, CS, Summation, 1
NAME=SLD3, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, 1, CS, Summation, 1
NAME=SLD4, STLCOMP, SERVICE, 0, 0, , 0, 0
     ST, TERMICA UNIFORME +, 0.5, RS, DX, -1, CS, Summation, 1
NAME=ENVESLU-SLV, STLCOMP, STRENGTH, 0, 1, , 0, 0
     CBSC, SLU1, 1, CBSC, SLU2, 1, CBSC, SLU3, 1, CBSC, SLU4, 1
     CBSC, SLU5, 1, CBSC, SLU6, 1, CBSC, SLU7, 1, CBSC, SLU8, 1
     CBSC, SLU9, 1, CBSC, SLU10, 1, CBSC, SLU11, 1, CBSC, SLU12, 1
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        CBSC, SLU13, 1, CBSC, SLU14, 1, CBSC, SLU15, 1, CBSC, SLU16, 1
        CBSC, SLU17, 1, CBSC, SLU18, 1, CBSC, SLU19, 1, CBSC, SLU20, 1
        CBSC, SLU21, 1, CBSC, SLU22, 1, CBSC, SLU23, 1, CBSC, SLU24, 1
        CBSC, SLV1, 1, CBSC, SLV2, 1, CBSC, SLV3, 1, CBSC, SLV4, 1
        CBSC, SLV5, 1, CBSC, SLV6, 1, CBSC, SLV7, 1, CBSC, SLV8, 1
        CBSC, SLV9, 1, CBSC, SLV10, 1, CBSC, SLV11, 1, CBSC, SLV12, 1
        CBSC, SLV13, 1, CBSC, SLV14, 1, CBSC, SLV15, 1, CBSC, SLV16, 1
        CBSC, SLV17, 1, CBSC, SLV18, 1, CBSC, SLV19, 1, CBSC, SLV20, 1
        CBSC, SLV21, 1, CBSC, SLV22, 1, CBSC, SLV23, 1, CBSC, SLV24, 1
        CBSC, SLV25, 1, CBSC, SLV26, 1, CBSC, SLV27, 1, CBSC, SLV28, 1
        CBSC, SLV29, 1, CBSC, SLV30, 1, CBSC, SLV31, 1, CBSC, SLV32, 1
        CBSC, SLV33, 1, CBSC, SLV34, 1, CBSC, SLV35, 1, CBSC, SLV36, 1
        CBSC, SLV37, 1, CBSC, SLV38, 1, CBSC, SLV39, 1, CBSC, SLV40, 1
        CBSC, SLV41, 1, CBSC, SLV42, 1, CBSC, SLV43, 1, CBSC, SLV44, 1
        CBSC, SLV45, 1, CBSC, SLV46, 1, CBSC, SLV47, 1, CBSC, SLV48, 1
        CBSC, SLV49, 1, CBSC, SLV50, 1, CBSC, SLV51, 1, CBSC, SLV52, 1
        CBSC, SLV53, 1, CBSC, SLV54, 1, CBSC, SLV55, 1, CBSC, SLV56, 1
   NAME=ENVE-RARA, STLCOMP, SERVICE, 0, 1, , 0, 0
        CBSC, RARA_1, 1, CBSC, RARA_2, 1, CBSC, RARA_3, 1, CBSC, RARA_4, 1
        CBSC, RARA_5, 1, CBSC, RARA_6, 1, CBSC, RARA_7, 1, CBSC, RARA_8, 1
        CBSC, RARA_9, 1, CBSC, RARA_10, 1, CBSC, RARA_11, 1, CBSC, RARA_12, 1
        CBSC, RARA_13, 1, CBSC, RARA_14, 1, CBSC, RARA_15, 1, CBSC, RARA_16, 1
   NAME=ENVE-FREQ, STLCOMP, SERVICE, 0, 1, , 0, 0
        CBSC, FREQ_1, 1, CBSC, FREQ_2, 1, CBSC, FREQ_3, 1, CBSC, FREQ_4, 1
        CBSC, FREQ_5, 1, CBSC, FREQ_6, 1, CBSC, FREQ_7, 1, CBSC, FREQ_8, 1
        CBSC, FREQ_9, 1, CBSC, FREQ_10, 1, CBSC, FREQ_11, 1, CBSC, FREQ_12, 1
        CBSC, FREQ_13, 1, CBSC, FREQ_14, 1, CBSC, FREQ_15, 1, CBSC, FREQ_16, 1
   NAME=ENVE-QP, STLCOMP, SERVICE, 0, 1, , 0, 0
        CBSC, QP 1, 1, CBSC, QP 2, 1, CBSC, QP 3, 1, CBSC, QP_4, 1
   NAME=ENVE-SLD, STLCOMP, SERVICE, 0, 1, , 0, 0
        CBSC, SLD1, 1, CBSC, SLD2, 1, CBSC, SLD3, 1, CBSC, SLD4, 1

*LC-COLOR    ; Diagram Color for Load Case
; ANAL, LCNAME, iR1(ALL), iG1(ALL), iB1(ALL), iR2(MIN), iG2(MIN), iB2(MIN), iR3(MAX),
iG2(MAX), iB2(MAX)
 CS, Dead Load, 255, 87, 87, 255, 0, 192, 0, 128, 192
 CS, Erection Load 1, 0, 128, 57, 255, 87, 87, 160, 192, 255
 CS, Erection Load 2, 0, 157, 192, 212, 160, 255, 192, 72, 0
 CS, Erection Load 3, 212, 160, 255, 128, 192, 0, 192, 128, 0
 CS, Tendon Primary, 192, 0, 192, 192, 72, 0, 128, 192, 0
 CS, Tendon Secondary, 163, 160, 255, 0, 128, 192, 255, 255, 255
 CS, Creep Primary, 192, 72, 0, 212, 160, 255, 85, 0, 192
 CS, Creep Secondary, 0, 192, 192, 192, 128, 0, 0, 128, 57
 CS, Shrinkage Primary, 128, 192, 0, 192, 192, 192, 210, 210, 210
 CS, Shrinkage Secondary, 0, 192, 192, 255, 0, 192, 255, 255, 87
 CS, Summation, 192, 128, 0, 85, 192, 0, 0, 192, 128
 ST, PESO PROPRIO ACCIAIO, 128, 192, 0, 160, 192, 255, 212, 160, 255
 ST, PESO PROPRIO SOLETTA, 0, 128, 192, 212, 160, 255, 255, 192, 87
 ST, PERMANENTE PORTATO, 255, 128, 0, 146, 0, 255, 192, 192, 192
 ST, VENTO A PONTE SCARICO, 255, 87, 87, 255, 160, 255, 78, 0, 255
 ST, VENTO A PONTE CARICO, 255, 87, 87, 0, 128, 255, 128, 192, 0
 ST, TERMICA UNIFORME +, 255, 128, 0, 255, 255, 255, 146, 0, 255
 ST, TERMICA UNIFORME -, 255, 192, 160, 85, 0, 192, 255, 0, 192
 ST, TERMICA GRADIENTE +, 255, 192, 160, 255, 255, 87, 128, 192, 0
 ST, TERMICA GRADIENTE -, 0, 128, 255, 255, 160, 255, 255, 87, 87
 ST, FRENATURA, 0, 192, 128, 255, 87, 128, 163, 255, 160
 MV, LM01, 160, 255, 255, 85, 0, 192, 255, 192, 87
 MV, LM02, 255, 192, 160, 85, 192, 0, 0, 157, 192
 MV, LM03, 192, 0, 192, 192, 192, 0, 255, 87, 128
 RS, EX, 85, 192, 0, 128, 192, 0, 255, 160, 255
 RS, EY, 255, 192, 87, 255, 87, 128, 255, 87, 128
 RS, EZ, 255, 255, 87, 0, 192, 128, 0, 192, 192
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RS, DX, 0, 128, 128, 192, 72, 0, 160, 255, 255
RS, CX, 0, 192, 128, 192, 192, 0, 255, 192, 87
CB, SLU1, 146, 0, 255, 78, 0, 255, 192, 192, 192
CB, SLU2, 255, 192, 87, 93, 255, 87, 146, 0, 255
CB, SLU3, 255, 192, 87, 212, 160, 255, 0, 128, 192
CB, SLU4, 0, 128, 128, 210, 210, 210, 0, 192, 128
CB, SLU5, 255, 128, 0, 163, 160, 255, 0, 128, 192
CB, SLU6, 0, 157, 192, 0, 128, 128, 255, 255, 255
CB, SLU7, 0, 128, 255, 148, 87, 255, 160, 255, 255
CB, SLU8, 192, 0, 128, 212, 160, 255, 0, 192, 192
CB, SLU9, 0, 128, 128, 192, 192, 192, 0, 128, 255
CB, SLU10, 255, 255, 255, 160, 192, 255, 160, 192, 255
CB, SLU11, 192, 0, 192, 0, 128, 255, 255, 0, 192
CB, SLU12, 93, 255, 87, 255, 192, 160, 255, 128, 0
CB, SLU13, 146, 0, 255, 255, 0, 192, 255, 87, 87
CB, SLU14, 0, 157, 192, 163, 160, 255, 0, 192, 192
CB, SLU15, 128, 192, 0, 255, 255, 255, 85, 0, 192
CB, SLU16, 255, 192, 160, 0, 157, 192, 255, 255, 255
CB, SLU17, 78, 0, 255, 160, 192, 255, 255, 0, 128
CB, SLU18, 128, 192, 0, 160, 255, 255, 163, 160, 255
CB, SLU19, 212, 160, 255, 163, 160, 255, 0, 128, 255
CB, SLU20, 255, 0, 192, 192, 128, 0, 85, 192, 0
CB, SLU21, 255, 128, 0, 210, 210, 210, 255, 255, 255
CB, SLU22, 0, 157, 192, 255, 255, 255, 146, 0, 255
CB, SLU23, 255, 87, 87, 192, 0, 128, 0, 128, 192
CB, SLU24, 85, 192, 0, 212, 160, 255, 192, 192, 192
CB, SLV1, 255, 255, 255, 128, 192, 0, 93, 255, 87
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CBS, RARA_9, 255, 87, 87, 255, 192, 87, 163, 160, 255
CBS, RARA_10, 146, 0, 255, 192, 0, 128, 192, 72, 0
CBS, RARA_11, 255, 87, 87, 255, 255, 87, 0, 192, 128
CBS, RARA_12, 192, 0, 128, 255, 0, 128, 212, 160, 255
CBS, RARA_13, 0, 192, 192, 148, 87, 255, 192, 0, 192
CBS, RARA_14, 0, 128, 255, 255, 87, 128, 160, 255, 255
CBS, RARA_15, 255, 128, 0, 78, 0, 255, 93, 255, 87
CBS, RARA_16, 255, 128, 0, 160, 192, 255, 210, 210, 210
CBS, FREQ_1, 192, 192, 192, 192, 192, 0, 192, 0, 128
CBS, FREQ_2, 210, 210, 210, 148, 87, 255, 255, 255, 87
CBS, FREQ_3, 85, 0, 192, 0, 128, 192, 192, 128, 0
CBS, FREQ 4, 192, 0, 192, 163, 160, 255, 192, 192, 192
CBS, FREQ_5, 85, 192, 0, 85, 192, 0, 255, 192, 160
CBS, FREQ_6, 255, 0, 128, 160, 255, 255, 146, 0, 255
CBS, FREQ_7, 160, 255, 255, 192, 128, 0, 78, 0, 255
CBS, FREQ_8, 255, 160, 255, 160, 192, 255, 192, 72, 0
CBS, FREQ_9, 163, 160, 255, 192, 128, 0, 255, 0, 128
CBS, FREQ_10, 0, 128, 57, 192, 192, 192, 192, 192, 192
CBS, FREQ_11, 192, 192, 192, 192, 0, 128, 255, 255, 87
CBS, FREQ_12, 192, 0, 128, 255, 255, 87, 0, 128, 255
CBS, FREQ_13, 255, 160, 255, 255, 255, 255, 160, 192, 255
CBS, FREQ_14, 128, 192, 0, 255, 192, 160, 163, 160, 255
CBS, FREQ_15, 255, 128, 0, 210, 210, 210, 255, 192, 160
CBS, FREQ_16, 192, 0, 192, 255, 160, 255, 255, 0, 192
CBS, QP 1, 255, 87, 128, 255, 0, 192, 255, 128, 0
CBS, QP_2, 255, 255, 87, 0, 128, 57, 255, 87, 128
CBS, QP_3, 0, 192, 192, 255, 192, 87, 212, 160, 255
CBS, QP_4, 192, 192, 192, 192, 0, 128, 255, 192, 160
CBS, SLD1, 255, 192, 87, 163, 160, 255, 78, 0, 255
CBS, SLD2, 255, 255, 87, 255, 128, 0, 255, 0, 128
CBS, SLD3, 255, 128, 0, 255, 160, 255, 192, 192, 0
CBS, SLD4, 255, 128, 0, 212, 160, 255, 255, 192, 160
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 CBS, ENVESLU-SLV, 0, 128, 128, 255, 87, 87, 146, 0, 255
 CBS, ENVE-RARA, 255, 160, 255, 163, 255, 160, 192, 0, 128
 CBS, ENVE-FREQ, 210, 210, 210, 255, 255, 255, 255, 192, 160
 CBS, ENVE-QP, 146, 0, 255, 192, 0, 128, 192, 0, 192
 CBS, ENVE-SLD, 255, 87, 128, 210, 210, 210, 0, 192, 128
 RS, CY, 160, 192, 255, 0, 128, 255, 255, 87, 87
 CB, SLC_X, 255, 160, 255, 255, 192, 160, 210, 210, 210
 CB, SLC_Y, 163, 255, 160, 255, 255, 87, 255, 192, 160

*EIGEN-CTRL    ; Eigenvalue Analysis Control
; TYPE, iFREQ, iITER, iDIM, TOL, bMINMAX, FRMIN, FRMAX, bSTRUM   ; TYPE=EIGEN
; TYPE, bINCNL, iGNUM                                           ; TYPE=RITZ(line 1)
;       KIND1, CASE1/GROUND1, iNOG1, ...                        ; TYPE=RITZ(from line
2)
   LANCZOS, 10, 20, 1, 1e-010, NO, 0, 0, NO

*DGN-MATL    ; Modify Steel(Concrete) Material
; iMAT, TYPE, MNAME, [DATA1]                                    ; STEEL
; iMAT, TYPE, MNAME, [DATA2], [R-DATA], FCI, bSERV, SHORT, LONG ; CONC
; iMAT, TYPE, MNAME, [DATA3], [DATA2], [R-DATA]                 ; SRC
; iMAT, TYPE, MNAME, [DATA5]                                    ; STEEL(None) & KSCE-A
SD05
; [DATA1] : 1, DB, CODE, NAME or 2, ELAST, POISN, FU, FY1, FY2, FY3, FY4
;           FY5, FY6, AFT, AFT2, AFT3, FY, AFV, AFV2, AFV3
; [DATA2] : 1, DB, CODE, NAME or 2, FC, CHK, LAMBDA
; [DATA3] : 1, DB, CODE, NAME or 2, ELAST, FU, FY1, FY2, FY3, FY4
;              FY5, FY6, AFT, AFT2, AFT3, FY, AFV, AFV2, AFV3
; [DATA4] : 1, DB, CODE, NAME or 2, FC
; [DATA5] : 3, ELAST, POISN, AL1, AL2, AL3, AL4, AL5, AL6, AL7, AL8, AL9, AL10
;              MIN1, MIN2, MIN3
; [R-DATA]: RBCODE, RBMAIN, RBSUB, FY(R), FYS
    1, STEEL, S355              , 1, EN05-PS(S) ,            ,S355          , 2, 0, ,
, , 0, 0,NO,0.0000e+000,     0,, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0,0.0000e+000,
 0,, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0,0, 0, 0,0.0000e+000,     0,, 0, 0,0, 0, 0,0, 0, 0,0,
 0, 0,0, 0, 0,
    2, CONC , C32/40            , 2, 0, NO, 1, , , , 0, 0, 0, NO, 0, 0,            ,
         ,              , 0, NO, 1, , , , 0, 0, 0
    3, CONC , C32/40_NOP        , 2, 0, NO, 1, , , , 0, 0, 0, NO, 0, 0,            ,
         ,              , 0, NO, 1, , , , 0, 0, 0

*LINK-KEY    ; Link Key
; iKEY, TYPE, LINK KEY
  523, RIGD, 2
  526, RIGD, 4
  556, RIGD, 8
  557, RIGD, 11
  558, RIGD, 14
  559, RIGD, 17
  560, RIGD, 20
  561, RIGD, 23
  562, RIGD, 26
  563, RIGD, 29
  564, RIGD, 32
  565, RIGD, 33
  566, RIGD, 7
  567, RIGD, 10
  568, RIGD, 13
  569, RIGD, 16
  570, RIGD, 19
  571, RIGD, 22
  572, RIGD, 25
  573, RIGD, 28
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  574, RIGD, 31
  575, RIGD, 5
  576, RIGD, 6
  577, RIGD, 9
  578, RIGD, 12
  579, RIGD, 15
  580, RIGD, 18
  581, RIGD, 21
  582, RIGD, 24
  583, RIGD, 27
  584, RIGD, 30
  586, RIGD, 1
  587, RIGD, 3

*ENDDATA
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