RegioneLombardia

Direzione Generale Infrastrutture e Mobilità

FERROVIENORD
FNMGROUP

NORD_ING
FNMGROUP

CODICE COMMESSA	LIVELLO PROGETTAZIONE	D.P.R. 207/10	PROGRESSIVO ELABORATO	CATEGORIA OPERA	NUMERO OPERA	REVISIONE	SCALA
F31	D	f	007	OS	--	R0	=

LINEA MILANO - VARESE - LAVENO
RADDOPPIO SELETTIVO GEMONIO - CITTIGLIO
Progetto Definitivo

F CALCOLI DELLE STRUTTURE E DEGLI IMPIANTI

Relazione di calcolo pensiline di stazione

Revisioni		Data	Descrizione	Redatto	Controllato
	3				
	2				
	1				
	0	OTT. 2022	PRIMA EMISSIONE	PC	MS

NORD_ING

NORD_ING Srl
IL DIRETTORE TECNICO
Ing. Luca Erba

FERROVIENORD

FERROVIENORD S.p.A.
DIREZIONE SVILUPPO INFRASTRUTTURA
IL DIRETTORE (a.i.)
Dott. Enrico Bellavita

Progettista

NORD_ING
FNMGROUP

ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI LECCO
ERBA LUCA
Sez. A Settori:
a) civile e ambientale
b) industriale
c) dell'informazione
n° A 639

Collaborazione

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REDATTO	CONTROLLATO	APPROVATO	DATA

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mod. 7.5 03 rev.01

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SOMMARIO

1 INTRODUZIONE 4
2 NORMATIVA 10
2.1 Normativa nazionale 10
2.2 Normativa europea 10
3 REQUISISTI PROGETTUALI UNI EN 1090 11
1.1 DEFINIZIONE DELLA CLASSE DI ESECUZIONE 11
4 CARATTERISTICHE DEI MATERIALI 13
4.1 Calcestruzzo magro 13
4.2 Calcestruzzo strutturale 13
4.3 Acciaio per calcestruzzo armato 15
4.4 Acciaio da carpenteria 15
5 CARATTERISTICHE GEOTECNICHE 16
5.1 Quote di falda 16
6 ANALISI DEI CARICHI 17
6.1 CARICHI PERMAMENTI STRUTTURALI 17
6.2 CARICHI PERMANENTI NON STRUTTURALI 17
6.3 NEVE E VENTO 17
6.3.1 Neve 17
6.3.2 Vento 20
6.4 ANALISI AZIONE SISMICA 28
6.4.1 Requisiti prestazionali delle opere 28
6.4.2 Determinazione categoria di sottosuolo e categoria topografica 28
6.4.3 Definizione parametri sismici 28
6.5 COMBINAZIONI DI CARICO 29
7 CRITERI GENERALI E TIPO DI ANALISI SVOLTA 41
7.1 SOFTWARE DI CALCOLO 41
7.2 MODELLO DI CALCOLO 42
8 VERIFICHE SOVRASTRUTTURA 45
8.1 TIPO 1.A 45
8.1.1 Travi a sbalzo 45
8.1.2 Trave di colmo 49
8.1.3 Colonna 58
8.2 TIPO 1.C 64
8.2.1 Travi a sbalzo 64
8.2.2 Trave di colmo 68
8.2.3 Colonna 77
8.3 TIPO 2 83
8.3.1 Travi a sbalzo 83
8.3.2 Trave di colmo 87
8.3.3 Colonna 96

9 VERIFICHE FONDAZIONI 102
9.1 TIPO 1 – FONDAZIONI SUPERFICIALI SU PLINTO CENTRATO 102
9.1.1 Sollecitazioni 102
9.1.2 Verifiche geotecniche 102
9.1.3 Verifiche strutturali 107
9.2 TIPO 1-P – FONDAZIONI PROFONDE SU PLINTO ZOPPO 110
9.2.1 Sollecitazioni 110
9.2.2 Verifiche geotecniche 111
9.2.3 Verifiche strutturali 117
9.3 TIPO 2 – FONDAZIONI SUPERFICIALI SU PLINTO CENTRATO 135
9.3.1 Sollecitazioni 135
9.3.2 Verifiche geotecniche 135
9.3.3 Verifiche strutturali 140

1 INTRODUZIONE

Nell'ambito del progetto di raddoppio della linea ferroviaria tra le stazioni di Gemonio e Cittiglio, sulla linea Saronno – Varese – Laveno, è stata sviluppata la seguente relazione di calcolo che ha come oggetto la verifica delle pensiline di nuova realizzazione sulla banchina della stazione di Gemonio.
L'elaborato riporta le analisi inerenti a tre sezioni tipologiche, la cui geometria è riportata di seguito.

- ***SEZIONE TIPO 1.A***

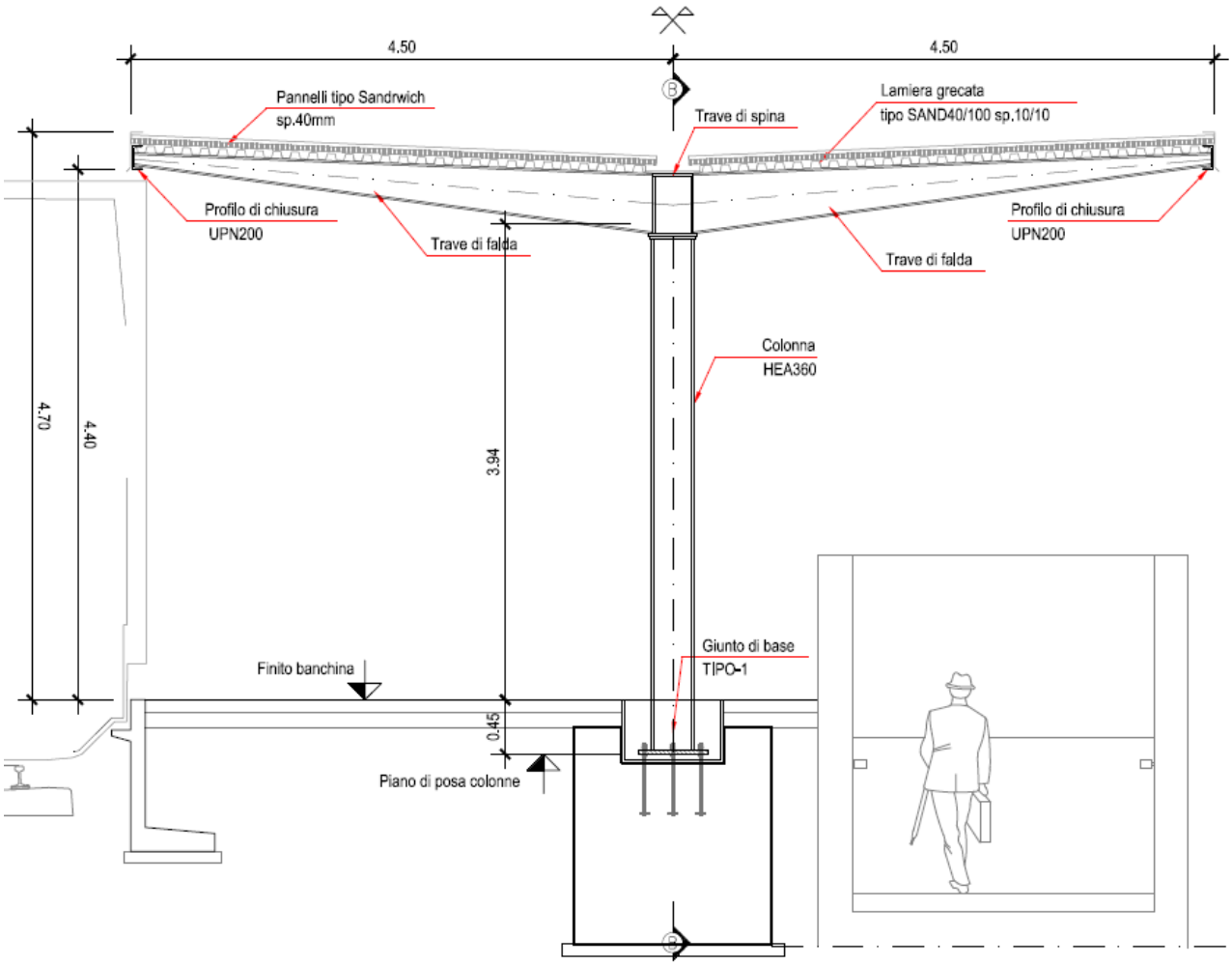


Figura 1-1 Sezione tipo 1.A con fondazione su plinto centrato

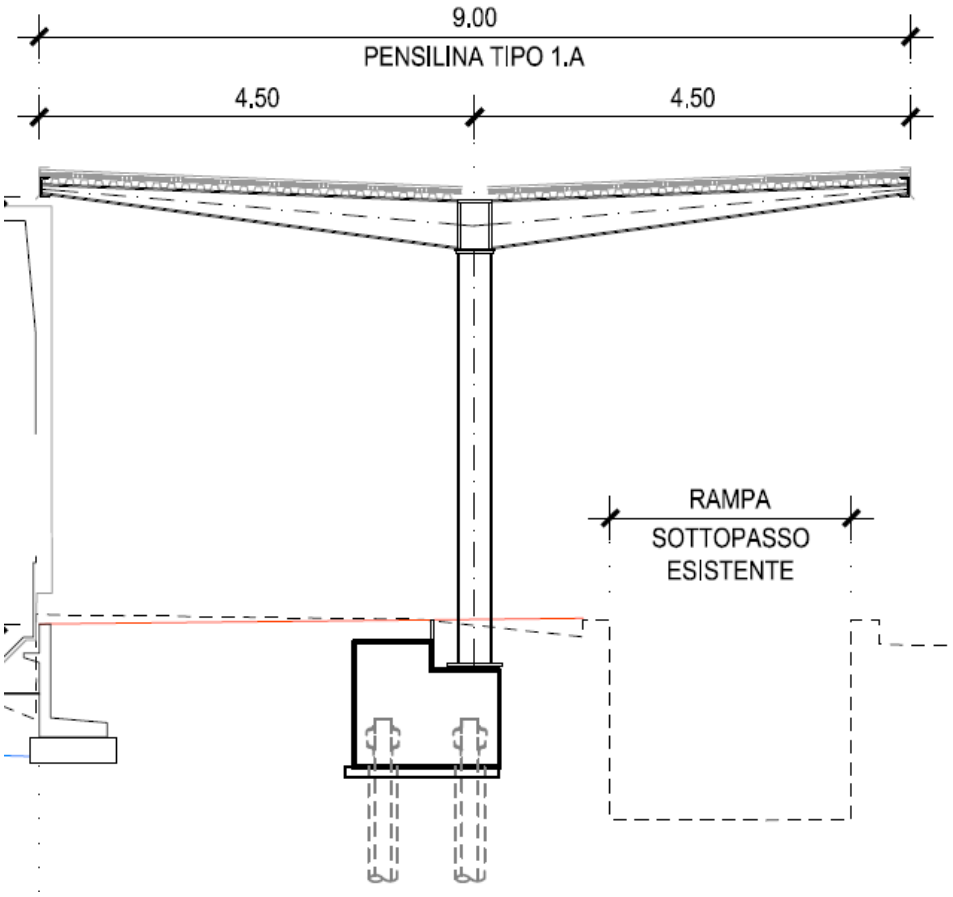


Figura 1-2 Sezione 1.A con fondazione a plinto zoppo su micropali

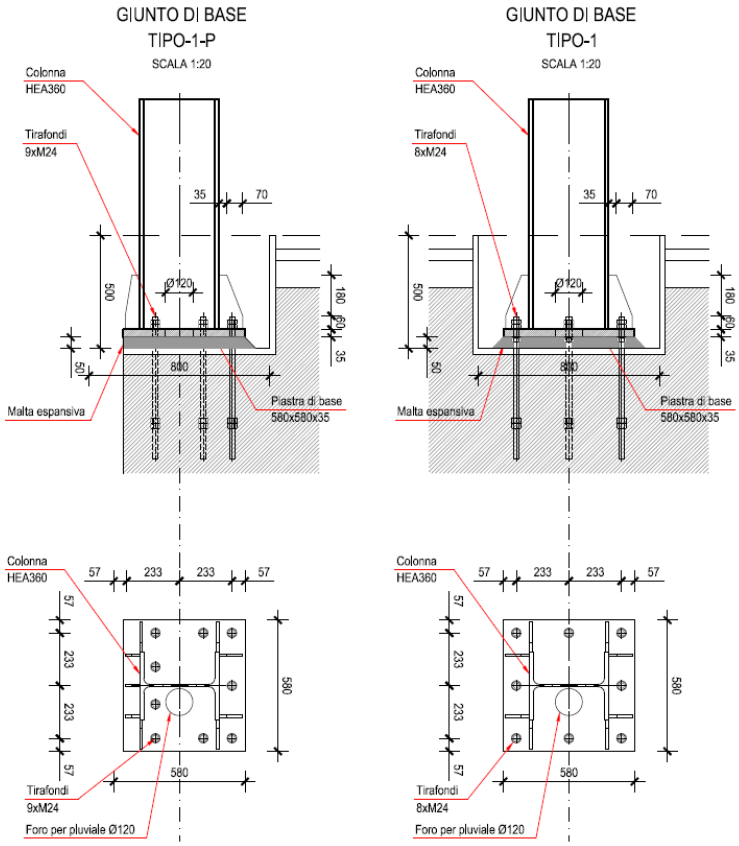


Figura 1-3 Giunti di base tipo 1 e 1-P

- ***SEZIONE TIPO 1.C***

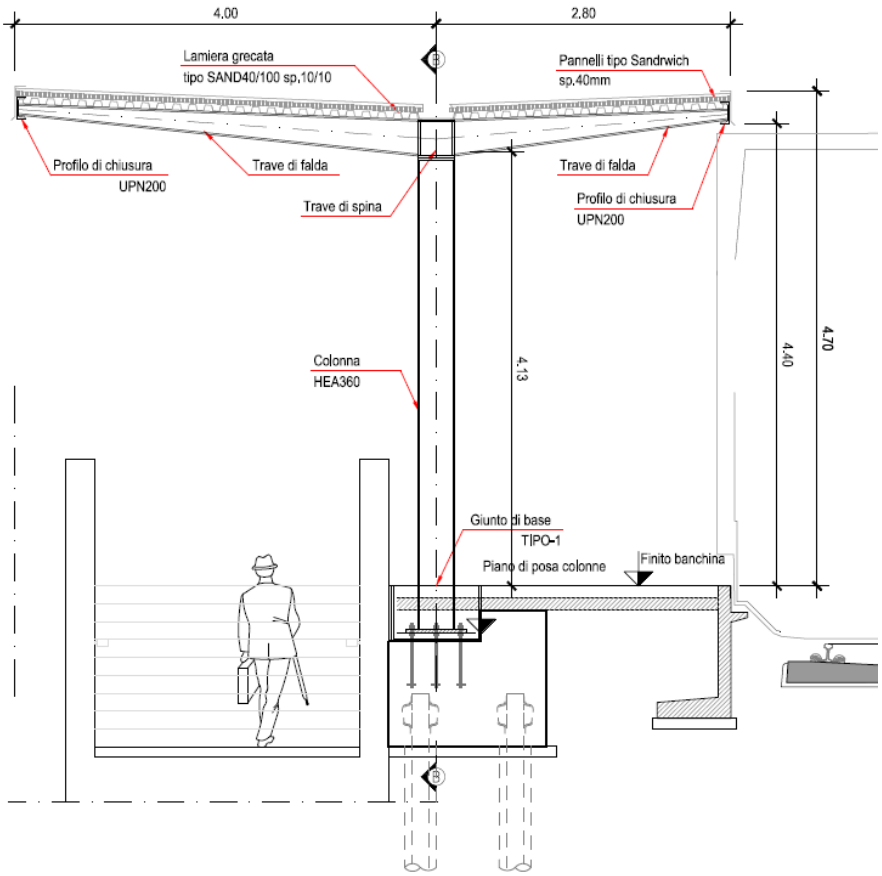


Figura 1-4 Sezione 1.C con fondazione a plinto zoppo su micropali

- ***SEZIONE TIPO 2***

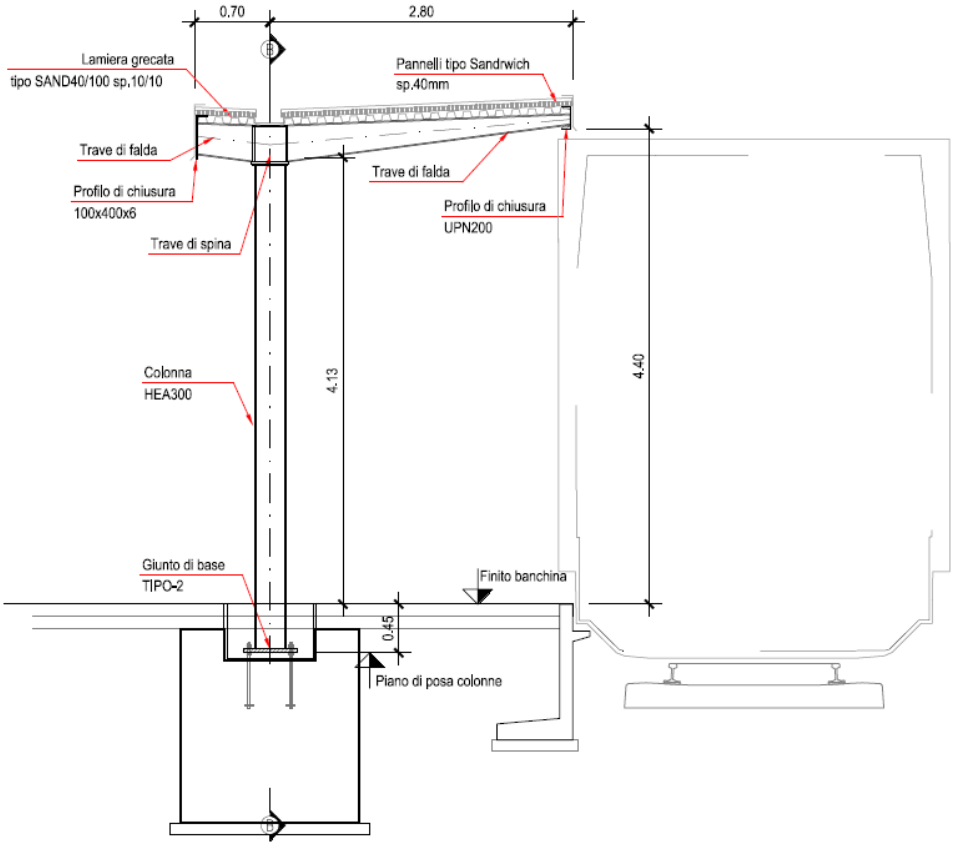


Figura 1-5 Sezione tipo 2 con fondazione su plinto centrato

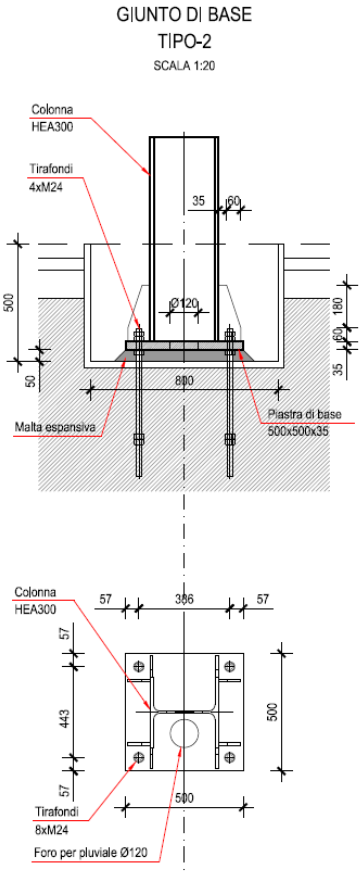


Figura 1-6 Giunti di base tipo 2

2 NORMATIVA

Le verifiche statiche e la redazione della presente relazione sono state eseguite nel rispetto della Normativa in vigore.

2.1 Normativa nazionale

- **DM Infrastrutture 17 gennaio 2018** - Aggiornamento delle "Norme Tecniche per le Costruzioni".
- **Circolare 20 gennaio 2019, n.7/C.S.LL.PP. –** Istruzioni per l'applicazione dell'«Aggiornamento delle "Norme tecniche per le costruzioni"» di cui al DM 17 gennaio 2018.

2.2 Normativa europea

- **UNI EN 1990** – Criteri generali di progettazione strutturale.
- **UNI EN 1992-1-1** – Eurocode 2. Progettazione delle strutture in cemento armato. Regole generali e regole per gli edifici
- **UNI EN 1993-1-1** – Eurocode 3. Progettazione delle strutture in acciaio. Regole generali e regole per gli edifici
- **UNI EN 1998-1** – Eurocode 8. Progetto di strutture resistenti al sisma – Regole generali, azioni sismiche e regole per gli edifici
- **UNI EN 1090** – Requisiti per l'esecuzione delle strutture di acciaio.

3 REQUISISTI PROGETTUALI UNI EN 1090

Il progetto della struttura metallica portante in esame viene redatto in conformità alla Norma UNI EN 1090:2012 – 1 e 2. Vengono riportati di seguito i dati e le caratteristiche tecniche utili alla realizzazione della struttura, definiti dalla suddetta Norma.

1.1 DEFINIZIONE DELLA CLASSE DI ESECUZIONE

La classe di esecuzione della struttura in esame viene individuata dalla correlazione tra tre tipi di sottoclassi:

1. Classe di Conseguenza CC (CC1, CC2, CC3), definita all'allegato B.1 dell'Eurocodice 0, che classifica la struttura in base alla gravità delle conseguenze di un eventuale crollo della struttura;

prospetto B.1 **Definizione delle classi di conseguenze**

Classe di conseguenze	Descrizione	Esempi di edifici e di opere di ingegneria civile
CC3	Elevate conseguenze per perdita di vite umane, o conseguenze molto gravi in termini economici, sociali o ambientali	Gradinate in impianti sportivi, edifici pubblici nei quali le conseguenze del collasso sono alte (per esempio, una sala da concerti)
CC2	Conseguenze medie per perdita di vite umane, conseguenze considerevoli in termini economici, sociali o ambientali	Edifici residenziali e per uffici, edifici pubblici nei quali le conseguenze del collasso sono medie (per esempio un edificio per uffici)
CC1	Conseguenze basse per perdita di vite umane, e conseguenze modeste o trascurabili in termini economici, sociali o ambientali	Costruzioni agricole, nei quali generalmente nessuno entra (per esempio, i magazzini), serre

2. Classe di rischio SC, che classifica la struttura in base all'utilizzo previsto per la struttura sotto il profilo delle azioni a cui la struttura è sottoposta in esercizio, definendo due Categorie di Servizio (SC1, SC2) descritte nella tabella B.1 della EN 1090-2;

Categoria	***Definite in base alle sollecitazioni previste (dinamiche / statiche)***
SC1	-Strutture e componenti progettati soltanto per azioni quasi statiche -Strutture e componenti le cui connessioni sono progettate per l' azione sismica in regioni con bassa sismicità e classe di duttilità DCL -Strutture e componenti progettati per azioni a fatica da carroponti/gru meccanici (classe S_0)
SC2	-Strutture e componenti progettati per la resistenza a fatica in accordo alla EN 1993 (es. Ponti stradali e ferroviari, gru, carriponte Classi da S_1 a S_9...), strutture suscettibili a vibrazioni indotte da vento, folla o macchinari in rotazione - Strutture e componenti progettati per l' azione sismica in regioni con media o alta sismicità ed in classe di duttilità DCM o DCH
DCL, DCM, DCH: classi di duttilità in accordo alla EN 1998-1	

3. Classe di rischio PC, che classifica la struttura in base alle modalità di realizzazione della struttura, con particolare riferimento alla tipologia di acciaio e all'impiego della saldatura, definendo due Categorie di Produzione (PC1, PC2) descritte nella tabella B.2 della EN 1090-2.

Categoria	*Definite in base alle tecnologie produttive*
PC1	-componenti non saldati fabbricati con qualsiasi classe di acciaio -componenti saldati fabbricati con classe di acciaio inferiore alla S355
PC2	-componenti saldati fabbricati con classe di acciaio uguale o superiore alla S355 -componenti essenziali per l'integrità strutturale che vengono assemblati in situ mediante saldatura -componenti prodotti a caldo o che ricevono trattamenti termici durante la produzione

La Classe di esecuzione viene determinata in base alla seguente tabella:

Classi di conseguenza →		CC1		CC2		CC3	
Categoria di servizio →		SC1	SC2	SC1	SC2	SC1	SC2
Categoria di produzione →	PC1	EXC1	EXC2	**EXC2**	EXC3	EXC3	EXC3
	PC2	EXC2	EXC2	EXC2	EXC3	EXC3	EXC4

Per la struttura in esame si ha quindi: **EXC2**

4 CARATTERISTICHE DEI MATERIALI

4.1 Calcestruzzo magro

Per il magrone di sottofondazione si prevede l'utilizzo di calcestruzzo classe: **C12/15**

4.2 Calcestruzzo strutturale

Classe di esposizione ambientale:

Tab. 4.1.III – *Descrizione delle condizioni ambientali*

Condizioni ambientali	Classe di esposizione
Ordinarie	X0, XC1, XC2, XC3, XF1
Aggressive	XC4, XD1, XS1, XA1, XA2, XF2, XF3
Molto aggressive	XD2, XD3, XS2, XS3, XA3, XF4

Figura 4-1 – Tabella 4.1.III NTC2018

prospetto 5 **Valori limite per la composizione e le proprietà del calcestruzzo**

	Classi di esposizione													
	Nessun rischio di corrosione dell'armatura	Corrosione delle armature indotta dalla carbonatazione				Corrosione delle armature indotta da cloruri						Attacco da cicli di gelo/disgelo		
						Acqua di mare			Cloruri provenienti da altre fonti					
	X0	XC1	XC2	XC3	XC4	XS1	XS2	XS3	XD1	XD2	XD3	XF1	XF2	XF3	XF4
Massimo rapporto *a/c*	-	0,60		0,55	0,50	0,50	0,45		0,55	0,50	0,45	0,50	0,50		0,45
Minima classe di resistenza	C12/15	C25/30		C30/37	C32/40	C32/40	C35/45		C30/37	C32/40	C35/45	C32/40	C25/30		C30/37
Minimo contenuto in cemento (kg/m^3) [d]	-	300		320	340	340	360		320	340	360	320	340		360
Contenuto minimo in aria (%)												[b]	4,0[a]		
Altri requisiti						E' richiesto l'utilizzo di cementi resistenti all'acqua di mare secondo UNI 9156						E' richiesto l'utilizzo di aggregati conformi alla UNI EN 12620 di adeguata resistenza al gelo/disgelo			

Figura 4-2 – Prospetto 5 UNI 11104:2016

Calcolo copriferri minimi:

Tabella C4.1.IV - *Copriferri minimi in mm*

			barre da c.a. elementi a piastra		barre da c.a. altri elementi	
C_{min}	C_o	ambiente	$C \geq C_o$	$C_{min} \leq C < C_o$	$C \geq C_o$	$C_{min} \leq C < C_o$
C25/30	C35/45	ordinario	15	20	20	25
C30/37	C40/50	aggressivo	25	30	30	35
C35/45	C45/55	molto ag.	35	40	40	45

Figura 4-3 – Tabella C4.1.IV Circolare 7/2019

Calcolo del copriferro secondo DM 17.01.2018

tipo corrosione	*classe esp.*	$f_{ck\ min}$	$R_{ck\ min}$
nessun rischio - tipo 1	***		
da carbonatazione - tipo 2	XC2	25	30
da cloruri - tipo 3	***		
da cloruri nell'acqua di mare - tipo 4	***		
da gelo/disgelo - tipo 5	***		
da attacco chimico - tipo 6	***		

classe minima prescritta = C25/30

R_{ck} = 30 N/mm²

f_{ck} = 25 N/mm²

Calcestruzzo scelto				CONTROLLO CLASSE OK			
Cls	C25/30	R_{ck} =	30	N/mm²	f_{ck} =	25	N/mm²
γ_c =	1.5	f_{cm} =	33.00	N/mm²	f_{cd} =	14.17	N/mm²
α_{cc} =	0.85	E_c =	31476	N/mm²	f_{ctm} =	2.56	N/mm²

Copriferro 4.1.6.1.3

tipo di ambiente = ordinarie

tipo di elemento = altri elementi

vita utile = 50 anni

Produzioni in qualità = No

strato minimo di ricoprimento di calcestruzzo (copriferro) = 35 mm

4.3 Acciaio per calcestruzzo armato

Si prevede l'utilizzo di acciaio per armatura di tipo:		**B450C**
Tensione di snervamento caratteristica	f_{yk}	≥ 450 N/mm^2
Tensione a rottura caratteristica	f_{tk}	≥ 540 N/mm^2
Allungamento totale al carico massimo	A_{gt}	$\geq 7.5\%$
Rapporto f_{tk}/f_{yk}		$1.15 \leq f_{tk}/f_{yk} < 1.35$
Rapporto $f_{y,misurato}/f_{y,nominale}$		$f_{y,misurato}/f_{y,nominale} \leq 1.25$
Coefficiente parziale di sicurezza per l'acciaio		$\gamma_s = 1.15$
Resistenza a trazione di calcolo		$f_{yd} = f_{yk}/\gamma_s = 391.30$ N/mm^2
Tensione di esercizio max (comb. Rara)		$\sigma_s = 0.80*f_{yk} = 360.00$ N/mm^2

4.4 Acciaio da carpenteria

Acciaio laminato:

	f_{yk} [MPa]	f_{tk} [MPa]
S355J0	355	510

Bulloni e dadi:

	f_{yb} [MPa]	f_{tb} [MPa]
classe 8.8, dado 8	649	800

Saldature:

Di testa o a cordoni d'angolo, comunque conformi alle disposizioni della UNI EN ISO 4063/2001.

Caratteristiche meccaniche di progetto:

modulo elastico:	E = 210 000 N/mm²
modulo di elasticità trasversale:	G = E / [2(1+ν)] = 80770 N/mm²
coefficiente di Poisson:	ν = 0,3
coefficiente di espansione termica lineare:	α = 12 × 10-6 per °C-1
densità:	ρ = 7850 kg/m³
coefficienti parziali di sicurezza:	γ_{M0} = 1.05; γ_{M1} = 1.05; γ_{M2} = 1.25

Per quanto riguarda le procedure e le prove sperimentali di accettazione dell'acciaio da carpenteria si rimanda nel dettaglio ai §§ 11.3.1 e 11.3.4 delle NTC.

5 CARATTERISTICHE GEOTECNICHE

Relativamente alla caratterizzazione geotecnica, si fa riferimento a quanto riportato sulla "Relazione geologica – Indagine geognostica, caratterizzazione e modellazione geotecnica" redatta da "Tecnostudio" in data 08/09/2022.
Si riportano, così come riportate nell'elaborato sopraccitato, le proprietà dei terreni indagati, relativamente a quelle opere in progetto che sorgono in prossimità dello sviluppo dei muri in analisi.

3.1. OpN 643 Passerella Pedonale SSE Gemonio

Profondità [m]	Tipologia	Cu [kPa]	E_{edom} [MPa]	Φ [°]	E [MPa]	γ [kN/m^3]	γ_s [kN/m^3]	Permeabilità [m/s]	$V_{S,eq}$ [m/s]	F_0 [Hz]	Categoria sottosuolo	Categoria topografica
0,30 – 2,50	Sabbia limosa con ghiaia	--	**2.507**	22	**1.929**	17	18	2E-07	406 (locale a valle)	9,65 (locale a valle)	B	T1 (locale a valle)
2,50 – 10,00	Trovanti rocciosi	--	**20,890**	**35**	**16,098**	**20**	**22**	--				

Nell'ottica di un approccio cautelativo nella progettazione si assumono le seguenti caratteristiche:.

TERRENO DI FONDAZIONE

- Quota da p.c. $z < 2$ m
  Peso specifico $\gamma = 17.00$ kN/m^2
  angolo di attrito interno $\varphi = 22°$
- Quota da p.c. $z > 2$ m
  Peso specifico $\gamma = 20.00$ kN/m^2
  angolo di attrito interno $\varphi = 30°$

5.1 Quote di falda

Per quanto riguarda la profondità della falda, il modello geotecnico di progetto prescrive, sulla base delle misurazioni effettuate, che venga considerata con il valore di **6 metri** dal piano campagna.

6 ANALISI DEI CARICHI

6.1 CARICHI PERMAMENTI STRUTTURALI

Il peso proprio degli elementi è stato tenuto in conto mediante la modellazione delle sezioni degli elementi stessi. Il peso unitario considerato per gli elementi strutturali metallici è di

$$\rho = 76.97\ kN/m^3$$

Il quale è stato aumentato del 10% per tenere conto implicitamente del peso delle giunzioni metalliche.

6.2 CARICHI PERMANENTI NON STRUTTURALI

Il pacchetto di copertura ipotizzato è composto da una lamiera grecata più pannelli sandwich.

solaio sp.10/10	lamiera	SAND40/100		0.10	kN/mq
			Totale peso proprio	**0.10**	**kN/mq**

Pannello sandwich	sp. 0.04 m	γ= 3.0 kN/mc		0.12	kN/mq
			Totale permanenti compiut. definiti	**0.12**	**kN/mq**

6.3 NEVE E VENTO

6.3.1 Neve

Si è considerato il carico neve medio nella condizione di neve su due falde.

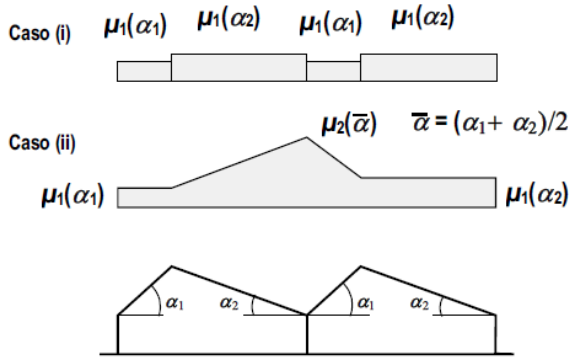
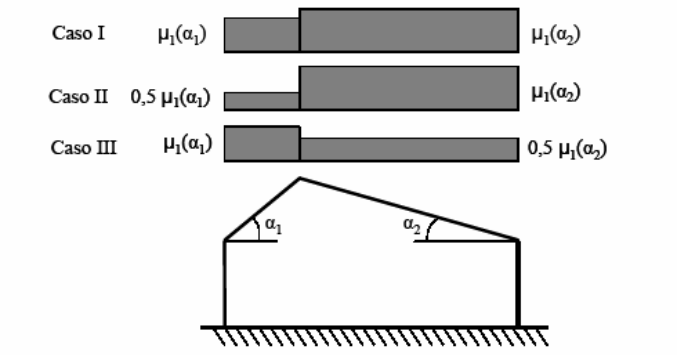


Figura C3.4.3 - *Coefficiente di forma per il carico neve – Coperture a più falde*

Successivamente, nelle combinazioni, si sono considerati i casi indicati in normativa.



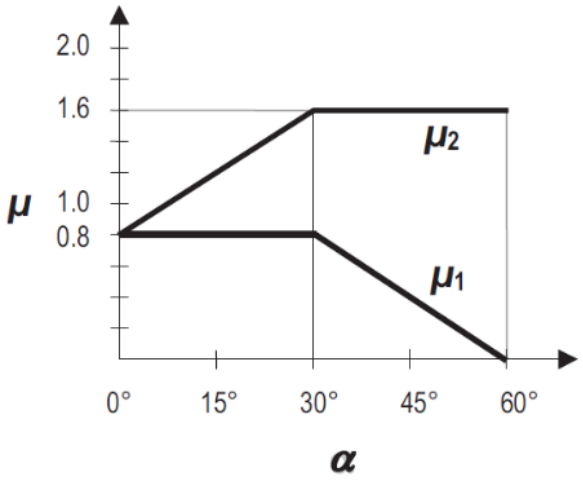


Figura C3.4.1: Coefficienti di forma per il carico neve

Tabella C3.4.I Coefficienti di forma per il carico neve

Angolo di inclinazione della falda α	$0° \le \alpha \le 30°$	$30° < \alpha < 60°$	$\alpha \ge 60°$
μ_1	0,8	$0,8(60 - \alpha)/30$	0,0
μ_2	$0,8 + 0,8\ \alpha/30$	1,6	--

CARICO DELLA NEVE D.M. 17/01/2018

Zona I - Mediterranea

a_s = 267 m.l.m.m. quota altimetrica rispetto al livello del mare

q_{sk} = 1.62 kN/m²

C_E = 1.00 coefficiente di esposizione topografia normale

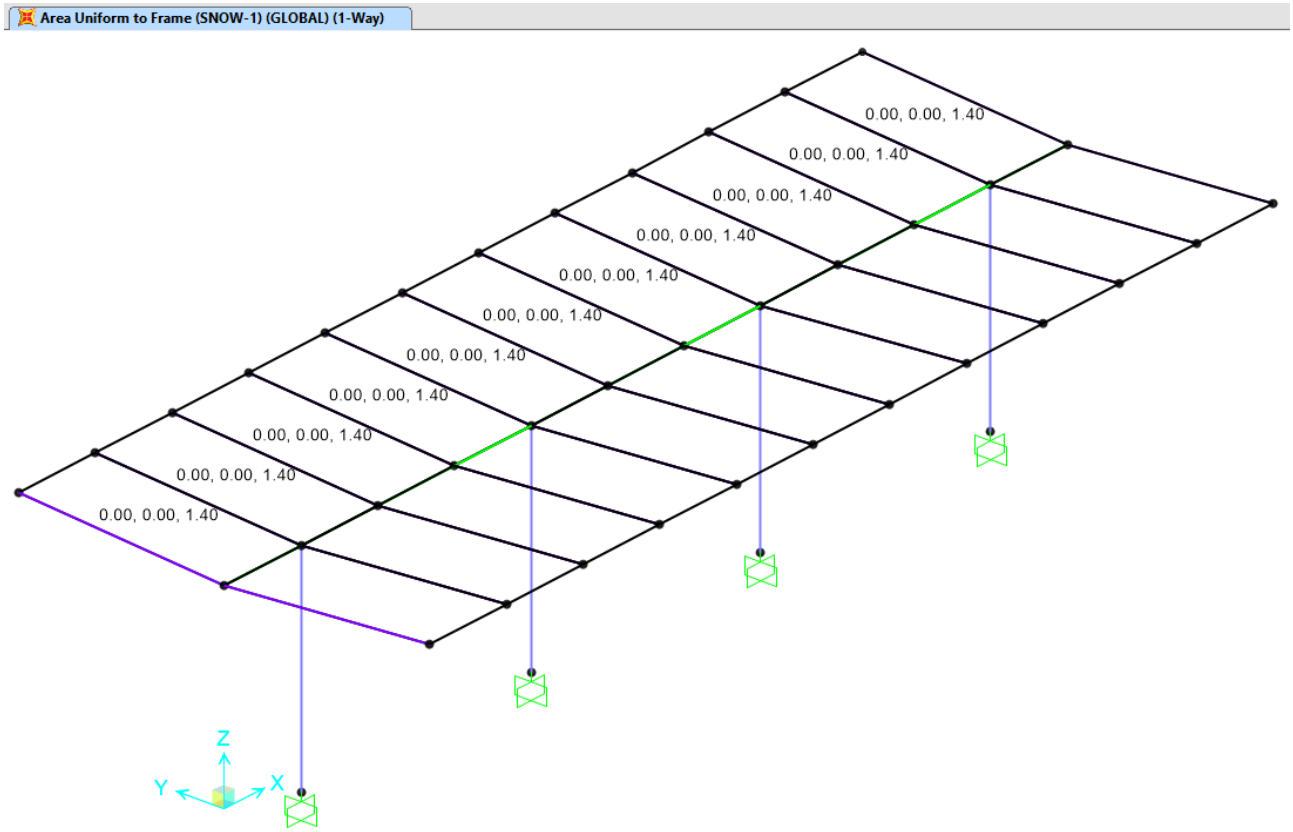
C_t = 1.00 coefficiente termico

COPERTURA A PIU' FALDE

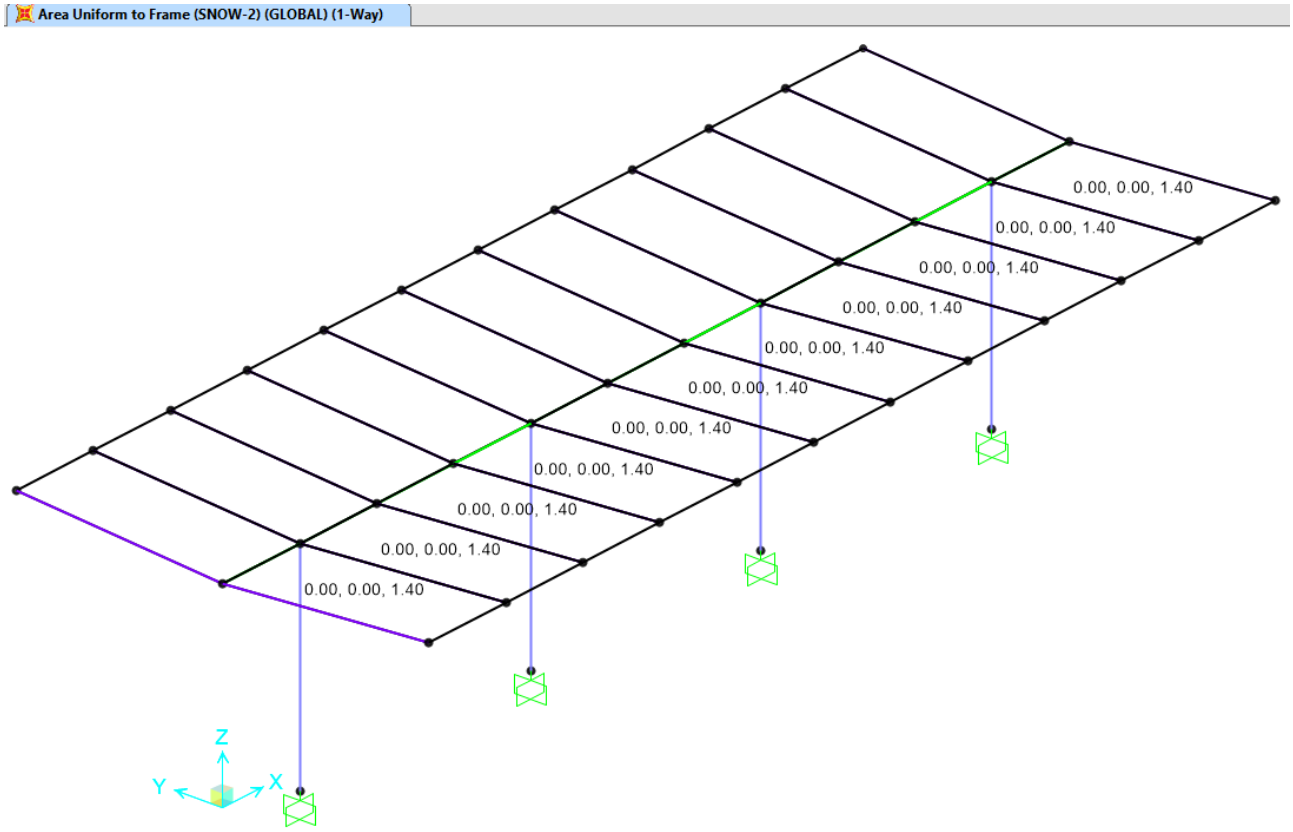
	falda	1	2	
	α_i =	5.0°	5.0°	inclinazione della falda
	μ_i =	0.80	0.93	coefficiente di forma
$q_s = \mu_i\ q_{sk}\ C_E\ C_t$ =		1.29	1.51	kN/m²
		1.40		kN/m²

Essendo il carico neve identico per tutti i tipologici, si riporta il riscontro grafico del modello solo per un tipo di struttura.

CASE: SNOW-1



CASE: SNOW-2



6.3.2 Vento

È stato considerato il carico vento che incide sulle superfici strutturali, sviluppando il calcolo per la superficie di copertura separatamente dal calcolo per le due tipologie di elementi in elevazione considerati.
L'azione da vento sugli elementi piani di copertura è stata applicata in direzione ortogonale alle superfici.

Pressione del vento:

$$p = q_r\, c_e\, c_p\, c_d$$

Zona 1 posizione fino a 500m

a_s = 267 m.l.m.m. quota altimetrica rispetto al livello del mare

z = 10.00 m altezza costruzione

Classe C Categoria III

$v_{b,0}$ =	25	m/s	c_a =	1.00		$v_b = v_{b,0}\, c_a$ =	25.0	m/s
T_R =	50	anni	c_r =	1.00		$v_r = v_b\, c_r$ =	25.0	m/s
ρ =	1.25	kg/m³	a_0 =	1000	m	k_a =	0.4	1/s

$q_r = 1/2\rho v_r^2$ = 390.63 N/m²

$c_e(z) = k_r^2 c_t \ln(z_i/z_0)\,[7+c_t \ln(z_i/z_0)]$ = 2.14 coefficiente di esposizione

con:

$z_i = z$	per $z \geq z_{min}$	z_0 =	0.10	m	k_r =	0.20
$z_i = z_{min}$	per $z < z_{min}$	z_{min} =	5.00	m		

Caso: Costruzione in piano c_t = 1.00

c_d = 1.10 coefficiente dinamico

$p_{base} = q_b\, c_e\, c_d$ = 0.919 kN/mq Pressione base

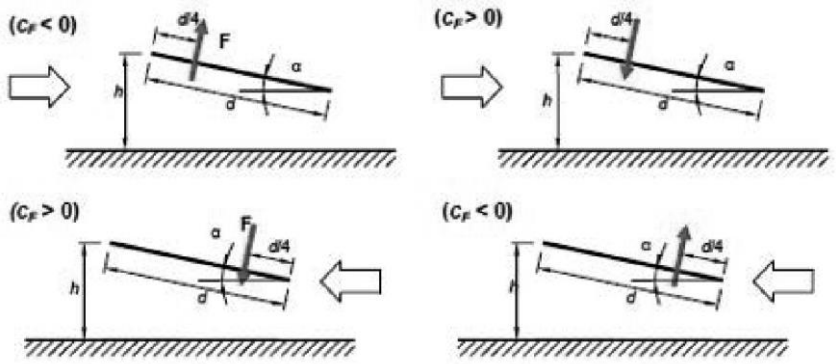
Direzione // alla linea di colmo

ϕ = 0

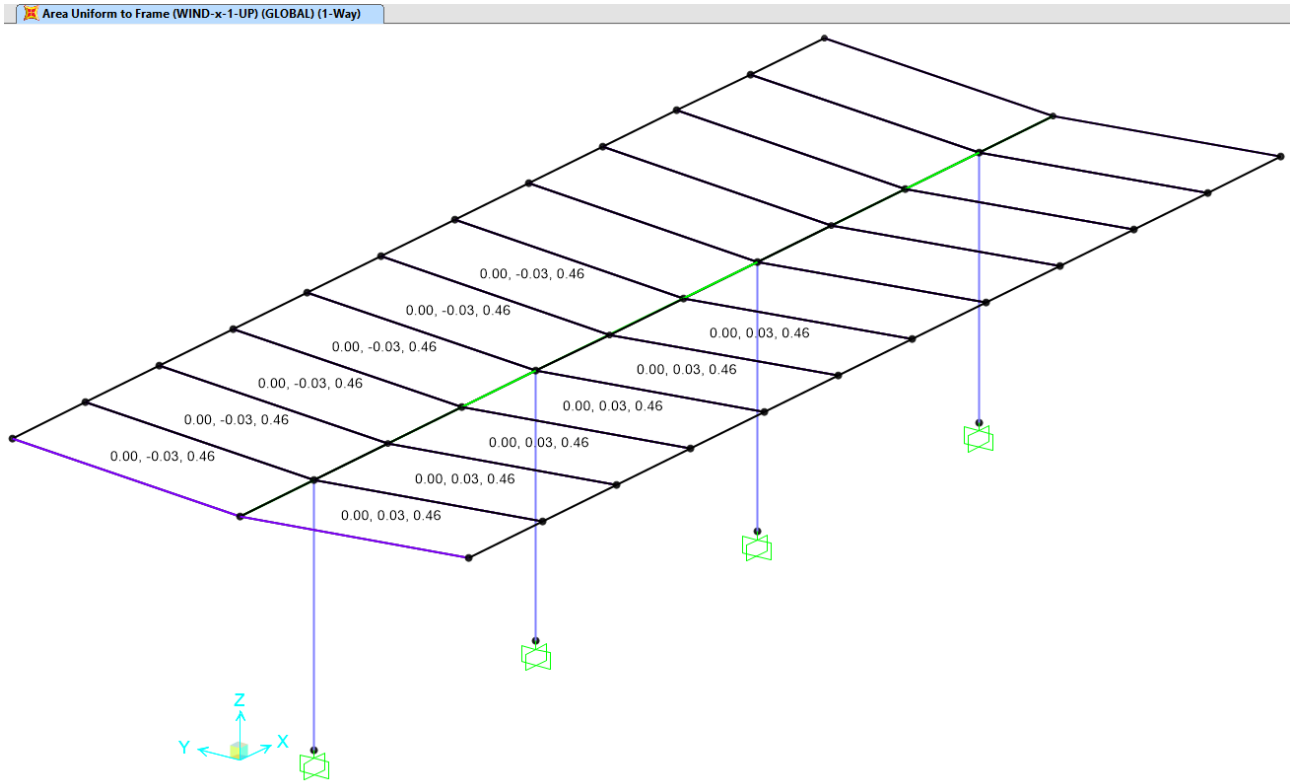
α = 0 °

	c_F	**$p = c_F\, p_{base}$ kN/m²**
$c_F > 0$	0.200	**0.184**
$c_F < 0$	-0.500	**-0.459**

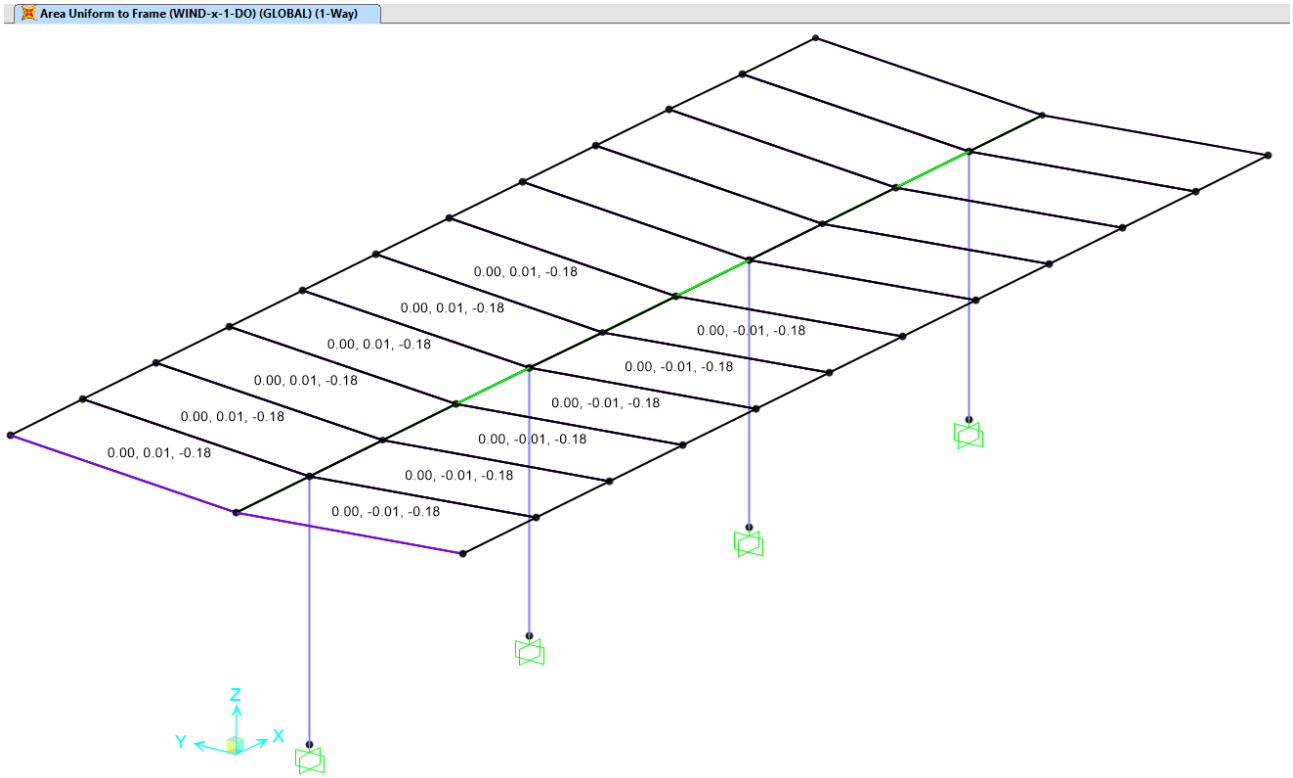
In direzione parallela al colmo la struttura è assimilabile ad una tettoia ad una sola falda con angolo di inclinazione di 0°. Si riporta l'azione da vento applicata alle falde di copertura. Essendo tale azione uguale per unità di superficie per tutti i tipologici, si riporta il riscontro del modello grafico per un solo tipo. Si sono riprodotte le combinazioni indicate dalla Circolare, riportate nello schema di seguito.



CASE: WIND-X-1-UP



CASE: WIND-X-1-DO



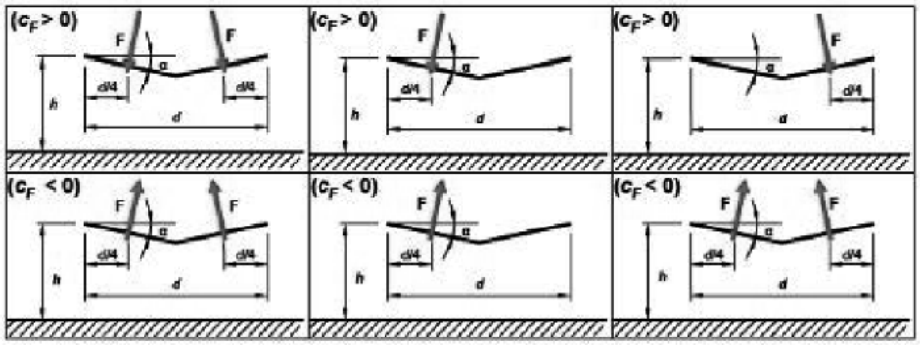
Direzione ⊥ alla linea di colmo

ϕ = 0

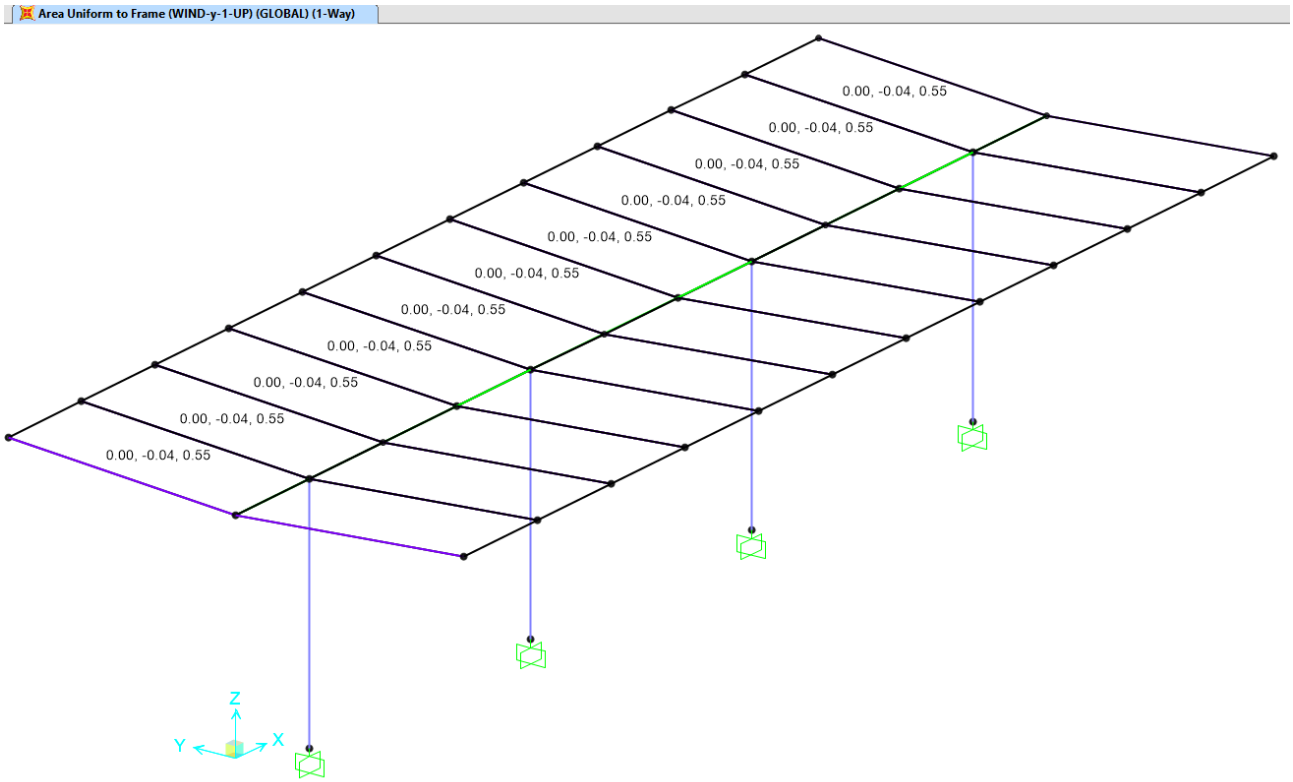
α = 5 °

	c_F	$p = c_F\, p_{base}$ kN/m²
$c_F > 0$	0.317	**0.291**
$c_F < 0$	-0.600	**-0.551**

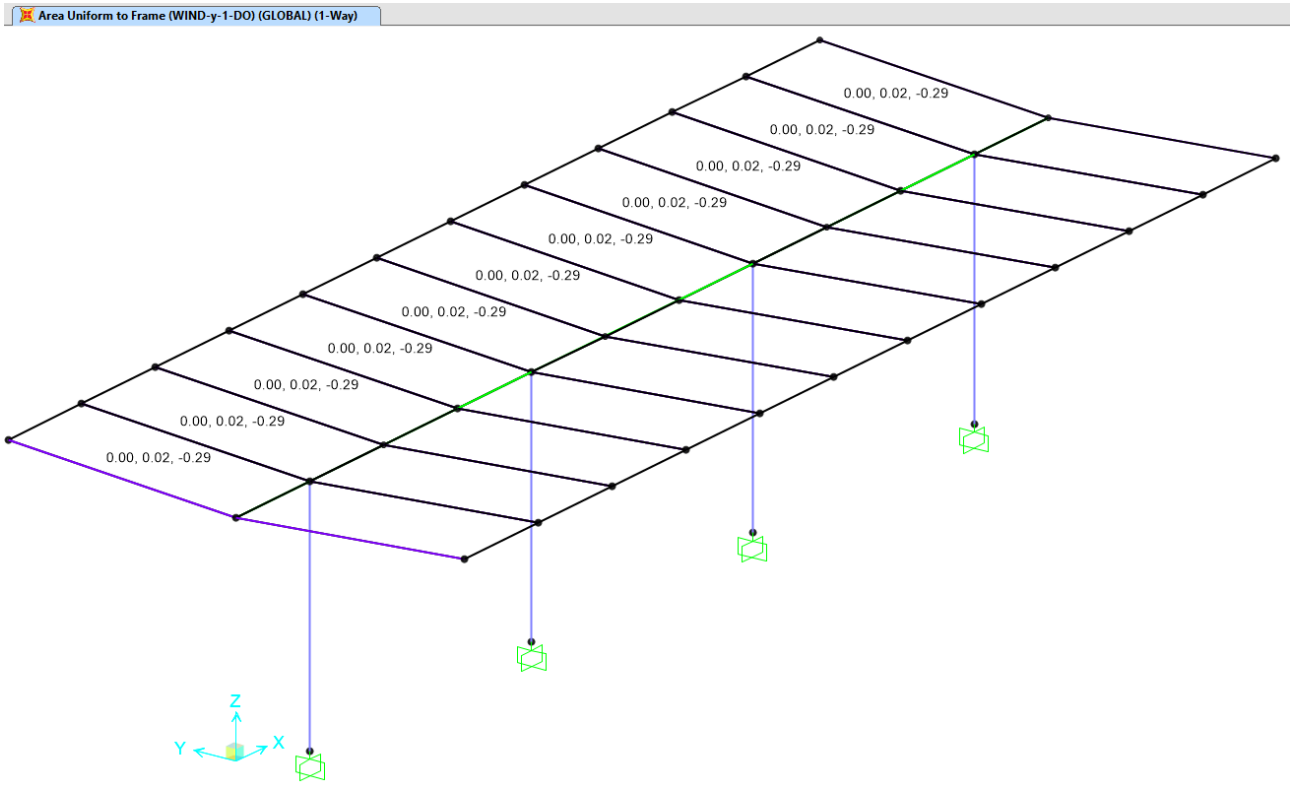
In direzione ortogonale al colmo la struttura è assimilabile ad una tettoia a due falde inclinate. Si riporta l'azione da vento applicata alle falde di copertura. Essendo tale azione uguale per unità di superficie per tutti i tipologici, si riporta il riscontro del modello grafico per un solo tipo. Attraverso le COMBINAZIONI (riportate nei paragrafi seguenti) si sono riprodotte le combinazioni indicate dalla Circolare. Si riportano nello schema di seguito i CASE fondamentali che sono stati poi combinati per riprodurre tutte le combinazioni significative.



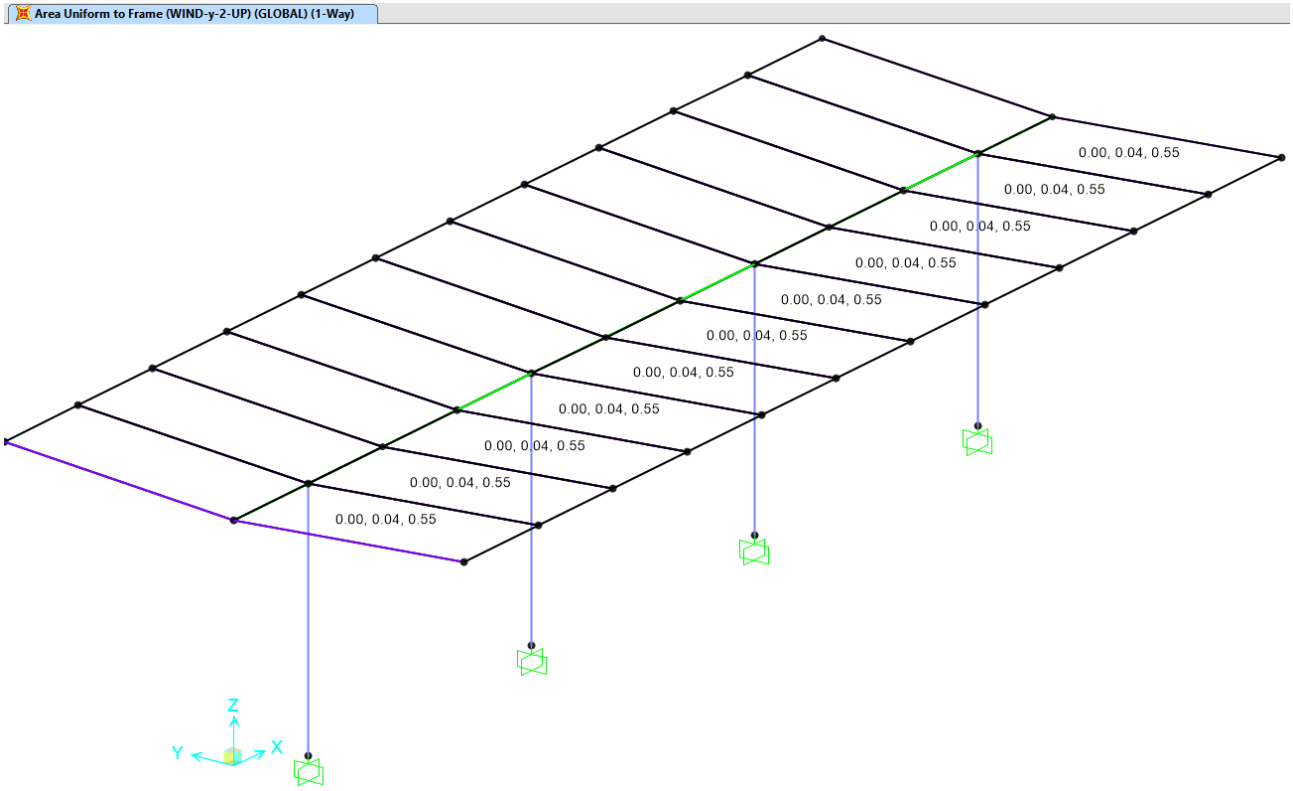
CASE: WIND-Y-1-UP



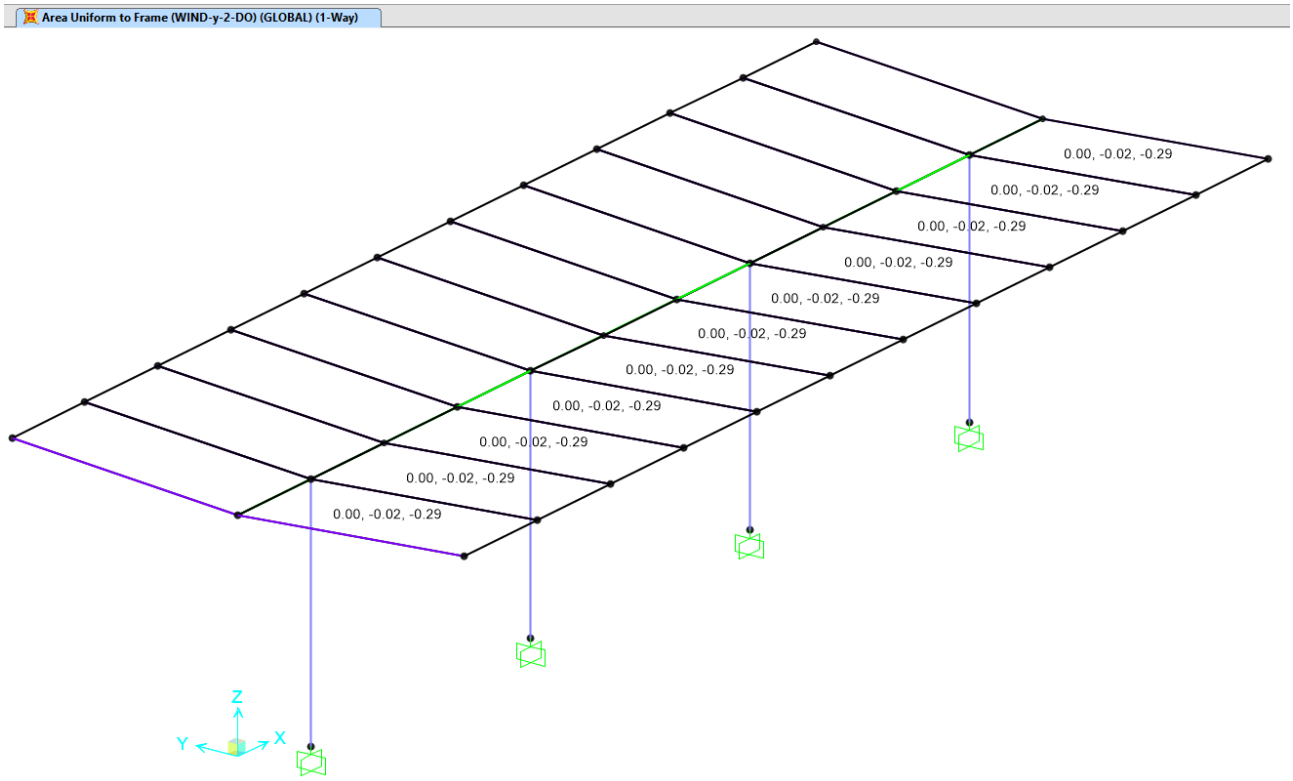
CASE: WIND-Y-1-DO



CASE: WIND-Y-2-UP



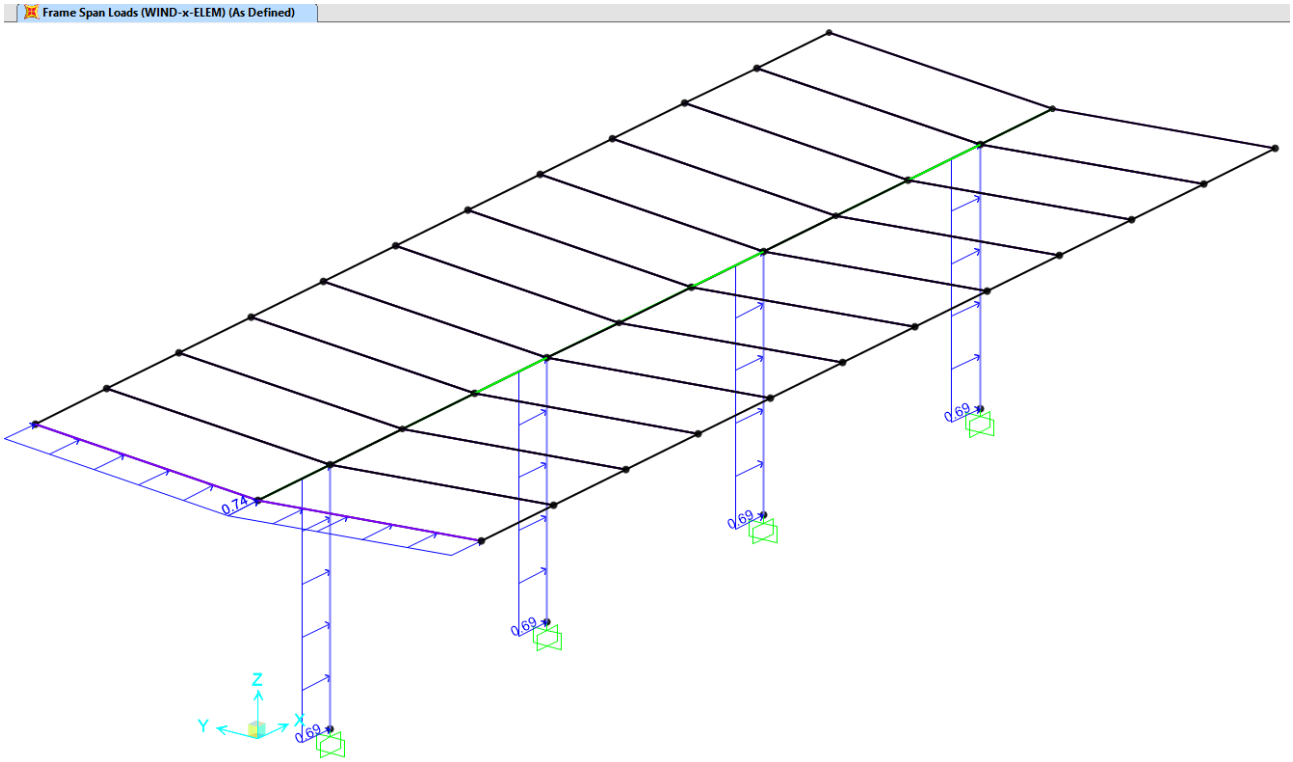
CASE: WIND-Y-2-DO



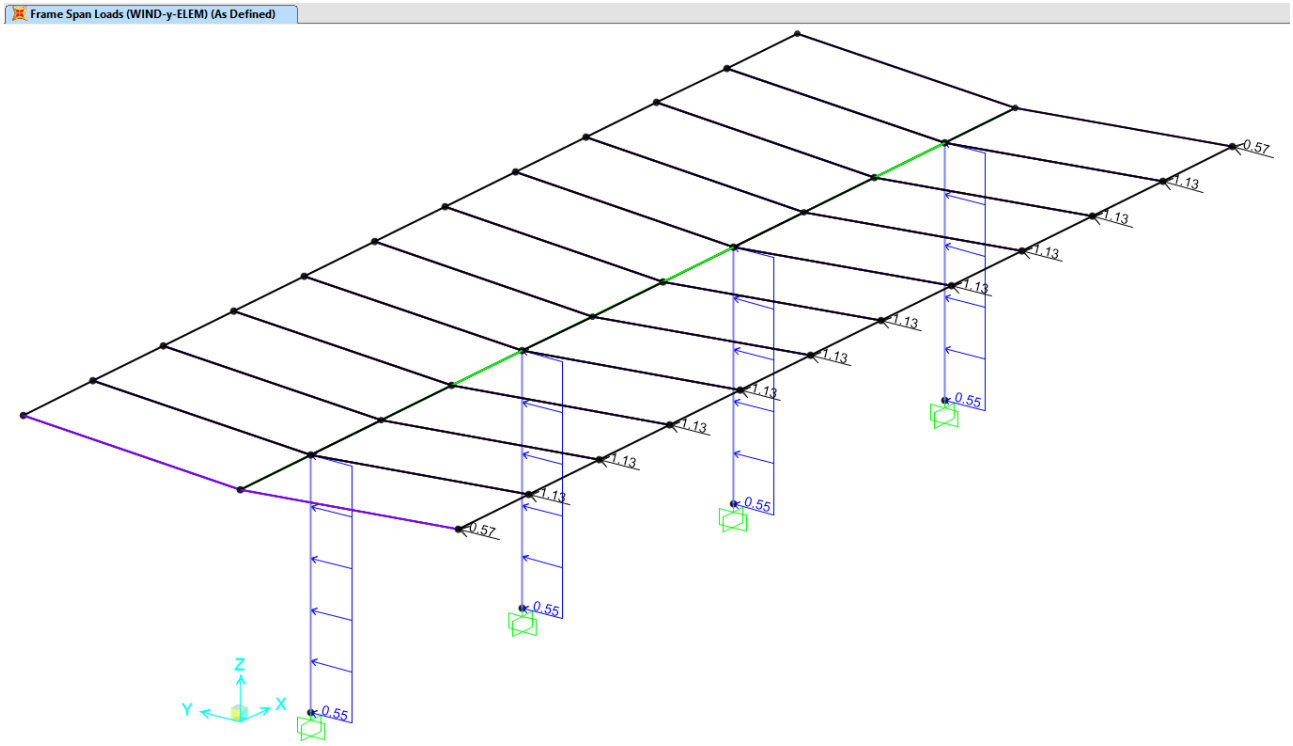
Carichi applicati agli elementi

TIPO-1					
Elementi a spigoli vivi					
cF	**2.00**	**EN1991-1-4 §7.7 Nota 1**	a	6	**m**
p = c_F p_{base}	**1.837**	**kN/m²**			
p.X.allineati	0.689	**kN/m**	b.X.col.	0.35	**m**
p.Y	0.551	**kN/m**	b.Y.col.	0.3	**m**
			a/b	**17.14**	
			k	**1.07**	**EN1991-1-4 prosp. 7.14**
Elementi copertura - trave + pannello a spigoli vivi					
cF	**2.00**	**EN1991-1-4 §7.7 Nota 1**			
p = c_F p_{base}	**1.837**	**kN/m²**			
p.X	0.742	**kN/m**	**b.tr.X**	**0.404**	**m**
p.Y	1.132	**kN/trave**	**b.tr.Y**	**0.308**	**m**
			a.tr.Y	**2.00**	**m**

CASE: WIND-X-ELEM

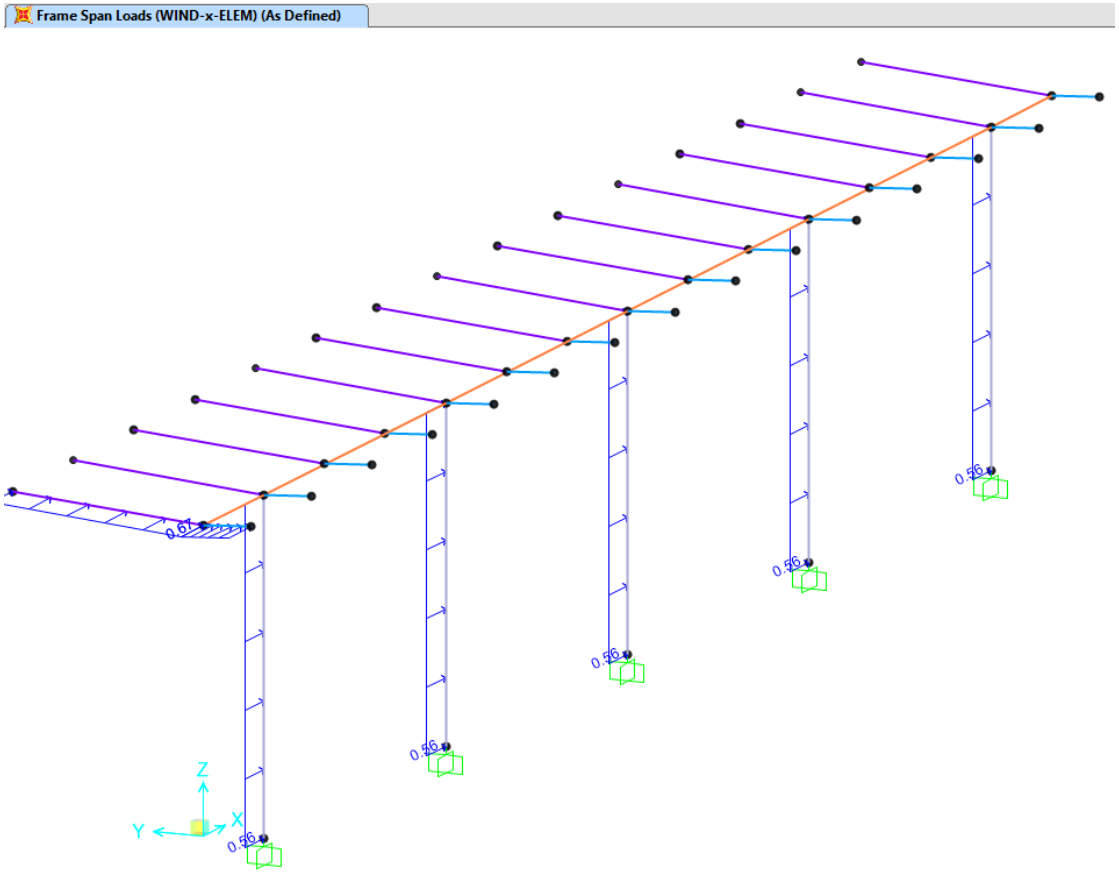


CASE: WIND-Y-ELEM

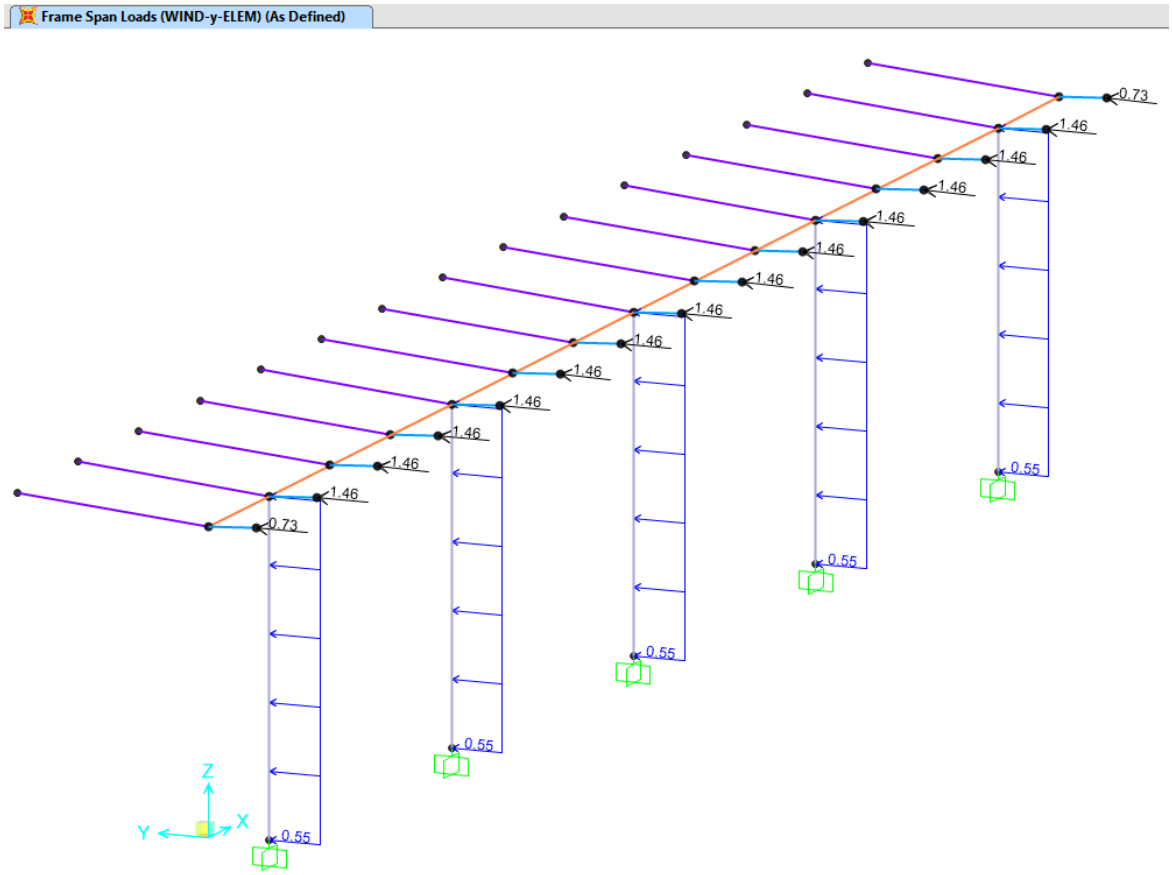


TIPO-2					
Elementi a spigoli vivi					
cF	**2.00**	**EN1991-1-4 §7.7 Nota 1**	a	6	**m**
$p = c_F p_{base}$	**1.837**	**kN/m²**			
p.X.allineat i	0.560	**kN/m**	b.X.col.	0.29	**m**
p.Y	0.551	**kN/m**	b.Y.col.	0.3	**m**
			a/b	**20.69**	
			k	**1.05**	**EN1991-1-4 prosp. 7.14**
Elementi copertura - trave + pannello a spigoli vivi					
cF	**2.00**	**EN1991-1-4 §7.7 Nota 1**			
$p = c_F p_{base}$	**1.837**	**kN/m²**			
p.X	0.669	**kN/m**	**b.tr.X**	**0.364**	**m**
p.Y	1.455	**kN/trave**	**b.tr.Y**	**0.396**	**m**
			a.tr.Y	**2.00**	**m**

CASE: WIND-X-ELEM



CASE: WIND-Y-ELEM



6.4 ANALISI AZIONE SISMICA

6.4.1 Requisiti prestazionali delle opere

La vita nominale (VN) delle opere in progetto è assunta pari a 50 anni.
La classe d'uso assunta è la II per reti viarie non ricadenti in Classi d'uso III o IV e reti ferroviarie la cui interruzione non provochi situazioni di emergenza.
Il periodo di riferimento (VR) per l'azione sismica, data la vita nominale e la classe d'uso vale:

$V_R = V_N \times c_u = 50$ anni

I valori di probabilità di superamento del periodo di riferimento PVR, cui riferirsi per individuare l'azione sismica agente è:

$P_{VR}(SLV) = 10\%$

Il periodo di ritorno dell'azione sismica T_R espresso in anni, vale:

$T_R(SLV) = - VR/\ln(1-PVR) = 475$ anni

6.4.2 Determinazione categoria di sottosuolo e categoria topografica

Per quanto riguarda la classificazione sismica, come indicato nella "Relazione geologica – Indagine geognostica, caratterizzazione e modellazione geotecnica" i terreni interessati dalle opere sono ascrivibili a:

- Categoria di suolo tipo B
- Categoria topografica tipo T1

6.4.3 Definizione parametri sismici

Si riportano i parametri ag, F0 e Tc* per i diversi stati limite.

a_g Accelerazione orizzontale massima del terreno
F0 Valore massimo del fattore di amplificazione dello spettro in accelerazione orizzontale
Tc* Periodo di inizio del tratto a velocità costante dello spettro in accelerazione orizzontale

Parametri di pericolosità Sismica					
Stato Limite		**T_r[anni]**	**a_g/g[-]**	**F_o[-]**	**T^*_c[s]**
SLO	Operatività	30	0.015	2.577	0.16
SLD	Danno	50	0.018	2.555	0.17
SLV	Salvaguardia Vita	475	0.039	2.652	0.28
SLC	Prevenzione Collasso	975	0.047	2.711	0.31

Stato Limite	SLV	
ag/g[-]	0.039	
Fo[-]	2.652	
T*c[s]	0.28	
Cat. Sottosuolo	B	
Cat. Topografica	T1	
Ss_orizz	1.200	
Ss_vertic	1.000	
Cc	1.419	
St	1	
	ORIZZ	VERTIC
T.B	0.132	0.05
T.C	0.397	0.15

T.D	1.756	1
S	1.2	1

Stato Limite	SLD	
ag/g[-]	0.018	
Fo[-]	2.555	
T*c[s]	0.17	
Cat. Sottosuolo	B	
Cat. Topografica	T1	
Ss_orizz	1.200	
Ss_vertic	1.000	
Cc	1.568	
St	1	
	ORIZZ	VERTIC
T.B	0.089	0.05
T.C	0.267	0.15
T.D	1.672	1
S	1.2	1

Gli effetti dell'azione sismica saranno valutati tenendo conto delle masse associate ai seguenti carichi gravitazionali:

$$G_1 + G_2 + \Sigma_j \psi_{2j} Q_{kj}.$$

I valori dei coefficienti ψ_{2j} sono riportati nelle tabelle ai § successivi.
Attraverso degli appositi LOAD CASE, la risposta è calcolata unitariamente per le tre componenti applicando l'espressione di seguito e permutando gli indici ottenendo tre combinazioni, delle quali poi è stato considerato l'inviluppo:

$$1{,}00 \cdot E_x + 0{,}30 \cdot E_y + 0{,}30 \cdot E_z$$

6.5 COMBINAZIONI DI CARICO

Siano:

G1 = peso proprio di tutti gli elementi strutturali;

G2 = peso proprio di tutti gli elementi non strutturali;

P = pretensione e precompressione;

Qk = azioni variabili caratteristiche sulla struttura;

A = azioni eccezionali sulla struttura;

E = azioni derivanti dai terremoti.

Ai fini delle verifiche degli stati limite si adottano le seguenti combinazioni delle azioni.

1) Fondamentale per gli stati limite ultimi (SLU)

$\gamma_{G1} \cdot G_1 + \gamma_{G2} \cdot G_2 + \gamma_P \cdot P + \gamma_{Q1} \cdot Q_{k1} + \gamma_{Q2} \cdot \psi_{02} \cdot Q_{k2} + \gamma_{Q3} \cdot \psi_{03} \cdot Q_{k3} + ...$

2) Rara per gli stati limite di esercizio (SLE)

$G_1 + G_2 + P + Q_{k1} + \psi_{02} \cdot Q_{k2} + \psi_{03} \cdot Q_{k3} + ...$

3) Frequente per gli stati limite di esercizio (SLE)

$G_1 + G_2 + P + \psi_{11} \cdot Q_{k1} + \psi_{22} \cdot Q_{k2} + \psi_{23} \cdot Q_{k3} + ...$

4) Quasi permanente per gli stati limite di esercizio (SLE)

$G_1 + G_2 + P + \psi_{21} \cdot Q_{k1} + \psi_{22} \cdot Q_{k2} + \psi_{23} \cdot Q_{k3} + ...$

5) Sismica per gli stati limite ultimi (SLU)

$E + G_1 + G_2 + P + \psi_{21} \cdot Q_{k1} + \psi_{22} \cdot Q_{k2} + ...$

6) Eccezionale per gli stati limite ultimi (SLU)

$G_1 + G_2 + P + A_d + \psi_{21} \cdot Q_{k1} + \psi_{22} \cdot Q_{k2} + ...$

I fattori di tali combinazioni lineari sono riportati nelle seguenti tabelle.

Categoria/Azione variabile	ψ_{0j}	ψ_{1j}	ψ_{2j}
Categoria A Ambienti ad uso residenziale	0,7	0,5	0,3
Categoria B Uffici	0,7	0,5	0,3
Categoria C Ambienti suscettibili di affollamento	0,7	0,7	0,6
Categoria D Ambienti ad uso commerciale	0,7	0,7	0,6
Categoria E Biblioteche, archivi, magazzini e ambienti ad uso industriale	1,0	0,9	0,8
Categoria F Rimesse e parcheggi (per autoveicoli di peso ≤ 30 kN)	0,7	0,7	0,6
Categoria G Rimesse e parcheggi (per autoveicoli di peso > 30 kN)	0,7	0,5	0,3
Categoria H Coperture	0,0	0,0	0,0
Vento	0,6	0,2	0,0
Neve (a quota ≤ 1000 m s.l.m.)	0,5	0,2	0,0
Neve (a quota > 1000 m s.l.m.)	0,7	0,5	0,2
Variazioni termiche	0,6	0,5	0,0

Tab. 2.6.I – *Coefficienti parziali per le azioni o per l'effetto delle azioni nelle verifiche SLU*

		Coefficiente γ_F	EQU	A1	A2
Carichi permanenti G_1	Favorevoli	γ_{G1}	0,9	1,0	1,0
	Sfavorevoli		1,1	1,3	1,0
Carichi permanenti non strutturali G_2[1]	Favorevoli	γ_{G2}	0,8	0,8	0,8
	Sfavorevoli		1,5	1,5	1,3
Azioni variabili Q	Favorevoli	γ_{Qi}	0,0	0,0	0,0
	Sfavorevoli		1,5	1,5	1,3

[1] Nel caso in cui l'intensità dei carichi permanenti non strutturali o di una parte di essi (ad es. carichi permanenti portati) sia ben definita in fase di progetto, per detti carichi o per la parte di essi nota si potranno adottare gli stessi coefficienti parziali validi per le azioni permanenti.

Tra le combinazioni valutate si sono considerate le varie disposizioni dell'azione del vento sulle due falde come indicato in normativa, combinatamente con il carico neve su di una falda o su entrambe, al fine di massimizzare le varie azioni di calcolo flettenti, taglianti e normali. Si riportano di seguito le combinazioni considerate in forma tabellare. I nomi dei CASE di riferimento sono riportati nei paragrafi precedenti relativi all'analisi dei carichi.

TABLE: Combination Definitions

ComboName	ComboType	AutoDesign	CaseName	ScaleFactor	SteelDesign
Text	Text	Yes/No	Text	Unitless	Text
S-1	Linear Add	No	SNOW-1	1	None
S-1			SNOW-2	1	
S-2	Linear Add	No	SNOW-1	1	None
S-2			SNOW-2	0.5	
S-env	Envelope	No	S-1	1	None
S-env			S-2	1	
Wx-1	Linear Add	No	WIND-x-1-DO	1	None
Wx-1			WIND-x-ELEM	1	
Wx-2	Linear Add	No	WIND-x-1-UP	1	None
Wx-2			WIND-x-ELEM	1	
Wy-1	Linear Add	No	WIND-y-1-UP	1	None
Wy-1			WIND-y-ELEM	1	
Wy-2	Linear Add	No	WIND-y-1-DO	1	None
Wy-2			WIND-y-ELEM	1	
Wy-3	Linear Add	No	WIND-y-1-UP	1	None
Wy-3			WIND-y-2-UP	1	
Wy-3			WIND-y-ELEM	1	
Wy-4	Linear Add	No	WIND-y-1-DO	1	None
Wy-4			WIND-y-2-DO	1	
Wy-4			WIND-y-ELEM	1	
Wy-5	Linear Add	No	WIND-y-2-UP	1	None
Wy-5			WIND-y-ELEM	1	
W-env	Envelope	No	Wx-1	1	None
W-env			Wx-2	1	
W-env			Wy-1	1	
W-env			Wy-2	1	
W-env			Wy-3	1	
W-env			Wy-4	1	
W-env			Wy-5	1	
E-SLD	Linear Add	No	SLD-x	1	None
E-SLD			SLD-y	1	
E-SLD			SLD-z	1	
E-SLV	Envelope	No	SLV-x	1	None
E-SLV			SLV-y	1	
E-SLV			SLV-z	1	
SLV	Envelope	No	DEAD	1	Strength
SLV			G1	1	
SLV			G2	1	
SLV			E-SLV	1	
Q1_1*S-1+0.6*Wx-1	Linear Add	No	S-1	1	None
Q1_1*S-1+0.6*Wx-1			Wx-1	0.6	
Q2_1*S-1+0.6*Wx-2	Linear Add	No	S-1	1	None
Q2_1*S-1+0.6*Wx-2			Wx-2	0.6	

Q3_1*S-1+0.6*Wy-1	Linear Add	No	S-1	1	None
Q3_1*S-1+0.6*Wy-1			Wy-1	0.6	
Q4_1*S-1+0.6*Wy-2	Envelope	No	S-1	1	None
Q4_1*S-1+0.6*Wy-2			Wy-2	0.6	
Q5_1*S-1+0.6*Wy-3	Linear Add	No	S-1	1	None
Q5_1*S-1+0.6*Wy-3			Wy-3	0.6	
Q6_1*S-1+0.6*Wy-4	Linear Add	No	S-1	1	None
Q6_1*S-1+0.6*Wy-4			Wy-4	0.6	
Q7_1*S-2+0.6*Wx-1	Linear Add	No	S-2	1	None
Q7_1*S-2+0.6*Wx-1			Wx-1	0.6	
Q7-f_0.2*S-2	Linear Add	No	S-2	0.2	None
Q8_1*S-2+0.6*Wx-2	Linear Add	No	S-2	1	Deflection
Q8_1*S-2+0.6*Wx-2			Wx-2	0.6	
Q9_1*S-2+0.6*Wy-1	Linear Add	No	S-2	1	None
Q9_1*S-2+0.6*Wy-1			Wy-1	0.6	
Q10_1*S-2+0.6*Wy-2	Linear Add	No	S-2	1	None
Q10_1*S-2+0.6*Wy-2			Wy-2	0.6	
Q11_1*S-2+0.6*Wy-3	Linear Add	No	S-2	1	None
Q11_1*S-2+0.6*Wy-3			Wy-3	0.6	
Q12_1*S-2+0.6*Wy-4	Linear Add	No	S-2	1	None
Q12_1*S-2+0.6*Wy-4			Wy-4	0.6	
Q13_0.5*S-1+1*Wx-1	Linear Add	No	S-1	0.5	None
Q13_0.5*S-1+1*Wx-1			Wx-1	1	
Q14_0.5*S-1+1*Wx-2	Linear Add	No	S-1	0.5	None
Q14_0.5*S-1+1*Wx-2			Wx-2	1	
Q15_0.5*S-1+1*Wy-1	Linear Add	No	S-1	0.5	None
Q15_0.5*S-1+1*Wy-1			Wy-1	1	
Q16_0.5*S-1+1*Wy-2	Linear Add	No	S-1	0.5	None
Q16_0.5*S-1+1*Wy-2			Wy-2	1	
Q17_0.5*S-1+1*Wy-3	Linear Add	No	S-1	0.5	None
Q17_0.5*S-1+1*Wy-3			Wy-3	1	
Q18_0.5*S-1+1*Wy-4	Envelope	No	S-1	0.5	None
Q18_0.5*S-1+1*Wy-4			Wy-4	1	
Q19_0.5*S-2+1*Wx-1	Linear Add	No	S-2	0.5	None
Q19_0.5*S-2+1*Wx-1			Wx-1	1	
Q19-f_0*S-2+0.2*Wx-1	Linear Add	No	S-2	0	None
Q19-f_0*S-2+0.2*Wx-1			Wx-1	0.2	
Q20_0.5*S-2+1*Wx-2	Linear Add	No	S-2	0.5	None
Q20_0.5*S-2+1*Wx-2			Wx-2	1	
Q20-f_0*S-2+0.2*Wx-2	Linear Add	No	S-2	0	None
Q20-f_0*S-2+0.2*Wx-2			Wx-2	0.2	
Q21_0.5*S-2+1*Wy-1	Envelope	No	S-2	0.5	None
Q21_0.5*S-2+1*Wy-1			Wy-1	1	
Q22_0.5*S-2+1*Wy-2	Linear Add	No	S-2	0.5	None
Q22_0.5*S-2+1*Wy-2			Wy-2	1	
Q23_0.5*S-2+1*Wy-3	Linear Add	No	S-2	0.5	None

Q23_0.5*S-2+1*Wy-3			Wy-3	1	
Q24_0.5*S-2+1*Wy-4	Envelope	No	S-2	0.5	None
Q24_0.5*S-2+1*Wy-4			Wy-4	1	
Q25_1*S-2+0.6*Wy-5	Linear Add	No	S-2	1	None
Q25_1*S-2+0.6*Wy-5			Wy-5	0.6	
Q25-f_0*S-2+0.2*Wy-5	Linear Add	No	S-2	0	None
Q25-f_0*S-2+0.2*Wy-5			Wy-5	0.2	
Q26_0.5*S-2+1*Wy-5	Linear Add	No	S-2	0.5	None
Q26_0.5*S-2+1*Wy-5			Wy-5	1	
Q-env	Envelope	No	Q1_1*S-1+0.6*Wx-1	1	None
Q-env			Q2_1*S-1+0.6*Wx-2	1	
Q-env			Q3_1*S-1+0.6*Wy-1	1	
Q-env			Q4_1*S-1+0.6*Wy-2	1	
Q-env			Q5_1*S-1+0.6*Wy-3	1	
Q-env			Q6_1*S-1+0.6*Wy-4	1	
Q-env			Q7_1*S-2+0.6*Wx-1	1	
Q-env			Q8_1*S-2+0.6*Wx-2	1	
Q-env			Q9_1*S-2+0.6*Wy-1	1	
Q-env			Q10_1*S-2+0.6*Wy-2	1	
Q-env			Q11_1*S-2+0.6*Wy-3	1	
Q-env			Q12_1*S-2+0.6*Wy-4	1	
Q-env			Q13_0.5*S-1+1*Wx-1	1	
Q-env			Q14_0.5*S-1+1*Wx-2	1	
Q-env			Q15_0.5*S-1+1*Wy-1	1	
Q-env			Q16_0.5*S-1+1*Wy-2	1	
Q-env			Q17_0.5*S-1+1*Wy-3	1	
Q-env			Q18_0.5*S-1+1*Wy-4	1	
Q-env			Q19_0.5*S-2+1*Wx-1	1	
Q-env			Q20_0.5*S-2+1*Wx-2	1	
Q-env			Q21_0.5*S-2+1*Wy-1	1	
Q-env			Q22_0.5*S-2+1*Wy-2	1	
Q-env			Q23_0.5*S-2+1*Wy-3	1	
Q-env			Q24_0.5*S-2+1*Wy-4	1	
Q-env			Q25_1*S-2+0.6*Wy-5	1	
Q-env			Q26_0.5*S-2+1*Wy-5	1	
Q-fatigue_0.2*Wy-5	Linear Add	No	Wy-5	0.2	None
SLE.f-Q19-f_0.2*Wx-1	Linear Add	No	Q19-f_0*S-2+0.2*Wx-1	1	Deflection
SLE.f-Q19-f_0.2*Wx-1			DEAD	1	
SLE.f-Q19-f_0.2*Wx-1			G1	1	
SLE.f-Q19-f_0.2*Wx-1			G2	1	
SLE.f-Q20-f_0.2*Wx-2	Linear Add	No	Q20-f_0*S-2+0.2*Wx-2	1	Deflection
SLE.f-Q20-f_0.2*Wx-2			DEAD	1	
SLE.f-Q20-f_0.2*Wx-2			G1	1	
SLE.f-Q20-f_0.2*Wx-2			G2	1	
SLE.f-Q25-f_0.2*Wy-5	Linear Add	No	Q25-f_0*S-2+0.2*Wy-5	1	Deflection
SLE.f-Q25-f_0.2*Wy-5			DEAD	1	

SLE.f-Q25-f_0.2*Wy-5			G1	1	
SLE.f-Q25-f_0.2*Wy-5			G2	1	
SLE.f-Q7-f_0.2*S-2	Linear Add	No	Q7-f_0.2*S-2	1	Deflection
SLE.f-Q7-f_0.2*S-2			DEAD	1	
SLE.f-Q7-f_0.2*S-2			G1	1	
SLE.f-Q7-f_0.2*S-2			G2	1	
SLE.qp	Linear Add	No	DEAD	1	None
SLE.qp			G1	1	
SLE.qp			G2	1	
SLE.r-Q1_1*S-1+0.6*Wx-1	Linear Add	No	Q1_1*S-1+0.6*Wx-1	1	Deflection
SLE.r-Q1_1*S-1+0.6*Wx-1			DEAD	1	
SLE.r-Q1_1*S-1+0.6*Wx-1			G1	1	
SLE.r-Q1_1*S-1+0.6*Wx-1			G2	1	
SLE.r-Q2_1*S-1+0.6*Wx-2	Linear Add	No	Q2_1*S-1+0.6*Wx-2	1	Deflection
SLE.r-Q2_1*S-1+0.6*Wx-2			DEAD	1	
SLE.r-Q2_1*S-1+0.6*Wx-2			G1	1	
SLE.r-Q2_1*S-1+0.6*Wx-2			G2	1	
SLE.r-Q3_1*S-1+0.6*Wy-1	Linear Add	No	Q3_1*S-1+0.6*Wy-1	1	Deflection
SLE.r-Q3_1*S-1+0.6*Wy-1			DEAD	1	
SLE.r-Q3_1*S-1+0.6*Wy-1			G1	1	
SLE.r-Q3_1*S-1+0.6*Wy-1			G2	1	
SLE.r-Q4_1*S-1+0.6*Wy-2	Linear Add	No	Q4_1*S-1+0.6*Wy-2	1	Deflection
SLE.r-Q4_1*S-1+0.6*Wy-2			DEAD	1	
SLE.r-Q4_1*S-1+0.6*Wy-2			G1	1	
SLE.r-Q4_1*S-1+0.6*Wy-2			G2	1	
SLE.r-Q5_1*S-1+0.6*Wy-3	Linear Add	No	Q5_1*S-1+0.6*Wy-3	1	Deflection
SLE.r-Q5_1*S-1+0.6*Wy-3			DEAD	1	
SLE.r-Q5_1*S-1+0.6*Wy-3			G1	1	
SLE.r-Q5_1*S-1+0.6*Wy-3			G2	1	
SLE.r-Q6_1*S-1+0.6*Wy-4	Linear Add	No	Q6_1*S-1+0.6*Wy-4	1	Deflection
SLE.r-Q6_1*S-1+0.6*Wy-4			DEAD	1	
SLE.r-Q6_1*S-1+0.6*Wy-4			G1	1	
SLE.r-Q6_1*S-1+0.6*Wy-4			G2	1	
SLE.r-Q7_1*S-2+0.6*Wx-1	Linear Add	No	Q7_1*S-2+0.6*Wx-1	1	Deflection
SLE.r-Q7_1*S-2+0.6*Wx-1			DEAD	1	
SLE.r-Q7_1*S-2+0.6*Wx-1			G1	1	
SLE.r-Q7_1*S-2+0.6*Wx-1			G2	1	
SLE.r-Q8_1*S-2+0.6*Wx-2	Linear Add	No	Q8_1*S-2+0.6*Wx-2	1	Deflection
SLE.r-Q8_1*S-2+0.6*Wx-2			DEAD	1	
SLE.r-Q8_1*S-2+0.6*Wx-2			G1	1	
SLE.r-Q8_1*S-2+0.6*Wx-2			G2	1	
SLE.r-Q9_1*S-2+0.6*Wy-1	Linear Add	No	Q9_1*S-2+0.6*Wy-1	1	Deflection
SLE.r-Q9_1*S-2+0.6*Wy-1			DEAD	1	
SLE.r-Q9_1*S-2+0.6*Wy-1			G1	1	
SLE.r-Q9_1*S-2+0.6*Wy-1			G2	1	
SLE.r-Q10_1*S-2+0.6*Wy-2	Linear Add	No	Q10_1*S-2+0.6*Wy-2	1	Deflection

SLE.r-Q10_1*S-2+0.6*Wy-2			DEAD	1	
SLE.r-Q10_1*S-2+0.6*Wy-2			G1	1	
SLE.r-Q10_1*S-2+0.6*Wy-2			G2	1	
SLE.r-Q11_1*S-2+0.6*Wy-3	Linear Add	No	Q11_1*S-2+0.6*Wy-3	1	Deflection
SLE.r-Q11_1*S-2+0.6*Wy-3			DEAD	1	
SLE.r-Q11_1*S-2+0.6*Wy-3			G1	1	
SLE.r-Q11_1*S-2+0.6*Wy-3			G2	1	
SLE.r-Q12_1*S-2+0.6*Wy-4	Linear Add	No	Q12_1*S-2+0.6*Wy-4	1	Deflection
SLE.r-Q12_1*S-2+0.6*Wy-4			DEAD	1	
SLE.r-Q12_1*S-2+0.6*Wy-4			G1	1	
SLE.r-Q12_1*S-2+0.6*Wy-4			G2	1	
SLE.r-Q13_0.5*S-1+1*Wx-1	Linear Add	No	Q13_0.5*S-1+1*Wx-1	1	Deflection
SLE.r-Q13_0.5*S-1+1*Wx-1			DEAD	1	
SLE.r-Q13_0.5*S-1+1*Wx-1			G1	1	
SLE.r-Q13_0.5*S-1+1*Wx-1			G2	1	
SLE.r-Q14_0.5*S-1+1*Wx-2	Linear Add	No	Q14_0.5*S-1+1*Wx-2	1	Deflection
SLE.r-Q14_0.5*S-1+1*Wx-2			DEAD	1	
SLE.r-Q14_0.5*S-1+1*Wx-2			G1	1	
SLE.r-Q14_0.5*S-1+1*Wx-2			G2	1	
SLE.r-Q15_0.5*S-1+1*Wy-1	Linear Add	No	Q15_0.5*S-1+1*Wy-1	1	Deflection
SLE.r-Q15_0.5*S-1+1*Wy-1			DEAD	1	
SLE.r-Q15_0.5*S-1+1*Wy-1			G1	1	
SLE.r-Q15_0.5*S-1+1*Wy-1			G2	1	
SLE.r-Q16_0.5*S-1+1*Wy-2	Linear Add	No	Q16_0.5*S-1+1*Wy-2	1	Deflection
SLE.r-Q16_0.5*S-1+1*Wy-2			DEAD	1	
SLE.r-Q16_0.5*S-1+1*Wy-2			G1	1	
SLE.r-Q16_0.5*S-1+1*Wy-2			G2	1	
SLE.r-Q17_0.5*S-1+1*Wy-3	Linear Add	No	Q17_0.5*S-1+1*Wy-3	1	Deflection
SLE.r-Q17_0.5*S-1+1*Wy-3			DEAD	1	
SLE.r-Q17_0.5*S-1+1*Wy-3			G1	1	
SLE.r-Q17_0.5*S-1+1*Wy-3			G2	1	
SLE.r-Q18_0.5*S-1+1*Wy-4	Linear Add	No	Q18_0.5*S-1+1*Wy-4	1	Deflection
SLE.r-Q18_0.5*S-1+1*Wy-4			DEAD	1	
SLE.r-Q18_0.5*S-1+1*Wy-4			G1	1	
SLE.r-Q18_0.5*S-1+1*Wy-4			G2	1	
SLE.r-Q19_0.5*S-2+1*Wx-1	Linear Add	No	Q19_0.5*S-2+1*Wx-1	1	Deflection
SLE.r-Q19_0.5*S-2+1*Wx-1			DEAD	1	
SLE.r-Q19_0.5*S-2+1*Wx-1			G1	1	
SLE.r-Q19_0.5*S-2+1*Wx-1			G2	1	
SLE.r-Q20_0.5*S-2+1*Wx-2	Linear Add	No	Q20_0.5*S-2+1*Wx-2	1	Deflection
SLE.r-Q20_0.5*S-2+1*Wx-2			DEAD	1	
SLE.r-Q20_0.5*S-2+1*Wx-2			G1	1	
SLE.r-Q20_0.5*S-2+1*Wx-2			G2	1	
SLE.r-Q21_0.5*S-2+1*Wy-1	Linear Add	No	Q21_0.5*S-2+1*Wy-1	1	Deflection
SLE.r-Q21_0.5*S-2+1*Wy-1			DEAD	1	
SLE.r-Q21_0.5*S-2+1*Wy-1			G1	1	

SLE.r-Q21_0.5*S-2+1*Wy-1			G2	1	
SLE.r-Q22_0.5*S-2+1*Wy-2	Linear Add	No	Q22_0.5*S-2+1*Wy-2	1	Deflection
SLE.r-Q22_0.5*S-2+1*Wy-2			DEAD	1	
SLE.r-Q22_0.5*S-2+1*Wy-2			G1	1	
SLE.r-Q22_0.5*S-2+1*Wy-2			G2	1	
SLE.r-Q23_0.5*S-2+1*Wy-3	Linear Add	No	Q23_0.5*S-2+1*Wy-3	1	Deflection
SLE.r-Q23_0.5*S-2+1*Wy-3			DEAD	1	
SLE.r-Q23_0.5*S-2+1*Wy-3			G1	1	
SLE.r-Q23_0.5*S-2+1*Wy-3			G2	1	
SLE.r-Q24_0.5*S-2+1*Wy-4	Linear Add	No	Q24_0.5*S-2+1*Wy-4	1	Deflection
SLE.r-Q24_0.5*S-2+1*Wy-4			DEAD	1	
SLE.r-Q24_0.5*S-2+1*Wy-4			G1	1	
SLE.r-Q24_0.5*S-2+1*Wy-4			G2	1	
SLE.r-Q25_1*S-2+0.6*Wy-5	Linear Add	No	Q25_1*S-2+0.6*Wy-5	1	Deflection
SLE.r-Q25_1*S-2+0.6*Wy-5			DEAD	1	
SLE.r-Q25_1*S-2+0.6*Wy-5			G1	1	
SLE.r-Q25_1*S-2+0.6*Wy-5			G2	1	
SLE.r-Q26_0.5*S-2+1*Wy-5	Linear Add	No	Q26_0.5*S-2+1*Wy-5	1	Deflection
SLE.r-Q26_0.5*S-2+1*Wy-5			DEAD	1	
SLE.r-Q26_0.5*S-2+1*Wy-5			G1	1	
SLE.r-Q26_0.5*S-2+1*Wy-5			G2	1	
SLE.r-env	Envelope	No	SLE.r-Q1_1*S-1+0.6*Wx-1	1	None
SLE.r-env			SLE.r-Q2_1*S-1+0.6*Wx-2	1	
SLE.r-env			SLE.r-Q3_1*S-1+0.6*Wy-1	1	
SLE.r-env			SLE.r-Q4_1*S-1+0.6*Wy-2	1	
SLE.r-env			SLE.r-Q5_1*S-1+0.6*Wy-3	1	
SLE.r-env			SLE.r-Q6_1*S-1+0.6*Wy-4	1	
SLE.r-env			SLE.r-Q7_1*S-2+0.6*Wx-1	1	
SLE.r-env			SLE.r-Q8_1*S-2+0.6*Wx-2	1	
SLE.r-env			SLE.r-Q9_1*S-2+0.6*Wy-1	1	
SLE.r-env			SLE.r-Q10_1*S-2+0.6*Wy-2	1	
SLE.r-env			SLE.r-Q11_1*S-2+0.6*Wy-3	1	
SLE.r-env			SLE.r-Q12_1*S-2+0.6*Wy-4	1	
SLE.r-env			SLE.r-Q13_0.5*S-1+1*Wx-1	1	
SLE.r-env			SLE.r-Q14_0.5*S-1+1*Wx-2	1	
SLE.r-env			SLE.r-Q15_0.5*S-1+1*Wy-1	1	
SLE.r-env			SLE.r-Q16_0.5*S-1+1*Wy-2	1	
SLE.r-env			SLE.r-Q17_0.5*S-1+1*Wy-3	1	
SLE.r-env			SLE.r-Q18_0.5*S-1+1*Wy-4	1	

			SLE.r-Q19_0.5*S-2+1*Wx-1		
SLE.r-env				1	
			SLE.r-Q20_0.5*S-2+1*Wx-2		
SLE.r-env				1	
			SLE.r-Q21_0.5*S-2+1*Wy-1		
SLE.r-env				1	
			SLE.r-Q22_0.5*S-2+1*Wy-2		
SLE.r-env				1	
			SLE.r-Q23_0.5*S-2+1*Wy-3		
SLE.r-env				1	
			SLE.r-Q24_0.5*S-2+1*Wy-4		
SLE.r-env				1	
			SLE.r-Q25_1*S-2+0.6*Wy-5		
SLE.r-env				1	
			SLE.r-Q26_0.5*S-2+1*Wy-5		
SLE.r-env				1	
SLU-Q1_1*S-1+0.6*Wx-1	Envelope	No	Q1_1*S-1+0.6*Wx-1	1.5	Strength
SLU-Q1_1*S-1+0.6*Wx-1			DEAD	1.3	
SLU-Q1_1*S-1+0.6*Wx-1			G1	1.3	
SLU-Q1_1*S-1+0.6*Wx-1			G2	1.5	
SLU-Q2_1*S-1+0.6*Wx-2	Linear Add	No	Q2_1*S-1+0.6*Wx-2	1.5	Strength
SLU-Q2_1*S-1+0.6*Wx-2			DEAD	1.3	
SLU-Q2_1*S-1+0.6*Wx-2			G1	1.3	
SLU-Q2_1*S-1+0.6*Wx-2			G2	1.5	
SLU-Q3_1*S-1+0.6*Wy-1	Linear Add	No	Q3_1*S-1+0.6*Wy-1	1.5	Strength
SLU-Q3_1*S-1+0.6*Wy-1			DEAD	1.3	
SLU-Q3_1*S-1+0.6*Wy-1			G1	1.3	
SLU-Q3_1*S-1+0.6*Wy-1			G2	1.5	
SLU-Q4_1*S-1+0.6*Wy-2	Linear Add	No	Q4_1*S-1+0.6*Wy-2	1.5	Strength
SLU-Q4_1*S-1+0.6*Wy-2			DEAD	1.3	
SLU-Q4_1*S-1+0.6*Wy-2			G1	1.3	
SLU-Q4_1*S-1+0.6*Wy-2			G2	1.5	
SLU-Q5_1*S-1+0.6*Wy-3	Linear Add	No	Q5_1*S-1+0.6*Wy-3	1.5	Strength
SLU-Q5_1*S-1+0.6*Wy-3			DEAD	1.3	
SLU-Q5_1*S-1+0.6*Wy-3			G1	1.3	
SLU-Q5_1*S-1+0.6*Wy-3			G2	1.5	
SLU-Q6_1*S-1+0.6*Wy-4	Linear Add	No	Q6_1*S-1+0.6*Wy-4	1.5	Strength
SLU-Q6_1*S-1+0.6*Wy-4			DEAD	1.3	
SLU-Q6_1*S-1+0.6*Wy-4			G1	1.3	
SLU-Q6_1*S-1+0.6*Wy-4			G2	1.5	
SLU-Q7_1*S-2+0.6*Wx-1	Linear Add	No	Q7_1*S-2+0.6*Wx-1	1.5	Strength
SLU-Q7_1*S-2+0.6*Wx-1			DEAD	1.3	
SLU-Q7_1*S-2+0.6*Wx-1			G1	1.3	
SLU-Q7_1*S-2+0.6*Wx-1			G2	1.5	
SLU-Q8_1*S-2+0.6*Wx-2	Linear Add	No	Q8_1*S-2+0.6*Wx-2	1.5	Strength
SLU-Q8_1*S-2+0.6*Wx-2			DEAD	1.3	
SLU-Q8_1*S-2+0.6*Wx-2			G1	1.3	
SLU-Q8_1*S-2+0.6*Wx-2			G2	1.5	

SLU-Q9_1*S-2+0.6*Wy-1	Linear Add	No	Q9_1*S-2+0.6*Wy-1	1.5	Strength
SLU-Q9_1*S-2+0.6*Wy-1			DEAD	1.3	
SLU-Q9_1*S-2+0.6*Wy-1			G1	1.3	
SLU-Q9_1*S-2+0.6*Wy-1			G2	1.5	
SLU-Q10_1*S-2+0.6*Wy-2	Linear Add	No	Q10_1*S-2+0.6*Wy-2	1.5	Strength
SLU-Q10_1*S-2+0.6*Wy-2			DEAD	1.3	
SLU-Q10_1*S-2+0.6*Wy-2			G1	1.3	
SLU-Q10_1*S-2+0.6*Wy-2			G2	1.5	
SLU-Q11_1*S-2+0.6*Wy-3	Linear Add	No	Q11_1*S-2+0.6*Wy-3	1.5	Strength
SLU-Q11_1*S-2+0.6*Wy-3			DEAD	1.3	
SLU-Q11_1*S-2+0.6*Wy-3			G1	1.3	
SLU-Q11_1*S-2+0.6*Wy-3			G2	1.5	
SLU-Q12_1*S-2+0.6*Wy-4	Linear Add	No	Q12_1*S-2+0.6*Wy-4	1.5	Strength
SLU-Q12_1*S-2+0.6*Wy-4			DEAD	1.3	
SLU-Q12_1*S-2+0.6*Wy-4			G1	1.3	
SLU-Q12_1*S-2+0.6*Wy-4			G2	1.5	
SLU-Q13_0.5*S-1+1*Wx-1	Linear Add	No	Q13_0.5*S-1+1*Wx-1	1.5	Strength
SLU-Q13_0.5*S-1+1*Wx-1			DEAD	1.3	
SLU-Q13_0.5*S-1+1*Wx-1			G1	1.3	
SLU-Q13_0.5*S-1+1*Wx-1			G2	1.5	
SLU-Q14_0.5*S-1+1*Wx-2	Linear Add	No	Q14_0.5*S-1+1*Wx-2	1.5	Strength
SLU-Q14_0.5*S-1+1*Wx-2			DEAD	1.3	
SLU-Q14_0.5*S-1+1*Wx-2			G1	1.3	
SLU-Q14_0.5*S-1+1*Wx-2			G2	1.5	
SLU-Q15_0.5*S-1+1*Wy-1	Linear Add	No	Q15_0.5*S-1+1*Wy-1	1.5	Strength
SLU-Q15_0.5*S-1+1*Wy-1			DEAD	1.3	
SLU-Q15_0.5*S-1+1*Wy-1			G1	1.3	
SLU-Q15_0.5*S-1+1*Wy-1			G2	1.5	
SLU-Q16_0.5*S-1+1*Wy-2	Linear Add	No	Q16_0.5*S-1+1*Wy-2	1.5	Strength
SLU-Q16_0.5*S-1+1*Wy-2			DEAD	1.3	
SLU-Q16_0.5*S-1+1*Wy-2			G1	1.3	
SLU-Q16_0.5*S-1+1*Wy-2			G2	1.5	
SLU-Q17_0.5*S-1+1*Wy-3	Linear Add	No	Q17_0.5*S-1+1*Wy-3	1.5	Strength
SLU-Q17_0.5*S-1+1*Wy-3			DEAD	1.3	
SLU-Q17_0.5*S-1+1*Wy-3			G1	1.3	
SLU-Q17_0.5*S-1+1*Wy-3			G2	1.5	
SLU-Q18_0.5*S-1+1*Wy-4	Linear Add	No	Q18_0.5*S-1+1*Wy-4	1.5	Strength
SLU-Q18_0.5*S-1+1*Wy-4			DEAD	1.3	
SLU-Q18_0.5*S-1+1*Wy-4			G1	1.3	
SLU-Q18_0.5*S-1+1*Wy-4			G2	1.5	
SLU-Q19_0.5*S-2+1*Wx-1	Linear Add	No	Q19_0.5*S-2+1*Wx-1	1.5	Strength
SLU-Q19_0.5*S-2+1*Wx-1			DEAD	1.3	
SLU-Q19_0.5*S-2+1*Wx-1			G1	1.3	
SLU-Q19_0.5*S-2+1*Wx-1			G2	1.5	
SLU-Q20_0.5*S-2+1*Wx-2	Linear Add	No	Q20_0.5*S-2+1*Wx-2	1.5	Strength
SLU-Q20_0.5*S-2+1*Wx-2			DEAD	1.3	

SLU-Q20_0.5*S-2+1*Wx-2			G1	1.3	
SLU-Q20_0.5*S-2+1*Wx-2			G2	1.5	
SLU-Q21_0.5*S-2+1*Wy-1	Linear Add	No	Q21_0.5*S-2+1*Wy-1	1.5	Strength
SLU-Q21_0.5*S-2+1*Wy-1			DEAD	1.3	
SLU-Q21_0.5*S-2+1*Wy-1			G1	1.3	
SLU-Q21_0.5*S-2+1*Wy-1			G2	1.5	
SLU-Q22_0.5*S-2+1*Wy-2	Linear Add	No	Q22_0.5*S-2+1*Wy-2	1.5	Strength
SLU-Q22_0.5*S-2+1*Wy-2			DEAD	1.3	
SLU-Q22_0.5*S-2+1*Wy-2			G1	1.3	
SLU-Q22_0.5*S-2+1*Wy-2			G2	1.5	
SLU-Q23_0.5*S-2+1*Wy-3	Linear Add	No	Q23_0.5*S-2+1*Wy-3	1.5	Strength
SLU-Q23_0.5*S-2+1*Wy-3			DEAD	1.3	
SLU-Q23_0.5*S-2+1*Wy-3			G1	1.3	
SLU-Q23_0.5*S-2+1*Wy-3			G2	1.5	
SLU-Q24_0.5*S-2+1*Wy-4	Linear Add	No	Q24_0.5*S-2+1*Wy-4	1.5	Strength
SLU-Q24_0.5*S-2+1*Wy-4			DEAD	1.3	
SLU-Q24_0.5*S-2+1*Wy-4			G1	1.3	
SLU-Q24_0.5*S-2+1*Wy-4			G2	1.5	
SLU-Q25_1*S-2+0.6*Wy-5	Linear Add	No	Q25_1*S-2+0.6*Wy-5	1.5	Strength
SLU-Q25_1*S-2+0.6*Wy-5			DEAD	1.3	
SLU-Q25_1*S-2+0.6*Wy-5			G1	1.3	
SLU-Q25_1*S-2+0.6*Wy-5			G2	1.5	
SLU-Q26_0.5*S-2+1*Wy-5	Linear Add	No	Q26_0.5*S-2+1*Wy-5	1.5	Strength
SLU-Q26_0.5*S-2+1*Wy-5			DEAD	1.3	
SLU-Q26_0.5*S-2+1*Wy-5			G1	1.3	
SLU-Q26_0.5*S-2+1*Wy-5			G2	1.5	
SLU-env	Envelope	No	SLU-Q1_1*S-1+0.6*Wx-1	1	None
SLU-env			SLU-Q2_1*S-1+0.6*Wx-2	1	
SLU-env			SLU-Q3_1*S-1+0.6*Wy-1	1	
SLU-env			SLU-Q4_1*S-1+0.6*Wy-2	1	
SLU-env			SLU-Q5_1*S-1+0.6*Wy-3	1	
SLU-env			SLU-Q6_1*S-1+0.6*Wy-4	1	
SLU-env			SLU-Q7_1*S-2+0.6*Wx-1	1	
SLU-env			SLU-Q8_1*S-2+0.6*Wx-2	1	
SLU-env			SLU-Q9_1*S-2+0.6*Wy-1	1	
SLU-env			SLU-Q10_1*S-2+0.6*Wy-2	1	
SLU-env			SLU-Q11_1*S-2+0.6*Wy-3	1	
SLU-env			SLU-Q12_1*S-2+0.6*Wy-4	1	
SLU-env			SLU-Q13_0.5*S-1+1*Wx-1	1	
SLU-env			SLU-Q14_0.5*S-1+1*Wx-2	1	
SLU-env			SLU-Q15_0.5*S-1+1*Wy-1	1	
SLU-env			SLU-Q16_0.5*S-1+1*Wy-2	1	
SLU-env			SLU-Q17_0.5*S-1+1*Wy-3	1	
SLU-env			SLU-Q18_0.5*S-1+1*Wy-4	1	
SLU-env			SLU-Q19_0.5*S-2+1*Wx-1	1	
SLU-env			SLU-Q20_0.5*S-2+1*Wx-2	1	

SLU-env	SLU-Q21_0.5*S-2+1*Wy-1	1
SLU-env	SLU-Q22_0.5*S-2+1*Wy-2	1
SLU-env	SLU-Q23_0.5*S-2+1*Wy-3	1
SLU-env	SLU-Q24_0.5*S-2+1*Wy-4	1
SLU-env	SLU-Q25_1*S-2+0.6*Wy-5	1
SLU-env	SLU-Q26_0.5*S-2+1*Wy-5	1

7 CRITERI GENERALI E TIPO DI ANALISI SVOLTA

7.1 SOFTWARE DI CALCOLO

I software utilizzati nella redazione della presente relazione di calcolo sono:

- ***SAP2000 – Analisi e calcolo degli elementi*** – distribuito dalla CSi: software di modellazione ad elementi finiti che permette analisi e verifica strutturale;
- ***Microsoft Excel*** – pacchetto Office di Microsoft: software adoperato per analisi dei carichi e verifiche strutturali;
- ***Microsoft Word*** – pacchetto Office di Microsoft: software adoperato per la stesura delle relazioni;

7.2 MODELLO DI CALCOLO

Si è costruito un modello ad elementi finiti mediante il software SAP2000. Sono state modellate le strutture in elevazione, precisamente: colonne, trave di spina e travi a sbalzo. Sono stati utilizzati elementi *frame*. I pilastri sono stati incastrati a terra nelle due direzioni. Le travi sono state modellate con elementi *non-prismatic frame* per tenere in considerazione la rastremazione della sezione.

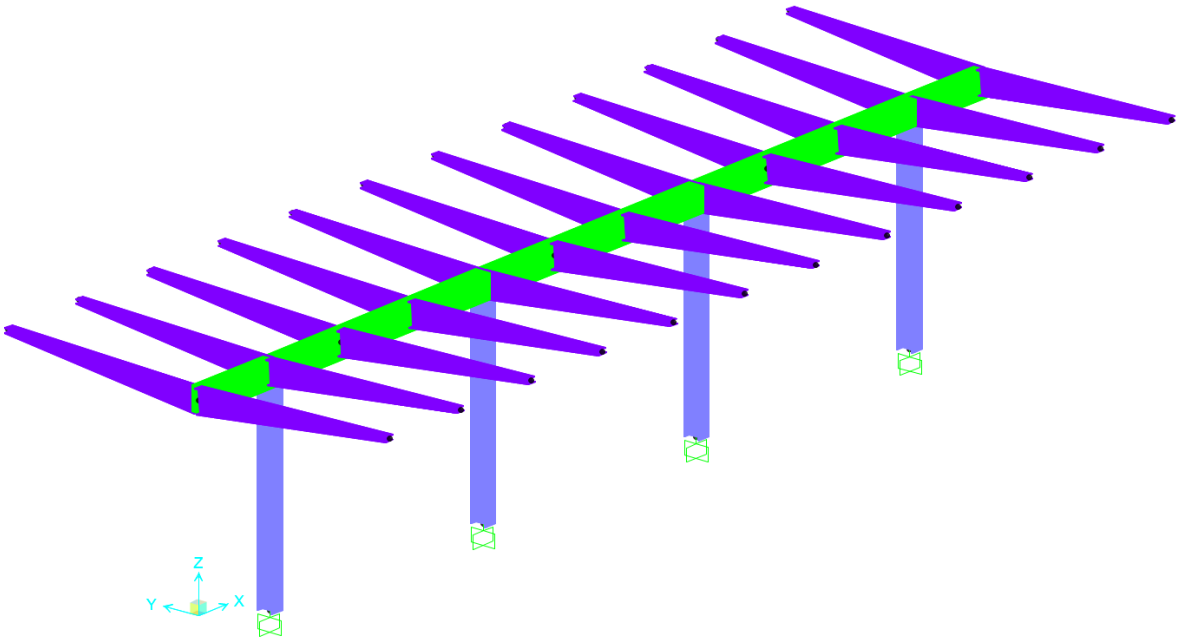


Figura 7-1. Modello tipo 1.A - estruso

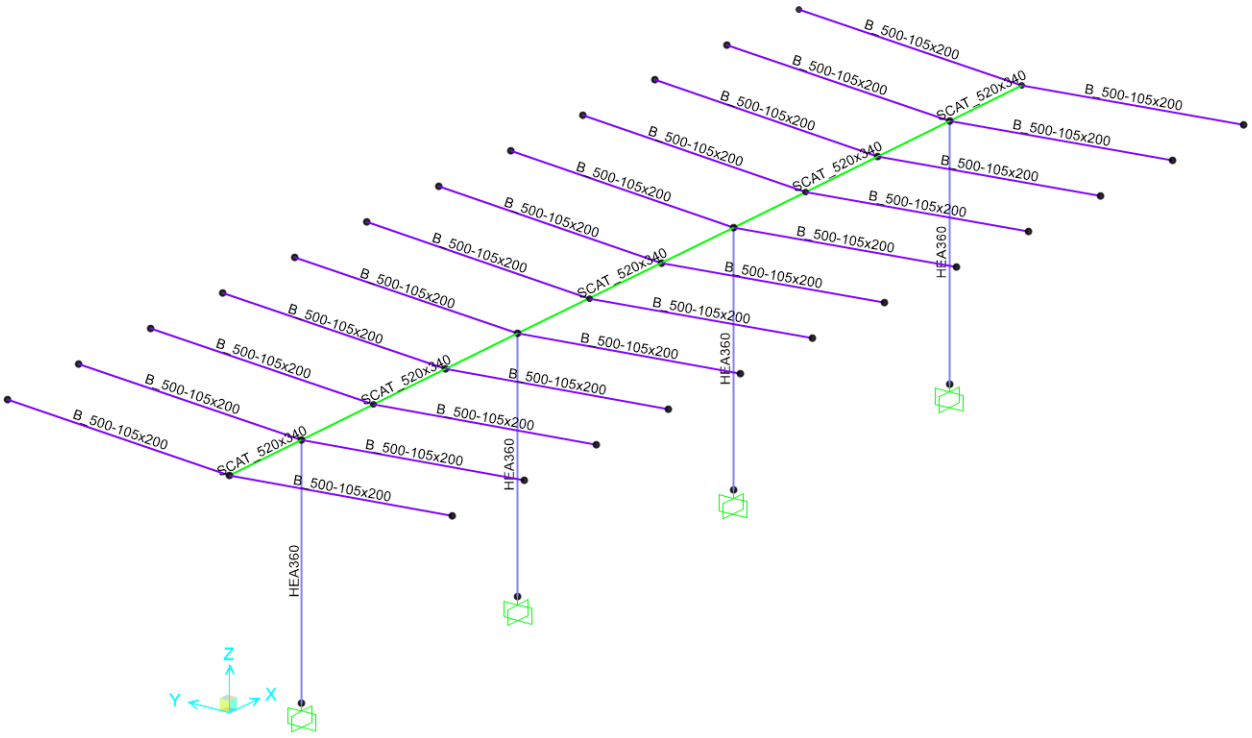


Figura 7-2. Modello tipo 1.A - assi

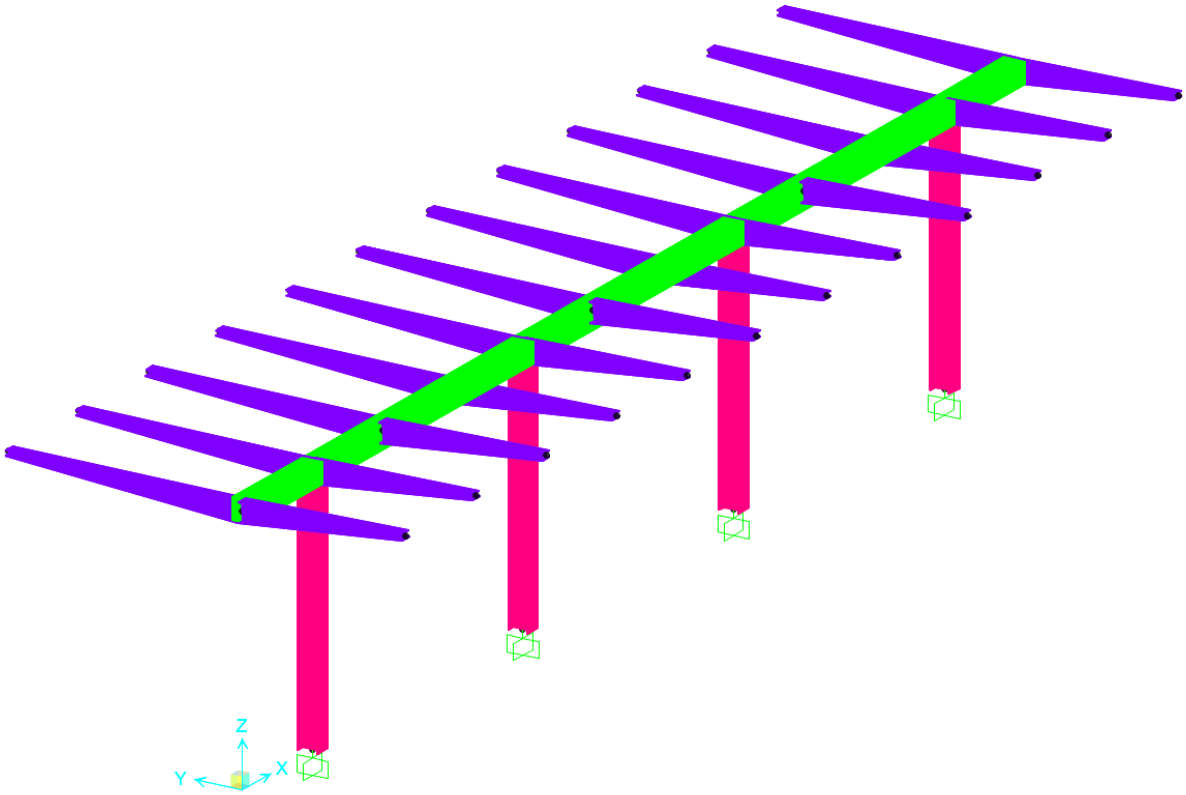


Figura 7-3. Modello tipo 1.C - estruso

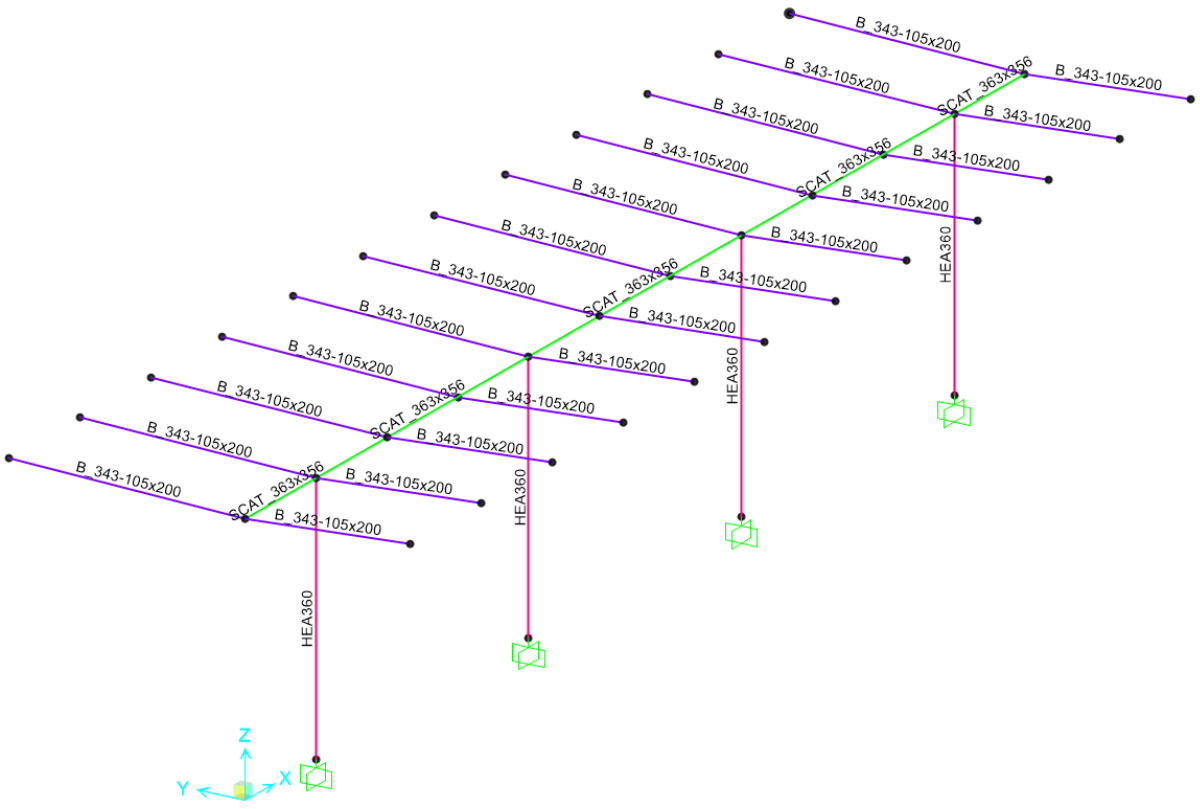


Figura 7-4. Modello tipo 1.C – assi

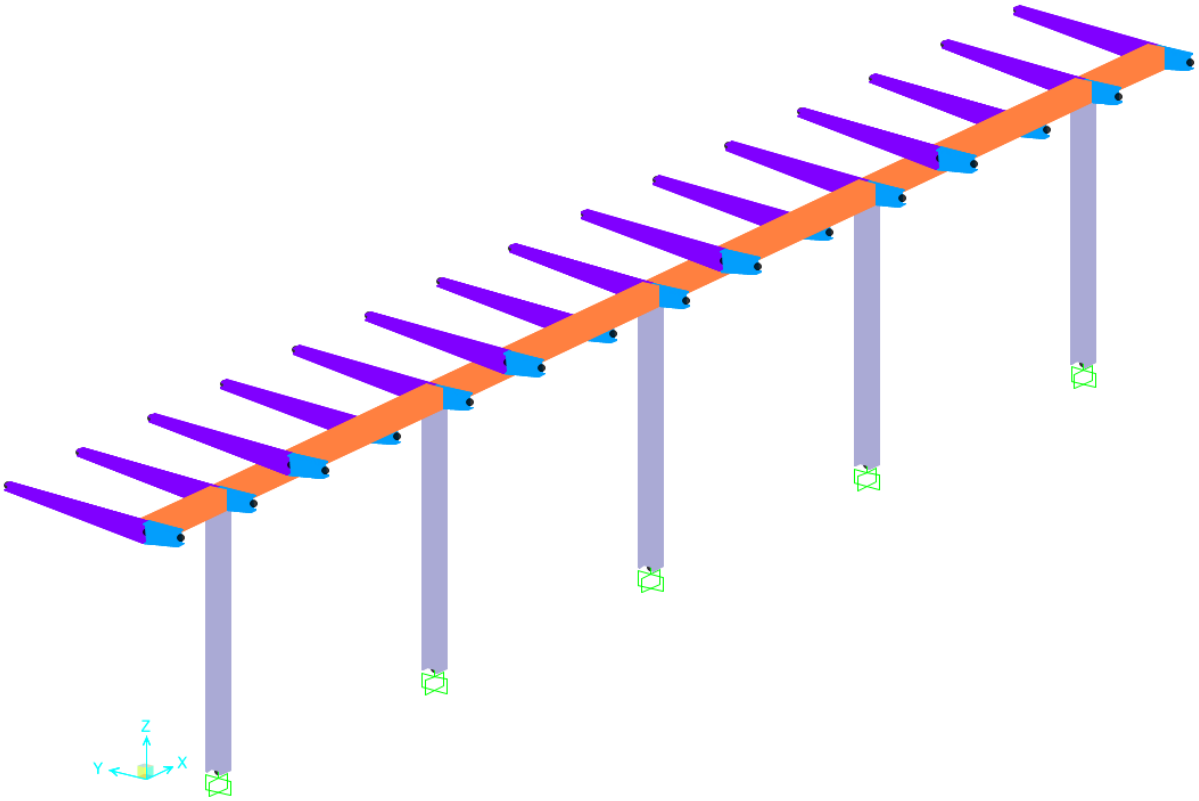


Figura 7-5. Modello tipo 2 – estruso

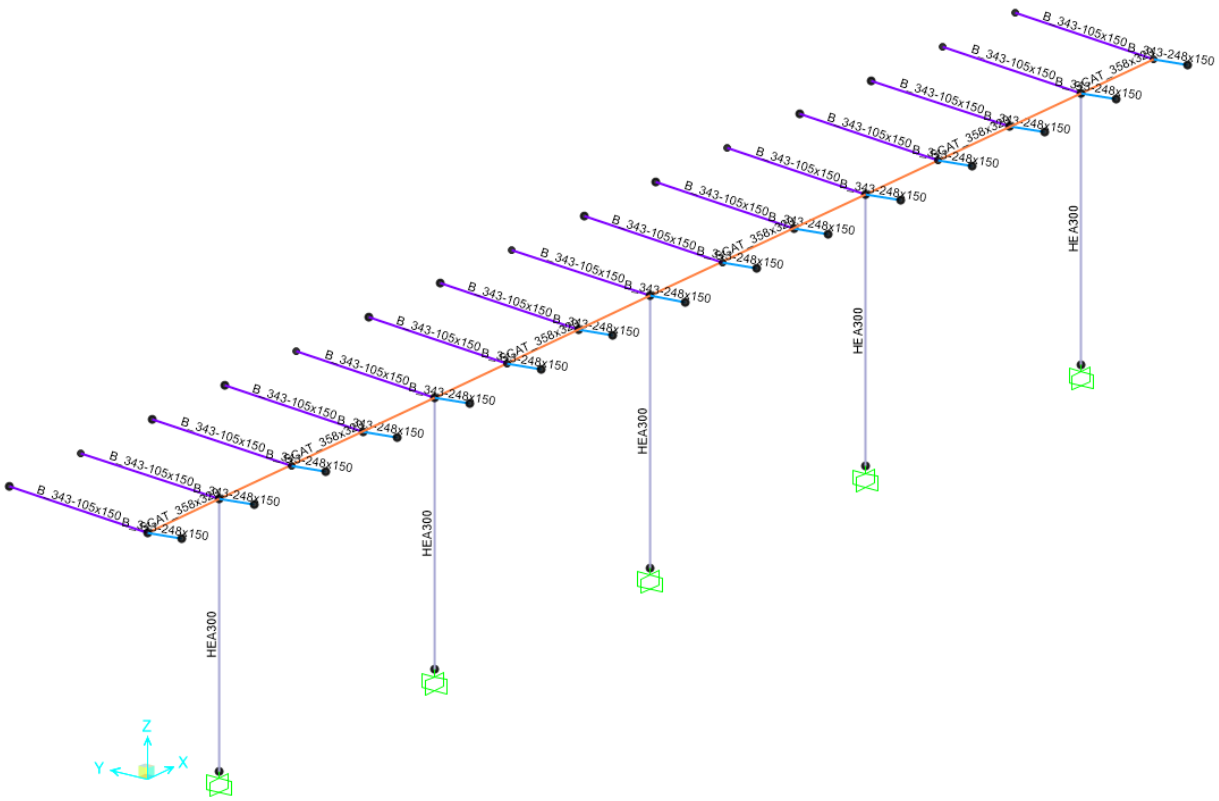


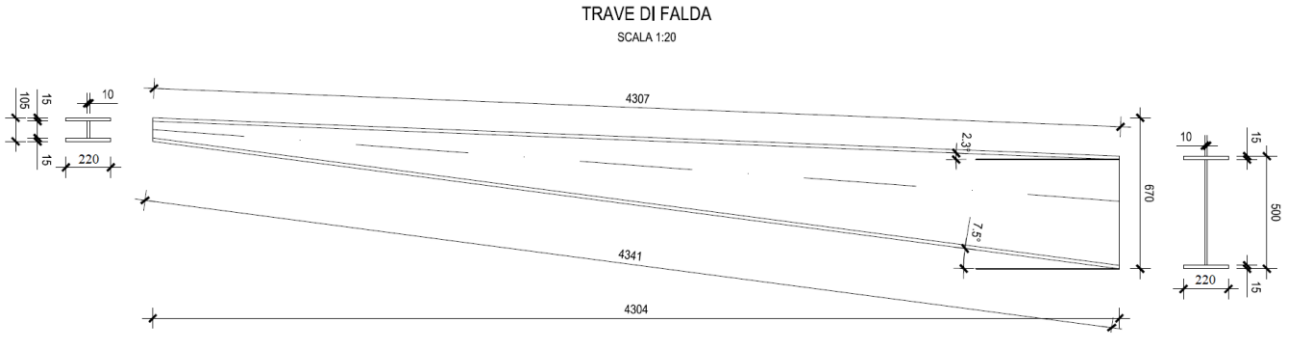
Figura 7-6. Modello tipo 2 – assi

8 VERIFICHE SOVRASTRUTTURA

8.1 TIPO 1.A

8.1.1 Travi a sbalzo

La trave a sbalzo è una trave rastremata su una luce di calcolo di 4.5 m da ambo i lati avente le sezioni di estremità riportate di seguito.



8.1.1.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 3 stazioni: all'inizio, in mezzeria ed alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	0.5	0.8	0.7	0.0	3.1	3.8
0	SLV	Min	-0.5	-3.6	-0.7	0.0	-3.1	-7.4
0	SLU-Q1_1*S-1+0.6*Wx-1		-1.9	-27.7	0.0	0.0	0.0	-63.1
0	SLU-Q2_1*S-1+0.6*Wx-2		-1.9	-25.0	0.0	0.0	0.0	-57.2
0	SLU-Q3_1*S-1+0.6*Wy-1		-1.9	-22.4	0.0	0.0	0.0	-51.3
0	SLU-Q4_1*S-1+0.6*Wy-2		-1.9	-29.3	0.0	0.0	0.0	-66.7
0	SLU-Q5_1*S-1+0.6*Wy-3		-1.9	-22.4	0.0	0.0	0.0	-51.3
0	SLU-Q6_1*S-1+0.6*Wy-4		-1.9	-29.3	0.0	0.0	0.0	-66.7
0	SLU-Q7_1*S-2+0.6*Wx-1		-1.9	-27.7	0.0	0.0	0.0	-63.1
0	SLU-Q8_1*S-2+0.6*Wx-2		-1.9	-25.0	0.0	0.0	0.0	-57.2
0	SLU-Q9_1*S-2+0.6*Wy-1		-1.9	-22.4	0.0	0.0	0.0	-51.3
0	SLU-Q10_1*S-2+0.6*Wy-2		-1.9	-29.3	0.0	0.0	0.0	-66.7
0	SLU-Q11_1*S-2+0.6*Wy-3		-1.9	-22.4	0.0	0.0	0.0	-51.3
0	SLU-Q12_1*S-2+0.6*Wy-4		-1.9	-29.3	0.0	0.0	0.0	-66.7
0	SLU-Q13_0.5*S-1+1*Wx-1		-1.2	-18.7	0.0	0.0	0.0	-42.9
0	SLU-Q14_0.5*S-1+1*Wx-2		-1.2	-14.4	0.0	0.0	0.0	-33.1
0	SLU-Q15_0.5*S-1+1*Wy-1		-1.2	-10.0	0.0	0.0	0.0	-23.3
0	SLU-Q16_0.5*S-1+1*Wy-2		-1.2	-21.4	0.0	0.0	0.0	-49.0
0	SLU-Q17_0.5*S-1+1*Wy-3		-1.2	-10.0	0.0	0.0	0.0	-23.3
0	SLU-Q18_0.5*S-1+1*Wy-4		-1.2	-21.4	0.0	0.0	0.0	-49.0
0	SLU-Q19_0.5*S-2+1*Wx-1		-1.2	-18.7	0.0	0.0	0.0	-42.9
0	SLU-Q20_0.5*S-2+1*Wx-2		-1.2	-14.4	0.0	0.0	0.0	-33.1
0	SLU-Q21_0.5*S-2+1*Wy-1		-1.2	-10.0	0.0	0.0	0.0	-23.3
0	SLU-Q22_0.5*S-2+1*Wy-2		-1.2	-21.4	0.0	0.0	0.0	-49.0
0	SLU-Q23_0.5*S-2+1*Wy-3		-1.2	-10.0	0.0	0.0	0.0	-23.3
0	SLU-Q24_0.5*S-2+1*Wy-4		-1.2	-21.4	0.0	0.0	0.0	-49.0

0	SLU-Q25_1*S-2+0.6*Wy-5		-1.9	-26.9	0.0	0.0	0.0	-61.4
0	SLU-Q26_0.5*S-2+1*Wy-5		-1.2	-17.5	0.0	0.0	0.0	-40.1
2.25558	SLV	Max	0.5	0.8	0.7	0.0	1.6	1.9
2.25558	SLV	Min	-0.5	-1.6	-0.7	0.0	-1.6	-1.9
2.25558	SLU-Q1_1*S-1+0.6*Wx-1		-1.0	-13.9	0.0	0.0	0.0	-16.3
2.25558	SLU-Q2_1*S-1+0.6*Wx-2		-1.0	-12.6	0.0	0.0	0.0	-14.8
2.25558	SLU-Q3_1*S-1+0.6*Wy-1		-1.0	-11.3	0.0	0.0	0.0	-13.4
2.25558	SLU-Q4_1*S-1+0.6*Wy-2		-1.0	-14.7	0.0	0.0	0.0	-17.2
2.25558	SLU-Q5_1*S-1+0.6*Wy-3		-1.0	-11.3	0.0	0.0	0.0	-13.4
2.25558	SLU-Q6_1*S-1+0.6*Wy-4		-1.0	-14.7	0.0	0.0	0.0	-17.2
2.25558	SLU-Q7_1*S-2+0.6*Wx-1		-1.0	-13.9	0.0	0.0	0.0	-16.3
2.25558	SLU-Q8_1*S-2+0.6*Wx-2		-1.0	-12.6	0.0	0.0	0.0	-14.8
2.25558	SLU-Q9_1*S-2+0.6*Wy-1		-1.0	-11.3	0.0	0.0	0.0	-13.4
2.25558	SLU-Q10_1*S-2+0.6*Wy-2		-1.0	-14.7	0.0	0.0	0.0	-17.2
2.25558	SLU-Q11_1*S-2+0.6*Wy-3		-1.0	-11.3	0.0	0.0	0.0	-13.4
2.25558	SLU-Q12_1*S-2+0.6*Wy-4		-1.0	-14.7	0.0	0.0	0.0	-17.2
2.25558	SLU-Q13_0.5*S-1+1*Wx-1		-0.6	-9.4	0.0	0.0	0.0	-11.3
2.25558	SLU-Q14_0.5*S-1+1*Wx-2		-0.6	-7.3	0.0	0.0	0.0	-8.8
2.25558	SLU-Q15_0.5*S-1+1*Wy-1		-0.6	-5.1	0.0	0.0	0.0	-6.4
2.25558	SLU-Q16_0.5*S-1+1*Wy-2		-0.6	-10.8	0.0	0.0	0.0	-12.8
2.25558	SLU-Q17_0.5*S-1+1*Wy-3		-0.6	-5.1	0.0	0.0	0.0	-6.4
2.25558	SLU-Q18_0.5*S-1+1*Wy-4		-0.6	-10.8	0.0	0.0	0.0	-12.8
2.25558	SLU-Q19_0.5*S-2+1*Wx-1		-0.6	-9.4	0.0	0.0	0.0	-11.3
2.25558	SLU-Q20_0.5*S-2+1*Wx-2		-0.6	-7.3	0.0	0.0	0.0	-8.8
2.25558	SLU-Q21_0.5*S-2+1*Wy-1		-0.6	-5.1	0.0	0.0	0.0	-6.4
2.25558	SLU-Q22_0.5*S-2+1*Wy-2		-0.6	-10.8	0.0	0.0	0.0	-12.8
2.25558	SLU-Q23_0.5*S-2+1*Wy-3		-0.6	-5.1	0.0	0.0	0.0	-6.4
2.25558	SLU-Q24_0.5*S-2+1*Wy-4		-0.6	-10.8	0.0	0.0	0.0	-12.8
2.25558	SLU-Q25_1*S-2+0.6*Wy-5		-1.0	-13.5	0.0	0.0	0.0	-15.9
2.25558	SLU-Q26_0.5*S-2+1*Wy-5		-0.6	-8.8	0.0	0.0	0.0	-10.6
4.51115	SLV	Max	0.5	0.8	0.7	0.0	0.0	0.0
4.51115	SLV	Min	-0.5	-0.8	-0.7	0.0	0.0	0.0
4.51115	SLU-Q1_1*S-1+0.6*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q2_1*S-1+0.6*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q3_1*S-1+0.6*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q4_1*S-1+0.6*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q5_1*S-1+0.6*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q6_1*S-1+0.6*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q7_1*S-2+0.6*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q8_1*S-2+0.6*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q9_1*S-2+0.6*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q10_1*S-2+0.6*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q11_1*S-2+0.6*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q12_1*S-2+0.6*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q13_0.5*S-1+1*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q14_0.5*S-1+1*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q15_0.5*S-1+1*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q16_0.5*S-1+1*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q18_0.5*S-1+1*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q19_0.5*S-2+1*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q20_0.5*S-2+1*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q21_0.5*S-2+1*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q22_0.5*S-2+1*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q24_0.5*S-2+1*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q25_1*S-2+0.6*Wy-5		0.0	-0.6	0.0	0.0	0.0	0.0
4.51115	SLU-Q26_0.5*S-2+1*Wy-5		0.0	-0.6	0.0	0.0	0.0	0.0

8.1.1.2 Verifiche

Verifiche SLU

Si riportano le verifiche effettuate tramite il software di calcolo SAP2000 per la combinazione che comporta il tasso di lavoro più alto.

EUROCODE 3-1993 STEEL SECTION CHECK
Combo : SLU-Q12_1*S-2+0.6*Wy-4
Units : KN, m, C

Frame	: 39	Design Sect:	B_500-105x220		
X Mid	: 12.000	Design Type:	Brace		
Y Mid	: 2.250	Frame Type :	Moment Resisting Frame		
Z Mid	: 4.310	Sect Class :	Class 2		
Length	: 4.511	Major Axis :	0.000 degrees counterclockwise from local 3		
Loc	: 0.000	RLLF :	1.000		
Area	: 0.011	SMajor :	0.002	rMajor :	0.205
IMajor	: 4.748E-04	SMinor :	2.424E-04	rMinor :	0.049
IMinor	: 2.666E-05	ZMajor :	0.002	E :	210000000.00
Ixy	: 0.000	ZMinor :	3.748E-04	Fy :	355000.000

AVMajor: 0.005
AVMinor: 0.006

STRESS CHECK FORCES & MOMENTS

Location	P	M33	M22	V2	V3	T
0.000	-1.895	-66.733	0.000	-29.269	0.000	0.000

PMM DEMAND/CAPACITY RATIO

Governing Equation	Total Ratio		P Ratio		MMajor Ratio		MMinor Ratio	Ratio Limit	Status Check
(5.5.4)	0.825	=	0.013	+	0.812	+	0.000	1.000	OK

AXIAL FORCE DESIGN

	Fc or Ft Force	Nc.Rd Capacity	Nt.Rd Capacity	Nb33.Rd Major	Nb22.Rd Minor
Axial	-1.895	146.856	3820.476	1928.466	146.856

MOMENT DESIGN

	M.Sd Moment	Mc.Rd Capacity	Mv.Rd Capacity	Mb.Rd Capacity
Major Moment	-66.733	727.835	727.835	81.487
Minor Moment	0.000	126.701	126.701	

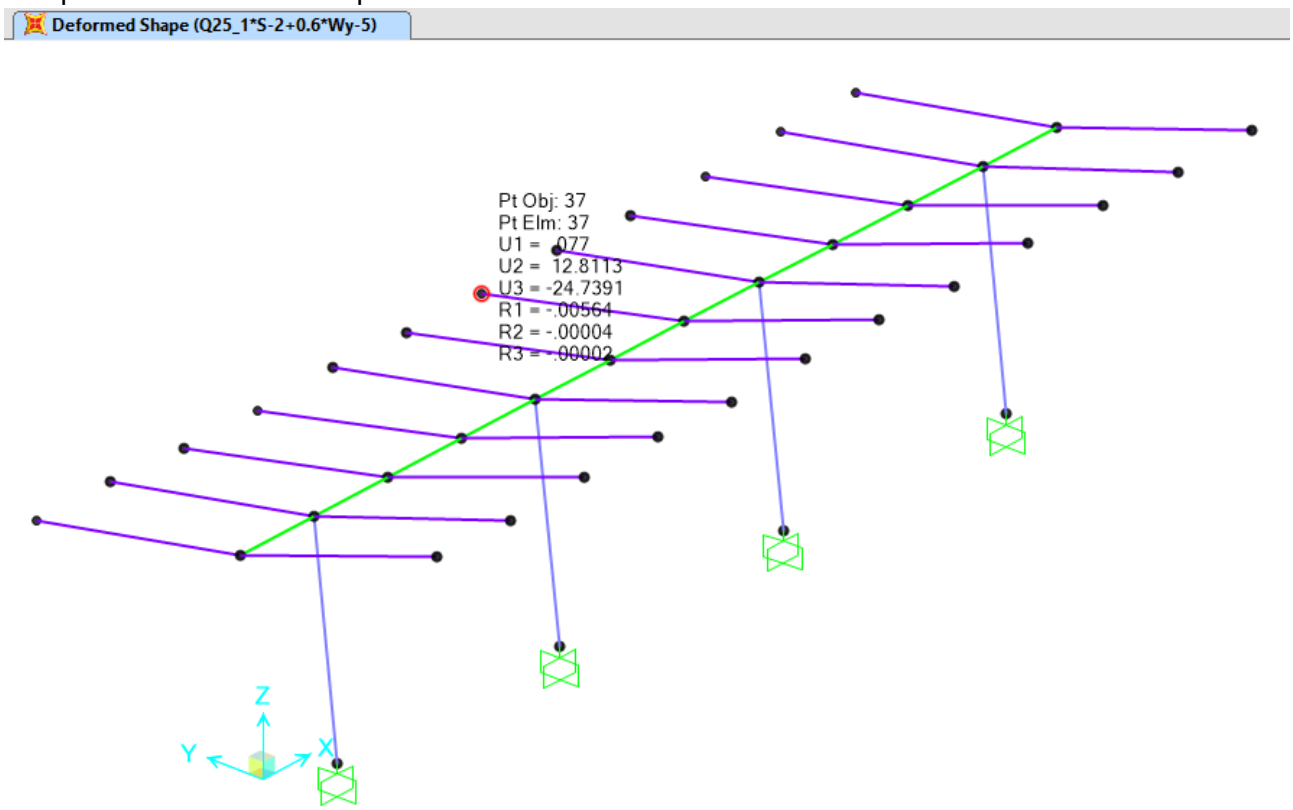
	K Factor	L Factor	k Factor	klt Factor	C1 Factor
Major Moment	2.000	2.000	1.002	0.992	1.000
Minor Moment	2.000	2.000	1.101		

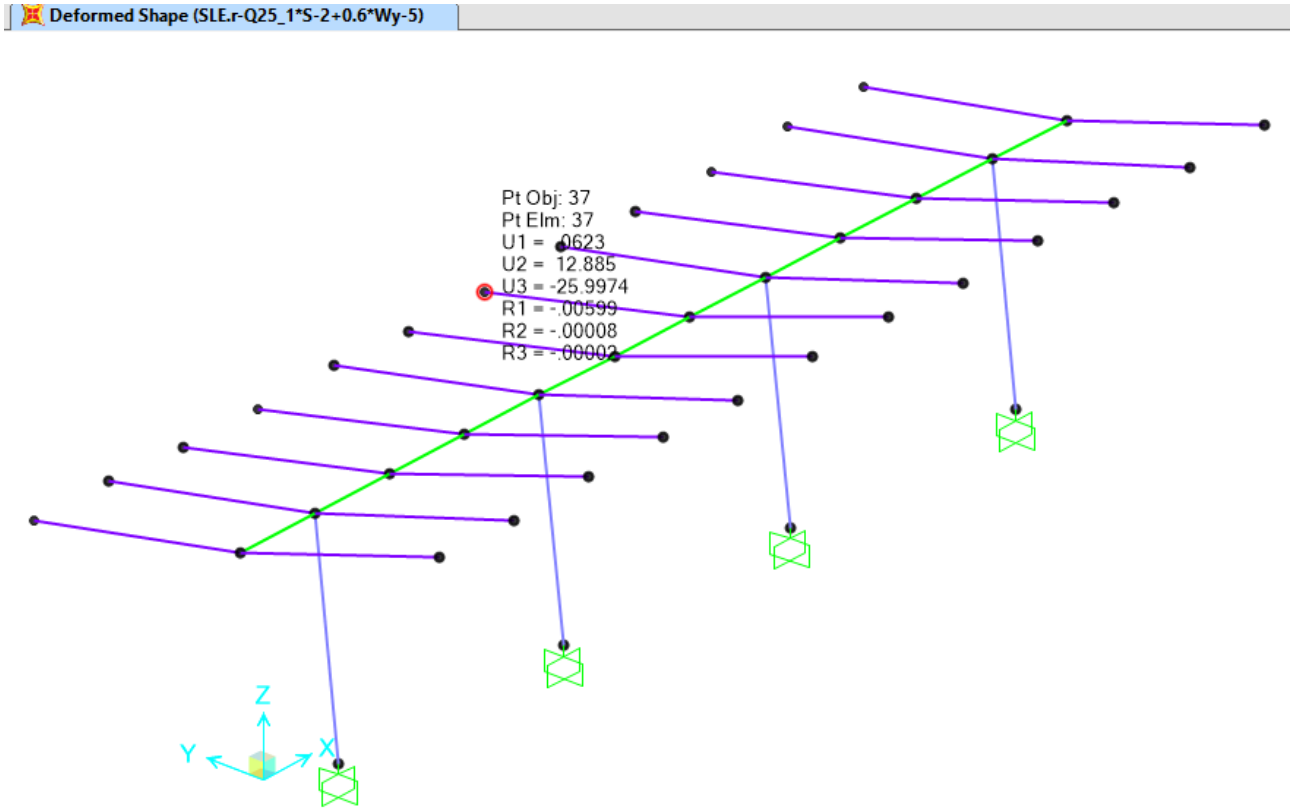
SHEAR DESIGN

	V.Sd Force	V.Rd Capacity	Stress Ratio	Status Check	Tu Torsion
Major Shear	29.269	975.997	0.030	OK	0.000
Minor Shear	0.000	1073.597	0.000	OK	0.000

Verifiche SLE

Si riporta la deformata valutata tramite il software di calcolo SAP2000 per la combinazione che comporta la deformazione più alta.

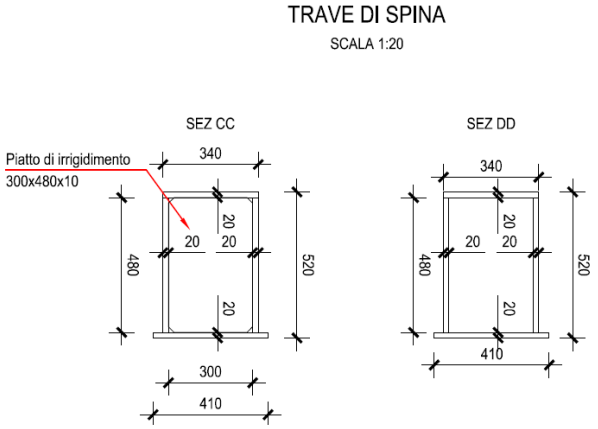




Luce	L	4.5	m
Coefficiente L_0	β	2	
Lunghezza libera di inflessione	L_0	9	m
Deformata da carichi variabili			
Limite deformata	L_0/	250	
Abbassamento limite	$\delta_{2,lim}$	36	mm
Abbassamento effettivo	$\delta_{2,d}$	24.74	mm
tasso di lavoro	w.r.	69%	
Deformata totale			
Limite deformata	L_0/	200	
Abbassamento limite	$\delta_{tot,lim}$	45	mm
Abbassamento effettivo	$\delta_{tot,d}$	26	mm
tasso di lavoro	w.r.	58%	

8.1.2 Trave di colmo

La trave di colmo è una trave continua con sezione scatolare come riportato di seguito ed una luce di calcolo pari all'interasse tra i pilastri, ovvero 6 m.



8.1.2.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 13 stazioni dall'inizio alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	3.0	4.5	2.4	8.4	2.6	16.1
0	SLV	Min	-3.0	-15.8	-2.4	-8.4	-2.6	-19.6
0	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	-63.7	0.0	0.0	0.0	-68.4
0	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	-53.9	0.0	0.0	0.0	-57.7
0	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-58.4	-0.6	11.0	-0.7	-67.1
0	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	-64.8	-1.3	-7.0	-1.2	-74.1
0	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-54.2	-1.0	-0.8	-1.0	-62.5
0	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-67.0	-1.0	-0.8	-1.0	-76.6
0	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	-54.9	-0.3	-24.5	0.0	-58.7

0	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	-45.0	-0.3	-24.5	0.0	-47.9
0	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-49.5	-0.9	-13.5	-0.7	-57.3
0	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-55.9	-1.5	-31.5	-1.2	-64.4
0	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-45.3	-1.3	-25.3	-1.0	-52.7
0	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	-58.2	-1.3	-25.3	-1.0	-66.8
0	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	-46.7	0.0	0.0	0.0	-46.8
0	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	-30.3	0.0	0.0	0.0	-28.8
0	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-37.8	-1.0	18.4	-1.2	-44.5
0	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-48.5	-2.1	-11.6	-2.0	-56.2
0	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-30.8	-1.7	-1.3	-1.7	-36.8
0	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-52.2	-1.7	-1.3	-1.7	-60.3
0	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	-42.3	-0.1	-12.3	0.0	-41.9
0	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	-25.8	-0.1	-12.3	0.0	-23.9
0	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-33.4	-1.1	6.1	-1.2	-39.6
0	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-44.1	-2.3	-23.9	-2.0	-51.3
0	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-26.4	-1.9	-13.5	-1.7	-31.9
0	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-47.8	-1.9	-13.5	-1.7	-55.4
0	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-49.5	-1.8	-37.1	-1.3	-57.3
0	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-33.4	-2.6	-33.1	-2.2	-39.6
0.5	SLV	Max	3.0	4.5	2.4	8.4	1.5	13.8
0.5	SLV	Min	-3.0	-14.4	-2.4	-8.4	-1.5	-13.8
0.5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	-61.9	0.0	0.0	0.0	-37.0
0.5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	-52.1	0.0	0.0	0.0	-31.2
0.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-56.6	-0.6	11.0	-0.4	-38.3
0.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	-63.0	-1.3	-7.0	-0.5	-42.2
0.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-52.4	-1.0	-0.8	-0.5	-35.8
0.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-65.2	-1.0	-0.8	-0.5	-43.5
0.5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	-53.0	-0.3	-24.5	0.1	-31.7
0.5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	-43.2	-0.3	-24.5	0.1	-25.8
0.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-47.7	-0.9	-13.5	-0.3	-33.0
0.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-54.1	-1.5	-31.5	-0.4	-36.8
0.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-43.5	-1.3	-25.3	-0.4	-30.5
0.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	-56.4	-1.3	-25.3	-0.4	-38.2
0.5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	-44.9	0.0	0.0	0.0	-23.8
0.5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	-28.5	0.0	0.0	0.0	-14.1
0.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-36.0	-1.0	18.4	-0.7	-26.0
0.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-46.7	-2.1	-11.6	-0.9	-32.4
0.5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-29.0	-1.7	-1.3	-0.8	-21.8
0.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-50.4	-1.7	-1.3	-0.8	-34.6
0.5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	-40.5	-0.1	-12.3	0.1	-21.2
0.5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	-24.0	-0.1	-12.3	0.1	-11.4
0.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-31.6	-1.1	6.1	-0.6	-23.3
0.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-42.3	-2.3	-23.9	-0.8	-29.7
0.5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-24.6	-1.9	-13.5	-0.8	-19.2
0.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-46.0	-1.9	-13.5	-0.8	-32.0
0.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-47.7	-1.8	-37.1	-0.5	-33.0
0.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-31.6	-2.6	-33.1	-0.9	-23.3
1	SLV	Max	3.0	4.5	2.4	8.4	0.6	11.5
1	SLV	Min	-3.0	-13.0	-2.4	-8.4	-0.6	-11.5
1	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	-60.1	0.0	0.0	0.0	-6.5
1	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	-50.3	0.0	0.0	0.0	-5.6
1	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-54.8	-0.6	11.0	-0.1	-10.5
1	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	-61.2	-1.3	-7.0	0.1	-11.1
1	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-50.6	-1.0	-0.8	0.0	-10.1
1	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-63.4	-1.0	-0.8	0.0	-11.3
1	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	-51.2	-0.3	-24.5	0.3	-5.6
1	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	-41.4	-0.3	-24.5	0.3	-4.7
1	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-45.9	-0.9	-13.5	0.2	-9.6

1	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-52.3	-1.5	-31.5	0.4	-10.2
1	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-41.7	-1.3	-25.3	0.3	-9.2
1	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	-54.5	-1.3	-25.3	0.3	-10.4
1	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	-43.1	0.0	0.0	0.0	-1.8
1	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	-26.7	0.0	0.0	0.0	-0.3
1	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-34.2	-1.0	18.4	-0.2	-8.4
1	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-44.9	-2.1	-11.6	0.2	-9.5
1	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-27.2	-1.7	-1.3	0.0	-7.8
1	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-48.6	-1.7	-1.3	0.0	-9.9
1	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	-38.7	-0.1	-12.3	0.1	-1.4
1	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	-22.2	-0.1	-12.3	0.1	0.1
1	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-29.8	-1.1	6.1	-0.1	-8.0
1	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-40.5	-2.3	-23.9	0.3	-9.1
1	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-22.8	-1.9	-13.5	0.2	-7.3
1	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-44.2	-1.9	-13.5	0.2	-9.4
1	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-45.9	-1.8	-37.1	0.4	-9.6
1	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-29.8	-2.6	-33.1	0.4	-8.0
1.5	SLV	Max	3.0	4.5	2.4	8.4	1.1	9.2
1.5	SLV	Min	-3.0	-11.7	-2.4	-8.4	-1.1	-9.2
1.5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	-58.3	0.0	0.0	0.0	23.1
1.5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	-48.5	0.0	0.0	0.0	19.1
1.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-53.0	-0.6	11.0	0.2	16.5
1.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	-59.4	-1.3	-7.0	0.7	19.1
1.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-48.8	-1.0	-0.8	0.5	14.8
1.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-61.6	-1.0	-0.8	0.5	20.0
1.5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	-49.4	-0.3	-24.5	0.4	19.5
1.5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	-39.6	-0.3	-24.5	0.4	15.5
1.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-44.1	-0.9	-13.5	0.6	12.9
1.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-50.5	-1.5	-31.5	1.1	15.5
1.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-39.9	-1.3	-25.3	0.9	11.2
1.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	-52.7	-1.3	-25.3	0.9	16.4
1.5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	-41.3	0.0	0.0	0.0	19.3
1.5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	-24.9	0.0	0.0	0.0	12.6
1.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-32.4	-1.0	18.4	0.3	8.2
1.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-43.1	-2.1	-11.6	1.2	12.5
1.5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-25.4	-1.7	-1.3	0.9	5.4
1.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-46.8	-1.7	-1.3	0.9	14.0
1.5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	-36.9	-0.1	-12.3	0.2	17.5
1.5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	-20.4	-0.1	-12.3	0.2	10.8
1.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-28.0	-1.1	6.1	0.5	6.4
1.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-38.7	-2.3	-23.9	1.4	10.7
1.5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-21.0	-1.9	-13.5	1.1	3.6
1.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-42.4	-1.9	-13.5	1.1	12.2
1.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-44.1	-1.8	-37.1	1.3	12.9
1.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-28.0	-2.6	-33.1	1.7	6.4
2	SLV	Max	3.0	4.5	2.4	8.4	2.2	7.0
2	SLV	Max	0.6	4.6	0.4	1.6	2.0	7.4
2	SLV	Min	-3.0	-10.3	-2.4	-8.4	-2.2	-7.0
2	SLV	Min	-0.6	-4.6	-0.4	-1.6	-2.0	-7.4
2	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	-56.5	0.0	0.0	0.0	51.8
2	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	0.4	0.0	0.0	0.0	51.8
2	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	-46.7	0.0	0.0	0.0	42.9
2	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	-0.1	0.0	0.0	0.0	42.9
2	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-51.2	-0.6	11.0	0.5	42.5
2	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-1.7	0.1	1.2	0.5	42.5
2	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	-57.6	-1.3	-7.0	1.4	48.3
2	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	-1.3	-0.1	-1.3	1.4	48.3
2	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-47.0	-1.0	-0.8	1.1	38.7

2	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-2.0	0.0	-0.4	1.1	38.7
2	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-59.8	-1.0	-0.8	1.1	50.3
2	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-1.2	0.0	-0.4	1.1	50.3
2	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	-47.6	-0.3	-24.5	0.5	43.8
2	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	-0.2	-0.3	-3.3	0.5	43.8
2	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	-37.8	-0.3	-24.5	0.5	34.9
2	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	-0.7	-0.3	-3.3	0.5	34.9
2	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-42.3	-0.9	-13.5	1.0	34.5
2	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-2.3	-0.2	-2.0	1.0	34.5
2	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-48.7	-1.5	-31.5	1.9	40.3
2	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-1.9	-0.4	-4.6	1.9	40.3
2	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-38.1	-1.3	-25.3	1.6	30.7
2	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-2.5	-0.3	-3.7	1.6	30.7
2	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	-50.9	-1.3	-25.3	1.6	42.3
2	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	-1.7	-0.3	-3.7	1.6	42.3
2	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	-39.5	0.0	0.0	0.0	39.5
2	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	0.5	0.0	0.0	0.0	39.5
2	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	-23.0	0.0	0.0	0.0	24.6
2	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	-0.4	0.0	0.0	0.0	24.6
2	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-30.6	-1.0	18.4	0.8	24.0
2	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-3.0	0.2	2.1	0.8	24.0
2	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-41.3	-2.1	-11.6	2.3	33.6
2	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-2.3	-0.2	-2.2	2.3	33.6
2	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-23.6	-1.7	-1.3	1.8	17.7
2	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-3.4	0.0	-0.7	1.8	17.7
2	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-45.0	-1.7	-1.3	1.8	37.0
2	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-2.1	0.0	-0.7	1.8	37.0
2	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	-35.0	-0.1	-12.3	0.3	35.4
2	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	0.2	-0.1	-1.6	0.3	35.4
2	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	-18.6	-0.1	-12.3	0.3	20.5
2	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	-0.7	-0.1	-1.6	0.3	20.5
2	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-26.2	-1.1	6.1	1.1	20.0
2	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-3.3	0.1	0.4	1.1	20.0
2	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-36.9	-2.3	-23.9	2.6	29.6
2	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-2.6	-0.3	-3.8	2.6	29.6
2	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-19.2	-1.9	-13.5	2.0	13.6
2	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-3.7	-0.2	-2.4	2.0	13.6
2	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-40.6	-1.9	-13.5	2.0	32.9
2	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-2.4	-0.2	-2.4	2.0	32.9
2	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-42.3	-1.8	-37.1	2.2	34.5
2	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-2.3	-0.4	-5.4	2.2	34.5
2	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-26.2	-2.6	-33.1	3.0	20.0
2	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-3.3	-0.4	-5.2	3.0	20.0
2.5	SLV	Max	0.6	4.6	0.4	1.6	2.1	7.7
2.5	SLV	Min	-0.6	-4.6	-0.4	-1.6	-2.1	-5.1
2.5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	2.2	0.0	0.0	0.0	51.2
2.5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	1.7	0.0	0.0	0.0	42.5
2.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	0.1	0.1	1.2	0.4	42.9
2.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	0.5	-0.1	-1.3	1.4	48.5
2.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	-0.2	0.0	-0.4	1.1	39.3
2.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	0.6	0.0	-0.4	1.1	50.5
2.5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	1.6	-0.3	-3.3	0.7	43.4
2.5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	1.1	-0.3	-3.3	0.7	34.8
2.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	-0.5	-0.2	-2.0	1.1	35.2
2.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	-0.1	-0.4	-4.6	2.1	40.8
2.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	-0.7	-0.3	-3.7	1.7	31.5
2.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	0.1	-0.3	-3.7	1.7	42.7
2.5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	2.3	0.0	0.0	0.0	38.7

2.5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	1.4	0.0	0.0	0.0	24.3
2.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	-1.2	0.2	2.1	0.7	25.0
2.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	-0.5	-0.2	-2.2	2.4	34.3
2.5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-1.6	0.0	-0.7	1.8	18.9
2.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	-0.3	0.0	-0.7	1.8	37.6
2.5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	2.0	-0.1	-1.6	0.3	34.9
2.5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	1.1	-0.1	-1.6	0.3	20.4
2.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	-1.5	0.1	0.4	1.0	21.2
2.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	-0.8	-0.3	-3.8	2.7	30.5
2.5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-1.9	-0.2	-2.4	2.1	15.1
2.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	-0.6	-0.2	-2.4	2.1	33.7
2.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	-0.5	-0.4	-5.4	2.4	35.2
2.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	-1.5	-0.4	-5.2	3.2	21.2
3	SLV	Max	0.6	4.6	0.4	1.6	2.2	8.2
3	SLV	Min	-0.6	-4.6	-0.4	-1.6	-2.2	-2.8
3	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	4.0	0.0	0.0	0.0	49.6
3	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	3.5	0.0	0.0	0.0	41.2
3	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	1.9	0.1	1.2	0.4	42.4
3	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	2.3	-0.1	-1.3	1.5	47.8
3	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	1.6	0.0	-0.4	1.1	38.9
3	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	2.4	0.0	-0.4	1.1	49.7
3	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	3.5	-0.3	-3.3	0.8	42.2
3	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	2.9	-0.3	-3.3	0.8	33.8
3	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	1.3	-0.2	-2.0	1.2	35.0
3	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	1.7	-0.4	-4.6	2.3	40.4
3	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	1.1	-0.3	-3.7	1.9	31.5
3	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	1.9	-0.3	-3.7	1.9	42.2
3	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	4.1	0.0	0.0	0.0	37.1
3	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	3.2	0.0	0.0	0.0	23.1
3	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	0.6	0.2	2.1	0.6	25.2
3	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	1.3	-0.2	-2.2	2.4	34.1
3	SLU-Q17_0.5*S-1+1*Wy-3		0.0	0.2	0.0	-0.7	1.8	19.3
3	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	1.5	0.0	-0.7	1.8	37.2
3	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	3.8	-0.1	-1.6	0.4	33.4
3	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	2.9	-0.1	-1.6	0.4	19.4
3	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	0.3	0.1	0.4	1.0	21.4
3	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	1.0	-0.3	-3.8	2.8	30.4
3	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-0.1	-0.2	-2.4	2.2	15.6
3	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	1.2	-0.2	-2.4	2.2	33.5
3	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	1.3	-0.4	-5.4	2.6	35.0
3	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	0.3	-0.4	-5.2	3.4	21.4
3.5	SLV	Max	0.6	4.6	0.4	1.6	2.4	8.1
3.5	SLV	Min	-0.6	-4.6	-0.4	-1.6	-2.4	-0.5
3.5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	5.8	0.0	0.0	0.0	47.2
3.5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	5.3	0.0	0.0	0.0	39.0
3.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	3.7	0.1	1.2	0.3	41.0
3.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	4.1	-0.1	-1.3	1.5	46.2
3.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	3.4	0.0	-0.4	1.1	37.7
3.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	4.2	0.0	-0.4	1.1	48.0
3.5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	5.3	-0.3	-3.3	0.9	40.0
3.5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	4.7	-0.3	-3.3	0.9	31.9
3.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	3.1	-0.2	-2.0	1.3	33.9
3.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	3.5	-0.4	-4.6	2.5	39.0
3.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	2.9	-0.3	-3.7	2.0	30.5
3.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	3.7	-0.3	-3.7	2.0	40.8
3.5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	5.9	0.0	0.0	0.0	34.6
3.5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	5.0	0.0	0.0	0.0	21.1
3.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	2.4	0.2	2.1	0.5	24.4

3.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	3.1	-0.2	-2.2	2.5	33.1
3.5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	2.0	0.0	-0.7	1.8	18.8
3.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	3.3	0.0	-0.7	1.8	36.0
3.5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	5.7	-0.1	-1.6	0.5	31.0
3.5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	4.7	-0.1	-1.6	0.5	17.5
3.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	2.1	0.1	0.4	1.0	20.8
3.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	2.8	-0.3	-3.8	3.0	29.5
3.5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	1.7	-0.2	-2.4	2.3	15.2
3.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	3.0	-0.2	-2.4	2.3	32.5
3.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	3.1	-0.4	-5.4	2.8	33.9
3.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	2.1	-0.4	-5.2	3.6	20.8
4	SLV	Max	0.6	4.6	0.4	1.6	2.5	7.2
4	SLV	Max	2.0	9.5	2.0	7.0	2.4	7.2
4	SLV	Min	-0.6	-4.6	-0.4	-1.6	-2.5	-1.8
4	SLV	Min	-2.0	-4.6	-2.0	-7.0	-2.4	-1.4
4	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	7.6	0.0	0.0	0.0	43.8
4	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	64.5	0.0	0.0	0.0	43.8
4	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	7.1	0.0	0.0	0.0	36.0
4	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	53.6	0.0	0.0	0.0	36.0
4	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	5.5	0.1	1.2	0.3	38.7
4	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	55.0	0.8	-8.5	0.3	38.7
4	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	5.9	-0.1	-1.3	1.6	43.7
4	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	62.2	1.1	4.3	1.6	43.7
4	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	5.2	0.0	-0.4	1.1	35.5
4	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	50.3	1.0	-0.1	1.1	35.5
4	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	6.1	0.0	-0.4	1.1	45.4
4	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	64.7	1.0	-0.1	1.1	45.4
4	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	7.1	-0.3	-3.3	1.1	36.9
4	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	54.5	-0.3	18.0	1.1	36.9
4	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	6.5	-0.3	-3.3	1.1	29.1
4	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	43.6	-0.3	18.0	1.1	29.1
4	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	5.0	-0.2	-2.0	1.3	31.8
4	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	45.0	0.5	9.5	1.3	31.8
4	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	5.4	-0.4	-4.6	2.6	36.8
4	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	52.2	0.8	22.3	2.6	36.8
4	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	4.7	-0.3	-3.7	2.2	28.6
4	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	40.3	0.7	17.9	2.2	28.6
4	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	5.5	-0.3	-3.7	2.2	38.5
4	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	54.7	0.7	17.9	2.2	38.5
4	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	7.7	0.0	0.0	0.0	31.2
4	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	47.8	0.0	0.0	0.0	31.2
4	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	6.8	0.0	0.0	0.0	18.1
4	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	29.5	0.0	0.0	0.0	18.1
4	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	4.2	0.2	2.1	0.4	22.8
4	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	31.8	1.4	-14.2	0.4	22.8
4	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	4.9	-0.2	-2.2	2.6	31.1
4	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	43.9	1.8	7.2	2.6	31.1
4	SLU-Q17_0.5*S-1+1*Wy-3		0.0	3.8	0.0	-0.7	1.8	17.3
4	SLU-Q17_0.5*S-1+1*Wy-3		0.0	23.9	1.7	-0.2	1.8	17.3
4	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	5.1	0.0	-0.7	1.8	33.9
4	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	48.0	1.7	-0.2	1.8	33.9
4	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	7.5	-0.1	-1.6	0.5	27.7
4	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	42.7	-0.1	9.0	0.5	27.7
4	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	6.5	-0.1	-1.6	0.5	14.7
4	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	24.5	-0.1	9.0	0.5	14.7
4	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	3.9	0.1	0.4	1.0	19.3
4	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	26.8	1.2	-5.2	1.0	19.3
4	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	4.6	-0.3	-3.8	3.1	27.6

4	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	38.9	1.7	16.2	3.1	27.6
4	SLU-Q23_0.5*S-2+1*Wy-3		0.0	3.5	-0.2	-2.4	2.4	13.9
4	SLU-Q23_0.5*S-2+1*Wy-3		0.0	18.9	1.5	8.8	2.4	13.9
4	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	4.8	-0.2	-2.4	2.4	30.5
4	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	43.0	1.5	8.8	2.4	30.5
4	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	5.0	-0.4	-5.4	3.0	31.8
4	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	45.0	0.9	26.3	3.0	31.8
4	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	3.9	-0.4	-5.2	3.8	19.3
4	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	26.8	1.8	22.8	3.8	19.3
4.5	SLV	Max	2.0	10.9	2.0	7.0	1.4	3.7
4.5	SLV	Min	-2.0	-4.6	-2.0	-7.0	-1.4	-3.7
4.5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	66.4	0.0	0.0	0.0	11.1
4.5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	55.4	0.0	0.0	0.0	8.7
4.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	56.8	0.8	-8.5	-0.2	10.8
4.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	64.0	1.1	4.3	1.0	12.2
4.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	52.1	1.0	-0.1	0.6	9.9
4.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	66.5	1.0	-0.1	0.6	12.6
4.5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	56.3	-0.3	18.0	1.2	9.2
4.5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	45.4	-0.3	18.0	1.2	6.8
4.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	46.8	0.5	9.5	1.1	8.9
4.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	54.0	0.8	22.3	2.2	10.3
4.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	42.1	0.7	17.9	1.8	8.0
4.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	56.5	0.7	17.9	1.8	10.7
4.5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	49.6	0.0	0.0	0.0	6.9
4.5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	31.3	0.0	0.0	0.0	2.9
4.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	33.6	1.4	-14.2	-0.3	6.4
4.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	45.7	1.8	7.2	1.7	8.7
4.5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	25.7	1.7	-0.2	1.0	4.9
4.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	49.8	1.7	-0.2	1.0	9.5
4.5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	44.6	-0.1	9.0	0.6	5.9
4.5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	26.3	-0.1	9.0	0.6	2.0
4.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	28.6	1.2	-5.2	0.4	5.5
4.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	40.7	1.7	16.2	2.3	7.7
4.5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	20.7	1.5	8.8	1.6	4.0
4.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	44.8	1.5	8.8	1.6	8.5
4.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	46.8	0.9	26.3	2.6	8.9
4.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	28.6	1.8	22.8	2.9	5.5
5	SLV	Max	2.0	12.3	2.0	7.0	0.7	6.0
5	SLV	Min	-2.0	-4.6	-2.0	-7.0	-0.7	-6.0
5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	68.2	0.0	0.0	0.0	-22.6
5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	57.2	0.0	0.0	0.0	-19.4
5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	58.6	0.8	-8.5	-0.6	-18.1
5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	65.8	1.1	4.3	0.5	-20.3
5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	53.9	1.0	-0.1	0.1	-16.6
5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	68.3	1.0	-0.1	0.1	-21.1
5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	58.2	-0.3	18.0	1.4	-19.4
5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	47.2	-0.3	18.0	1.4	-16.3
5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	48.6	0.5	9.5	0.8	-14.9
5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	55.8	0.8	22.3	1.8	-17.2
5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	43.9	0.7	17.9	1.5	-13.5
5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	58.3	0.7	17.9	1.5	-18.0
5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	51.4	0.0	0.0	0.0	-18.4
5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	33.1	0.0	0.0	0.0	-13.2
5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	35.4	1.4	-14.2	-0.9	-10.9
5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	47.5	1.8	7.2	0.8	-14.6
5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	27.6	1.7	-0.2	0.2	-8.4
5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	51.6	1.7	-0.2	0.2	-15.9
5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	46.4	-0.1	9.0	0.7	-16.8

5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	28.1	-0.1	9.0	0.7	-11.6
5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	30.4	1.2	-5.2	-0.3	-9.3
5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	42.5	1.7	16.2	1.4	-13.0
5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	22.5	1.5	8.8	0.9	-6.9
5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	46.6	1.5	8.8	0.9	-14.3
5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	48.6	0.9	26.3	2.1	-14.9
5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	30.4	1.8	22.8	2.0	-9.3
5.5	SLV	Max	2.0	13.7	2.0	7.0	1.0	8.3
5.5	SLV	Min	-2.0	-4.6	-2.0	-7.0	-1.0	-10.2
5.5	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	70.0	0.0	0.0	0.0	-57.1
5.5	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	59.0	0.0	0.0	0.0	-48.5
5.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	60.4	0.8	-8.5	-1.0	-47.8
5.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	67.6	1.1	4.3	-0.1	-53.7
5.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	55.7	1.0	-0.1	-0.4	-44.0
5.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	70.1	1.0	-0.1	-0.4	-55.7
5.5	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	60.0	-0.3	18.0	1.5	-49.0
5.5	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	49.0	-0.3	18.0	1.5	-40.4
5.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	50.4	0.5	9.5	0.5	-39.7
5.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	57.6	0.8	22.3	1.4	-45.5
5.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	45.7	0.7	17.9	1.1	-35.9
5.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	60.1	0.7	17.9	1.1	-47.6
5.5	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	53.2	0.0	0.0	0.0	-44.5
5.5	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	34.9	0.0	0.0	0.0	-30.1
5.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	37.2	1.4	-14.2	-1.6	-29.0
5.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	49.3	1.8	7.2	-0.1	-38.8
5.5	SLU-Q17_0.5*S-1+1*Wy-3		0.0	29.4	1.7	-0.2	-0.6	-22.6
5.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	53.4	1.7	-0.2	-0.6	-42.2
5.5	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	48.2	-0.1	9.0	0.7	-40.4
5.5	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	29.9	-0.1	9.0	0.7	-26.1
5.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	32.2	1.2	-5.2	-0.9	-25.0
5.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.2	44.3	1.7	16.2	0.6	-34.7
5.5	SLU-Q23_0.5*S-2+1*Wy-3		0.0	24.4	1.5	8.8	0.1	-18.6
5.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.2	48.4	1.5	8.8	0.1	-38.1
5.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.3	50.4	0.9	26.3	1.7	-39.7
5.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.1	32.2	1.8	22.8	1.1	-25.0
6	SLV	Max	2.0	15.1	2.0	7.0	1.9	10.6
6	SLV	Min	-2.0	-4.6	-2.0	-7.0	-1.9	-17.4
6	SLU-Q1_1*S-1+0.6*Wx-1		-5.0	71.8	0.0	0.0	0.0	-92.5
6	SLU-Q2_1*S-1+0.6*Wx-2		-4.9	60.8	0.0	0.0	0.0	-78.4
6	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	62.2	0.8	-8.5	-1.4	-78.5
6	SLU-Q4_1*S-1+0.6*Wy-2		-0.4	69.4	1.1	4.3	-0.6	-87.9
6	SLU-Q5_1*S-1+0.6*Wy-3		-0.3	57.5	1.0	-0.1	-0.9	-72.3
6	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	71.9	1.0	-0.1	-0.9	-91.2
6	SLU-Q7_1*S-2+0.6*Wx-1		-4.9	61.8	-0.3	18.0	1.6	-79.4
6	SLU-Q8_1*S-2+0.6*Wx-2		-4.8	50.8	-0.3	18.0	1.6	-65.3
6	SLU-Q9_1*S-2+0.6*Wy-1		-0.3	52.2	0.5	9.5	0.2	-65.3
6	SLU-Q10_1*S-2+0.6*Wy-2		-0.3	59.4	0.8	22.3	1.0	-74.8
6	SLU-Q11_1*S-2+0.6*Wy-3		-0.2	47.5	0.7	17.9	0.7	-59.2
6	SLU-Q12_1*S-2+0.6*Wy-4		-0.4	61.9	0.7	17.9	0.7	-78.1
6	SLU-Q13_0.5*S-1+1*Wx-1		-7.9	55.0	0.0	0.0	0.0	-71.5
6	SLU-Q14_0.5*S-1+1*Wx-2		-7.7	36.7	0.0	0.0	0.0	-48.0
6	SLU-Q15_0.5*S-1+1*Wy-1		-0.1	39.0	1.4	-14.2	-2.3	-48.1
6	SLU-Q16_0.5*S-1+1*Wy-2		-0.2	51.1	1.8	7.2	-1.0	-63.9
6	SLU-Q17_0.5*S-1+1*Wy-3		0.0	31.2	1.7	-0.2	-1.5	-37.8
6	SLU-Q18_0.5*S-1+1*Wy-4		-0.3	55.2	1.7	-0.2	-1.5	-69.3
6	SLU-Q19_0.5*S-2+1*Wx-1		-7.9	50.0	-0.1	9.0	0.8	-65.0
6	SLU-Q20_0.5*S-2+1*Wx-2		-7.6	31.7	-0.1	9.0	0.8	-41.5
6	SLU-Q21_0.5*S-2+1*Wy-1		-0.1	34.0	1.2	-5.2	-1.5	-41.5

6	SLU-Q22_0.5*S-2+1*Wy-2	-0.2	46.1	1.7	16.2	-0.2	-57.3
6	SLU-Q23_0.5*S-2+1*Wy-3	0.0	26.2	1.5	8.8	-0.7	-31.2
6	SLU-Q24_0.5*S-2+1*Wy-4	-0.2	50.2	1.5	8.8	-0.7	-62.8
6	SLU-Q25_1*S-2+0.6*Wy-5	-0.3	52.2	0.9	26.3	1.2	-65.3
6	SLU-Q26_0.5*S-2+1*Wy-5	-0.1	34.0	1.8	22.8	0.1	-41.5

8.1.2.2 Verifiche

Si riportano le verifiche effettuate tramite un foglio Excel autoprodotto per le azioni che comportano il tasso di lavoro più alto.

Dimensioni e materiale			
Base esterna	b	340	mm
Altezza esterna	h	520	mm
Spessore pareti	sp	20	mm
Tensione di snervamento caratteristica	fyk	355	Mpa
Tensione di snervamento di calcolo	fyd	338.1	Mpa
Azioni agenti			
Azione assiale	N	-7.90	kN
Taglio - asse debole	V2	67.05	kN
Taglio - asse forte	V3	2.62	kN
Azione torcente	T	37.06	kNm
Momento - asse debole	M2	3.80	kNm
Momento - asse forte	M3	91.51	kNm
Verifica a torsione			*EN1993-1-1 §6.2.7(1)*
Area racchiusa da linea media	Ω	160000	mm²
Tensione tangenziale di calcolo	τt,Ed	115.8125	Mpa
Tensione tangenziale resistente	τt,Rd	195.2	Mpa
Momento torcente di calcolo	Mt,Ed	37.06	kNm
Momento torcente resistente	Mt,Rd	62.5	kNm
Tasso di lavoro	w.r.	59%	
Verifica a taglio ridotto			*EN1993-1-1 §6.2.7(9)*
Azione da taglio	Ved	67.05	kN
Taglio resistente	Vpl,Rd	4060.1	kN
Taglio resistente ridotto per torsione	Vpl,T,Rd	1651.2	kN
Tasso di lavoro	w.r.	4%	
Verifica a flessione			*EN1993-1-1 §6.2.8*
Azione da taglio	Ved	67.05	kN
Limite taglio resistente senza riduzioni a momento	0.5*Vpl,T,Rd	825.6	kN
Nessuna interazione taglio-momento	Ved	<	0.5*Vpl,T,Rd
Fattore di interazione taglio-momento	ρ	0.000	
Tensione di snervamento caratteristica a flessione	(1-ρ) fyk	355.0	Mpa
Tensione di snervamento di calcolo a flessione	(1-ρ) fyd	338.1	MPa

Momento di inerzia	I	1.219E+09	mm4
Modulo di resistenza elastico	w.el	4688820.5	mm3
Momento di calcolo	Med	91.51	kNm
Momento resistente	Mrd	1585.27	kNm
Tasso di lavoro	w.r.	6%	

8.1.3 Colonna

La colonna ha sezione HEA360, con uno schema a pendolo inverso incastrata alla base ed una luce di calcolo di 4.601 m.

8.1.3.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 3 stazioni: all'inizio, in mezzeria ed alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	2.5	7.1	7.1	0.0	16.5	27.9
0	SLV	Min	-43.0	-7.1	-7.1	0.0	-16.5	-27.9
0	SLU-Q1_1*S-1+0.6*Wx-1		-202.6	0.0	-4.5	0.0	-8.2	0.0
0	SLU-Q2_1*S-1+0.6*Wx-2		-171.0	0.0	-4.5	0.0	-8.1	0.0
0	SLU-Q3_1*S-1+0.6*Wy-1		-178.9	4.5	-0.1	0.0	-0.1	-12.6
0	SLU-Q4_1*S-1+0.6*Wy-2		-199.8	5.7	-0.1	0.0	-0.1	36.8
0	SLU-Q5_1*S-1+0.6*Wy-3		-165.3	5.3	-0.1	0.0	-0.1	19.7
0	SLU-Q6_1*S-1+0.6*Wy-4		-207.0	5.3	-0.1	0.0	-0.2	19.7
0	SLU-Q7_1*S-2+0.6*Wx-1		-173.7	-0.3	-4.5	0.0	-8.1	59.3
0	SLU-Q8_1*S-2+0.6*Wx-2		-142.1	-0.3	-4.5	0.0	-8.1	59.3
0	SLU-Q9_1*S-2+0.6*Wy-1		-150.0	4.2	-0.1	0.0	-0.1	46.7
0	SLU-Q10_1*S-2+0.6*Wy-2		-170.9	5.5	-0.1	0.0	-0.1	96.1
0	SLU-Q11_1*S-2+0.6*Wy-3		-136.4	5.0	0.0	0.0	-0.1	79.0
0	SLU-Q12_1*S-2+0.6*Wy-4		-178.1	5.0	-0.1	0.0	-0.1	79.0
0	SLU-Q13_0.5*S-1+1*Wx-1		-151.5	0.0	-7.4	0.0	-13.4	0.0
0	SLU-Q14_0.5*S-1+1*Wx-2		-98.8	0.0	-7.4	0.0	-13.4	0.0
0	SLU-Q15_0.5*S-1+1*Wy-1		-112.0	7.5	0.0	0.0	0.0	-21.0
0	SLU-Q16_0.5*S-1+1*Wy-2		-146.8	9.6	-0.1	0.0	-0.1	61.4
0	SLU-Q17_0.5*S-1+1*Wy-3		-89.2	8.9	0.0	0.0	0.0	32.9
0	SLU-Q18_0.5*S-1+1*Wy-4		-158.8	8.9	-0.1	0.0	-0.1	32.9
0	SLU-Q19_0.5*S-2+1*Wx-1		-137.1	-0.1	-7.4	0.0	-13.4	29.6
0	SLU-Q20_0.5*S-2+1*Wx-2		-84.4	-0.1	-7.4	0.0	-13.3	29.6
0	SLU-Q21_0.5*S-2+1*Wy-1		-97.5	7.4	0.0	0.0	0.0	8.7
0	SLU-Q22_0.5*S-2+1*Wy-2		-132.3	9.4	0.0	0.0	-0.1	91.0
0	SLU-Q23_0.5*S-2+1*Wy-3		-74.8	8.7	0.0	0.0	0.0	62.5
0	SLU-Q24_0.5*S-2+1*Wy-4		-144.3	8.7	0.0	0.0	-0.1	62.5
0	SLU-Q25_1*S-2+0.6*Wy-5		-150.0	5.9	-0.1	0.0	-0.1	111.3
0	SLU-Q26_0.5*S-2+1*Wy-5		-97.5	10.1	0.0	0.0	0.0	116.4
2.3005	SLV	Max	2.5	7.1	7.1	0.0	0.1	16.7
2.3005	SLV	Min	-40.3	-7.1	-7.1	0.0	-0.1	-16.7
2.3005	SLU-Q1_1*S-1+0.6*Wx-1		-199.2	0.0	-3.1	0.0	0.6	0.0
2.3005	SLU-Q2_1*S-1+0.6*Wx-2		-167.6	0.0	-3.1	0.0	0.6	0.0
2.3005	SLU-Q3_1*S-1+0.6*Wy-1		-175.5	3.4	-0.1	0.0	0.1	-21.6
2.3005	SLU-Q4_1*S-1+0.6*Wy-2		-196.3	4.6	-0.1	0.0	0.1	24.9
2.3005	SLU-Q5_1*S-1+0.6*Wy-3		-161.8	4.2	-0.1	0.0	0.1	8.8

2.3005	SLU-Q6_1*S-1+0.6*Wy-4		-203.5	4.2	-0.1	0.0	0.1	8.8
2.3005	SLU-Q7_1*S-2+0.6*Wx-1		-170.3	-0.3	-3.1	0.0	0.6	59.9
2.3005	SLU-Q8_1*S-2+0.6*Wx-2		-138.7	-0.3	-3.0	0.0	0.6	59.9
2.3005	SLU-Q9_1*S-2+0.6*Wy-1		-146.6	3.1	-0.1	0.0	0.0	38.3
2.3005	SLU-Q10_1*S-2+0.6*Wy-2		-167.4	4.3	-0.1	0.0	0.1	84.8
2.3005	SLU-Q11_1*S-2+0.6*Wy-3		-132.9	3.9	0.0	0.0	0.0	68.7
2.3005	SLU-Q12_1*S-2+0.6*Wy-4		-174.6	3.9	-0.1	0.0	0.1	68.7
2.3005	SLU-Q13_0.5*S-1+1*Wx-1		-148.1	0.0	-5.1	0.0	0.9	0.0
2.3005	SLU-Q14_0.5*S-1+1*Wx-2		-95.4	0.0	-5.0	0.0	0.9	0.0
2.3005	SLU-Q15_0.5*S-1+1*Wy-1		-108.5	5.6	0.0	0.0	0.0	-36.1
2.3005	SLU-Q16_0.5*S-1+1*Wy-2		-143.3	7.7	-0.1	0.0	0.0	41.5
2.3005	SLU-Q17_0.5*S-1+1*Wy-3		-85.8	7.0	0.0	0.0	0.0	14.7
2.3005	SLU-Q18_0.5*S-1+1*Wy-4		-155.3	7.0	-0.1	0.0	0.0	14.7
2.3005	SLU-Q19_0.5*S-2+1*Wx-1		-133.6	-0.1	-5.0	0.0	0.9	29.9
2.3005	SLU-Q20_0.5*S-2+1*Wx-2		-80.9	-0.1	-5.0	0.0	0.9	29.9
2.3005	SLU-Q21_0.5*S-2+1*Wy-1		-94.1	5.5	0.0	0.0	0.0	-6.1
2.3005	SLU-Q22_0.5*S-2+1*Wy-2		-128.9	7.5	0.0	0.0	0.0	71.5
2.3005	SLU-Q23_0.5*S-2+1*Wy-3		-71.3	6.8	0.0	0.0	0.0	44.7
2.3005	SLU-Q24_0.5*S-2+1*Wy-4		-140.9	6.8	0.0	0.0	0.0	44.7
2.3005	SLU-Q25_1*S-2+0.6*Wy-5		-146.6	4.7	-0.1	0.0	0.0	99.2
2.3005	SLU-Q26_0.5*S-2+1*Wy-5		-94.1	8.2	0.0	0.0	0.0	95.4
4.601	SLV	Max	2.5	7.1	7.1	0.0	16.3	17.8
4.601	SLV	Min	-37.7	-7.1	-7.1	0.0	-16.3	-17.8
4.601	SLU-Q1_1*S-1+0.6*Wx-1		-195.7	0.0	-1.7	0.0	6.1	0.0
4.601	SLU-Q2_1*S-1+0.6*Wx-2		-164.1	0.0	-1.6	0.0	6.0	0.0
4.601	SLU-Q3_1*S-1+0.6*Wy-1		-172.0	2.2	-0.1	0.0	0.2	-28.1
4.601	SLU-Q4_1*S-1+0.6*Wy-2		-192.9	3.5	-0.1	0.0	0.3	15.6
4.601	SLU-Q5_1*S-1+0.6*Wy-3		-158.4	3.0	-0.1	0.0	0.2	0.5
4.601	SLU-Q6_1*S-1+0.6*Wy-4		-200.1	3.0	-0.1	0.0	0.3	0.5
4.601	SLU-Q7_1*S-2+0.6*Wx-1		-166.8	-0.3	-1.6	0.0	6.0	60.5
4.601	SLU-Q8_1*S-2+0.6*Wx-2		-135.2	-0.3	-1.6	0.0	5.9	60.5
4.601	SLU-Q9_1*S-2+0.6*Wy-1		-143.1	2.0	-0.1	0.0	0.2	32.4
4.601	SLU-Q10_1*S-2+0.6*Wy-2		-164.0	3.2	-0.1	0.0	0.2	76.1
4.601	SLU-Q11_1*S-2+0.6*Wy-3		-129.4	2.8	0.0	0.0	0.1	61.0
4.601	SLU-Q12_1*S-2+0.6*Wy-4		-171.2	2.8	-0.1	0.0	0.2	61.0
4.601	SLU-Q13_0.5*S-1+1*Wx-1		-144.6	0.0	-2.7	0.0	9.8	0.0
4.601	SLU-Q14_0.5*S-1+1*Wx-2		-91.9	0.0	-2.6	0.0	9.6	0.0
4.601	SLU-Q15_0.5*S-1+1*Wy-1		-105.1	3.7	0.0	0.0	0.1	-46.8
4.601	SLU-Q16_0.5*S-1+1*Wy-2		-139.9	5.8	-0.1	0.0	0.2	26.1
4.601	SLU-Q17_0.5*S-1+1*Wy-3		-82.3	5.1	0.0	0.0	0.0	0.9
4.601	SLU-Q18_0.5*S-1+1*Wy-4		-151.9	5.1	-0.1	0.0	0.2	0.9
4.601	SLU-Q19_0.5*S-2+1*Wx-1		-130.2	-0.1	-2.7	0.0	9.8	30.3
4.601	SLU-Q20_0.5*S-2+1*Wx-2		-77.5	-0.1	-2.6	0.0	9.6	30.3
4.601	SLU-Q21_0.5*S-2+1*Wy-1		-90.6	3.6	0.0	0.0	0.0	-16.5
4.601	SLU-Q22_0.5*S-2+1*Wy-2		-125.4	5.6	0.0	0.0	0.1	56.3
4.601	SLU-Q23_0.5*S-2+1*Wy-3		-67.9	4.9	0.0	0.0	0.0	31.1
4.601	SLU-Q24_0.5*S-2+1*Wy-4		-137.4	4.9	0.0	0.0	0.1	31.1
4.601	SLU-Q25_1*S-2+0.6*Wy-5		-143.1	3.6	-0.1	0.0	0.2	89.6
4.601	SLU-Q26_0.5*S-2+1*Wy-5		-90.6	6.3	0.0	0.0	0.0	78.8

8.1.3.2 Verifiche

Si riportano le verifiche effettuate tramite un foglio Excel autoprodotto per le azioni che comportano il tasso di lavoro più alto.

LUNGHEZZA ELEMENTO		
L	4.601 m	4 601 mm
AZIONI		
Ved_y	10.07 kN	10 070 N
Ved_z	7.43 kN	7 430 N
Ned (compressione)	206.99 kN	206 992 N
Ned (trazione)		0 N
Med_y	116.41 kNm	116 413 900 Nmm
Med_z	16.45 kNm	16 450 000 Nmm

Verifica a Taglio		
Avz	4 896	mm2
Ved	10 070	N
0,5*Vpl,rd	477 848	N
w.r.	0.0211	
A.fl	8 446	mm2
Ved_z	7 430	N
0,5*Vpl,rd	824 288	N
w.r.	0.0090	

Profilo		
HE		
Laminate ad I	HE 360 A	Bending
Classe	2	Bending355
g	112	kg/m
A	14 280	mm2
I_y	330 900 000	mm4
Wel.y	1 891 000	mm3
Wpl.y	2 088 000	mm3
iy	152	mm
Avz	4 896	mm2
Iz	78 870 000	mm4
Wel.z	525 800	mm3
Wpl.z	802 300	mm3
iz	74	mm

It	1.49E+06	mm4
Iw	2.18E+12	mm6
h/b	1.17	
tf	18	

Centrod i taglio		
ym	0	mm
zm	0	mm

Eulero		
	y	
β_y	2	
L0_y	9202.00	mm
Ncr_y	8099372	N
	z	
β_z	2	
L0_z	9202.00	mm
Ncr_z	1930485	N

h/b	1.17	
tf	18	
caso_curv	caso3	

y		
C.d.Inst._y	b	
α_y	0.34	
λ_y	0.7911	
ϕ_y	0.9134	
χ_y	0.72991	
Nd_y	206 992.00	N
Nb,rd_y	3 523 988	N
Ef_rate_y	0.058738	

z		
C.d.Inst._z	c	
α_z	0.49	
z		
λ_z	1.6205	
ϕ_z	2.1610	
χ_z	0.27850	
Nd_z	206 992.00	N
Nb,rd_z	1 344 592	N

Ef_rate_z	0.1539441

RESUME'		
Ef_rate	0.058738	y
	0.1539441	z
Eulero	0.1539441	z
Nd_y	206992.00	N
Ncr_y	8.10E+06	N
χ_y	0.72991	
ϕ_y	0.91344	
λ_y	0.791	
Nd_z	206992.00	N
Ncr_z	1.93E+06	N
χ_z	0.27850	
ϕ_z	2.16101	
λ_z	1.620	
Nrk	5069400	N

Latero-Torsionale		
Mpl_y,Rd	7.06E+08	Nmm
Mpl_z,Rd	2.71E+08	Nmm

h/b	1.17
Sezioni	Laminate ad I
caso_curv	caso1
curva	b
αLT	0.34

y		
β_LT	2	
L,y	9202	mm
Mcr,max_y	5.79E+08	Nmm
λLT,0	1.0771	\
w	0.6658587	
A	1.12	**
B	1.2879558	**
Cm	1.1499605	**
Mcr,y	5.03E+08	Nmm
λLT	1.1550	
ϕLT	1.3293496	
χLT	0.5031435	

Eulero + Latero-Torsionale

Appendice A1 EC3-1-1

Ned	206992	N
Med_y	1.16E+08	Nmm
Med_z	1.65E+07	Nmm
Nrk	5069400	N
My,rk	6.71E+08	Nmm
Mz,rk	1.87E+08	Nmm
Limite	elastico	

Cmy	1.000251
Cmz	1.003217
CmLT	1.072635

HP Ned << N_TF		
kc	0.94	table 6,6
Ci	1.131734	
λLT,0	1.0771	
? λLT,0 <	2.05E-01	no
Cm_y0	1.00077	
Cm_z0	1.00322	

	si	no
Cmy	1.00077	1.000251
Cmz	1.00322	1.00322
CmLT	1	1.072635

λmax	1.620
εy	4.247
μy	9.93E-01
μz	9.20E-01
wy	1.104178
wz	1.5
npl	0.042873
aLT	0.995503
bLT	0.01
cLT	0.32
dLT	0.01
eLT	0.09
Cyy	0.98024
Cyz	0.779457
Czy	0.908208
Czz	0.94332

classe_sez	3	4	1	2
kyy	1.09330	1.09330	1.11534	1.11534
kyz	1.11580	1.11580	1.00109	1.00109
kzy	1.01324	1.01324	0.57432	0.57432
kzz	1.03410	1.03410	1.09623	1.09623

classe_sez	2
kyy	1.115338
kyz	1.001086
kzy	0.57432
kzz	1.096231

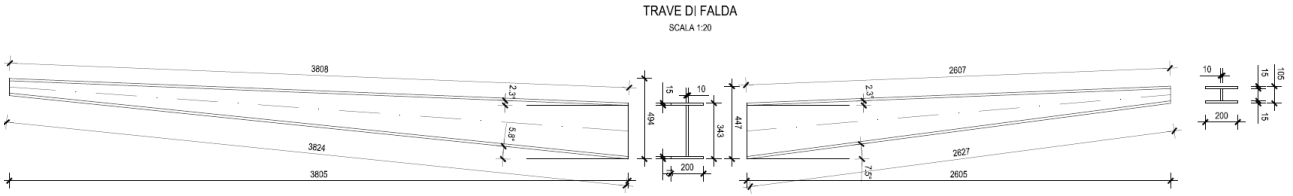
Verifica

	N	My	Mz	
Eulero y	0.058738	0.40	0.09	1
	0.5550			
Eulero z	0.153944	0.21	0.10	
	0.4632			

8.2 TIPO 1.C

8.2.1 Travi a sbalzo

La trave a sbalzo è una trave rastremata su luci di calcolo di 4 m e 2.8 m avente le sezioni di estremità riportate di seguito.



8.2.1.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 3 stazioni: all'inizio, in mezzeria ed alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	0.5	1.2	1.1	0.0	4.4	4.7
0	SLV	Min	-0.5	-2.7	-1.1	0.0	-4.4	-5.1
0	SLU-Q1_1*S-1+0.6*Wx-1		-1.1	-24.7	0.0	0.0	0.0	-50.4
0	SLU-Q2_1*S-1+0.6*Wx-2		-1.1	-20.1	0.0	0.0	0.0	-41.2
0	SLU-Q3_1*S-1+0.6*Wy-1		-1.1	-19.4	0.0	0.0	0.0	-39.9
0	SLU-Q4_1*S-1+0.6*Wy-2		-1.1	-25.5	0.0	0.0	0.0	-52.0
0	SLU-Q5_1*S-1+0.6*Wy-3		-1.1	-19.4	0.0	0.0	0.0	-39.9
0	SLU-Q6_1*S-1+0.6*Wy-4		-1.1	-25.5	0.0	0.0	0.0	-52.0
0	SLU-Q7_1*S-2+0.6*Wx-1		-1.1	-24.7	0.0	0.0	0.0	-50.4
0	SLU-Q8_1*S-2+0.6*Wx-2		-1.1	-20.1	0.0	0.0	0.0	-41.2
0	SLU-Q9_1*S-2+0.6*Wy-1		-1.1	-19.4	0.0	0.0	0.0	-39.9
0	SLU-Q10_1*S-2+0.6*Wy-2		-1.1	-25.5	0.0	0.0	0.0	-52.0
0	SLU-Q11_1*S-2+0.6*Wy-3		-1.1	-19.4	0.0	0.0	0.0	-39.9
0	SLU-Q12_1*S-2+0.6*Wy-4		-1.1	-25.5	0.0	0.0	0.0	-52.0
0	SLU-Q13_0.5*S-1+1*Wx-1		-0.7	-17.2	0.0	0.0	0.0	-35.3
0	SLU-Q14_0.5*S-1+1*Wx-2		-0.7	-9.5	0.0	0.0	0.0	-19.9
0	SLU-Q15_0.5*S-1+1*Wy-1		-0.7	-8.4	0.0	0.0	0.0	-17.8
0	SLU-Q16_0.5*S-1+1*Wy-2		-0.7	-18.5	0.0	0.0	0.0	-38.0
0	SLU-Q17_0.5*S-1+1*Wy-3		-0.7	-8.4	0.0	0.0	0.0	-17.8
0	SLU-Q18_0.5*S-1+1*Wy-4		-0.7	-18.5	0.0	0.0	0.0	-38.0
0	SLU-Q19_0.5*S-2+1*Wx-1		-0.7	-17.2	0.0	0.0	0.0	-35.3
0	SLU-Q20_0.5*S-2+1*Wx-2		-0.7	-9.5	0.0	0.0	0.0	-19.9
0	SLU-Q21_0.5*S-2+1*Wy-1		-0.7	-8.4	0.0	0.0	0.0	-17.8
0	SLU-Q22_0.5*S-2+1*Wy-2		-0.7	-18.5	0.0	0.0	0.0	-38.0
0	SLU-Q23_0.5*S-2+1*Wy-3		-0.7	-8.4	0.0	0.0	0.0	-17.8
0	SLU-Q24_0.5*S-2+1*Wy-4		-0.7	-18.5	0.0	0.0	0.0	-38.0
0	SLU-Q25_1*S-2+0.6*Wy-5		-1.1	-23.4	0.0	0.0	0.0	-47.8
0	SLU-Q26_0.5*S-2+1*Wy-5		-0.7	-15.0	0.0	0.0	0.0	-31.0
2.00209	SLV	Max	0.5	1.2	1.1	0.0	2.2	2.4
2.00209	SLV	Min	-0.5	-1.2	-1.1	0.0	-2.2	-2.4
2.00209	SLU-Q1_1*S-1+0.6*Wx-1		-0.5	-12.5	0.0	0.0	0.0	-13.2
2.00209	SLU-Q2_1*S-1+0.6*Wx-2		-0.5	-10.2	0.0	0.0	0.0	-10.8
2.00209	SLU-Q3_1*S-1+0.6*Wy-1		-0.5	-9.9	0.0	0.0	0.0	-10.5

2.00209	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-12.9	0.0	0.0	0.0	-13.6
2.00209	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-9.9	0.0	0.0	0.0	-10.5
2.00209	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-12.9	0.0	0.0	0.0	-13.6
2.00209	SLU-Q7_1*S-2+0.6*Wx-1		-0.5	-12.5	0.0	0.0	0.0	-13.2
2.00209	SLU-Q8_1*S-2+0.6*Wx-2		-0.5	-10.2	0.0	0.0	0.0	-10.8
2.00209	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-9.9	0.0	0.0	0.0	-10.5
2.00209	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-12.9	0.0	0.0	0.0	-13.6
2.00209	SLU-Q11_1*S-2+0.6*Wy-3		-0.5	-9.9	0.0	0.0	0.0	-10.5
2.00209	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-12.9	0.0	0.0	0.0	-13.6
2.00209	SLU-Q13_0.5*S-1+1*Wx-1		-0.4	-8.8	0.0	0.0	0.0	-9.4
2.00209	SLU-Q14_0.5*S-1+1*Wx-2		-0.4	-4.9	0.0	0.0	0.0	-5.5
2.00209	SLU-Q15_0.5*S-1+1*Wy-1		-0.4	-4.4	0.0	0.0	0.0	-5.0
2.00209	SLU-Q16_0.5*S-1+1*Wy-2		-0.4	-9.4	0.0	0.0	0.0	-10.1
2.00209	SLU-Q17_0.5*S-1+1*Wy-3		-0.4	-4.4	0.0	0.0	0.0	-5.0
2.00209	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-9.4	0.0	0.0	0.0	-10.1
2.00209	SLU-Q19_0.5*S-2+1*Wx-1		-0.4	-8.8	0.0	0.0	0.0	-9.4
2.00209	SLU-Q20_0.5*S-2+1*Wx-2		-0.4	-4.9	0.0	0.0	0.0	-5.5
2.00209	SLU-Q21_0.5*S-2+1*Wy-1		-0.4	-4.4	0.0	0.0	0.0	-5.0
2.00209	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-9.4	0.0	0.0	0.0	-10.1
2.00209	SLU-Q23_0.5*S-2+1*Wy-3		-0.4	-4.4	0.0	0.0	0.0	-5.0
2.00209	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-9.4	0.0	0.0	0.0	-10.1
2.00209	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-11.9	0.0	0.0	0.0	-12.5
2.00209	SLU-Q26_0.5*S-2+1*Wy-5		-0.4	-7.7	0.0	0.0	0.0	-8.3
4.00418	SLV	Max	0.5	1.2	1.1	0.0	0.0	0.0
4.00418	SLV	Min	-0.5	-1.2	-1.1	0.0	0.0	0.0
4.00418	SLU-Q1_1*S-1+0.6*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q2_1*S-1+0.6*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q3_1*S-1+0.6*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q4_1*S-1+0.6*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q5_1*S-1+0.6*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q6_1*S-1+0.6*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q7_1*S-2+0.6*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q8_1*S-2+0.6*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q9_1*S-2+0.6*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q10_1*S-2+0.6*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q11_1*S-2+0.6*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q12_1*S-2+0.6*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q13_0.5*S-1+1*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q14_0.5*S-1+1*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q15_0.5*S-1+1*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q16_0.5*S-1+1*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q18_0.5*S-1+1*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q19_0.5*S-2+1*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q20_0.5*S-2+1*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q21_0.5*S-2+1*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q22_0.5*S-2+1*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q24_0.5*S-2+1*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q25_1*S-2+0.6*Wy-5		0.0	-0.6	0.0	0.0	0.0	0.0
4.00418	SLU-Q26_0.5*S-2+1*Wy-5		0.0	-0.6	0.0	0.0	0.0	0.0

8.2.1.2 Verifiche

Verifiche SLU

Si riportano le verifiche effettuate tramite il software di calcolo SAP2000 per la combinazione che comporta il tasso di lavoro più alto.

EUROCODE 3-1993 STEEL SECTION CHECK
Combo : SLU-Q12_1*S-2+0.6*Wy-4
Units : KN, m, C

Frame : 39 Design Sect: B_343-105x200
X Mid : 12.000 Design Type: Brace
Y Mid : 2.000 Frame Type : Moment Resisting Frame
Z Mid : 4.439 Sect Class : Class 1
Length : 4.004 Major Axis : 0.000 degrees counterclockwise from local 3
Loc : 0.000 RLLF : 1.000

Area : 0.009 SMajor : 0.001 rMajor : 0.143 AVMajor: 0.003
IMajor : 1.870E-04 SMinor : 2.003E-04 rMinor : 0.047 AVMinor: 0.005
IMinor : 2.003E-05 ZMajor : 0.001 E : 210000000.00
Ixy : 0.000 ZMinor : 3.078E-04 Fy : 355000.000

STRESS CHECK FORCES & MOMENTS

Location	P	M33	M22	V2	V3	T
0.000	-1.071	-51.980	0.000	-25.493	0.000	0.000

PMM DEMAND/CAPACITY RATIO

Governing Equation	Total Ratio		P Ratio		MMajor Ratio		MMinor Ratio	Ratio Limit	Status Check
(5.5.4)	0.777	=	0.008	+	0.770	+	0.000	1.000	OK

AXIAL FORCE DESIGN

	Fc or Ft Force	Nc.Rd Capacity	Nt.Rd Capacity	Nb33.Rd Major	Nb22.Rd Minor
Axial	-1.071	138.882	3086.810	1097.722	138.882

MOMENT DESIGN

	M.Sd Moment	Mc.Rd Capacity	Mv.Rd Capacity	Mb.Rd Capacity
Major Moment	-51.980	415.493	415.493	67.239
Minor Moment	0.000	104.074	104.074	

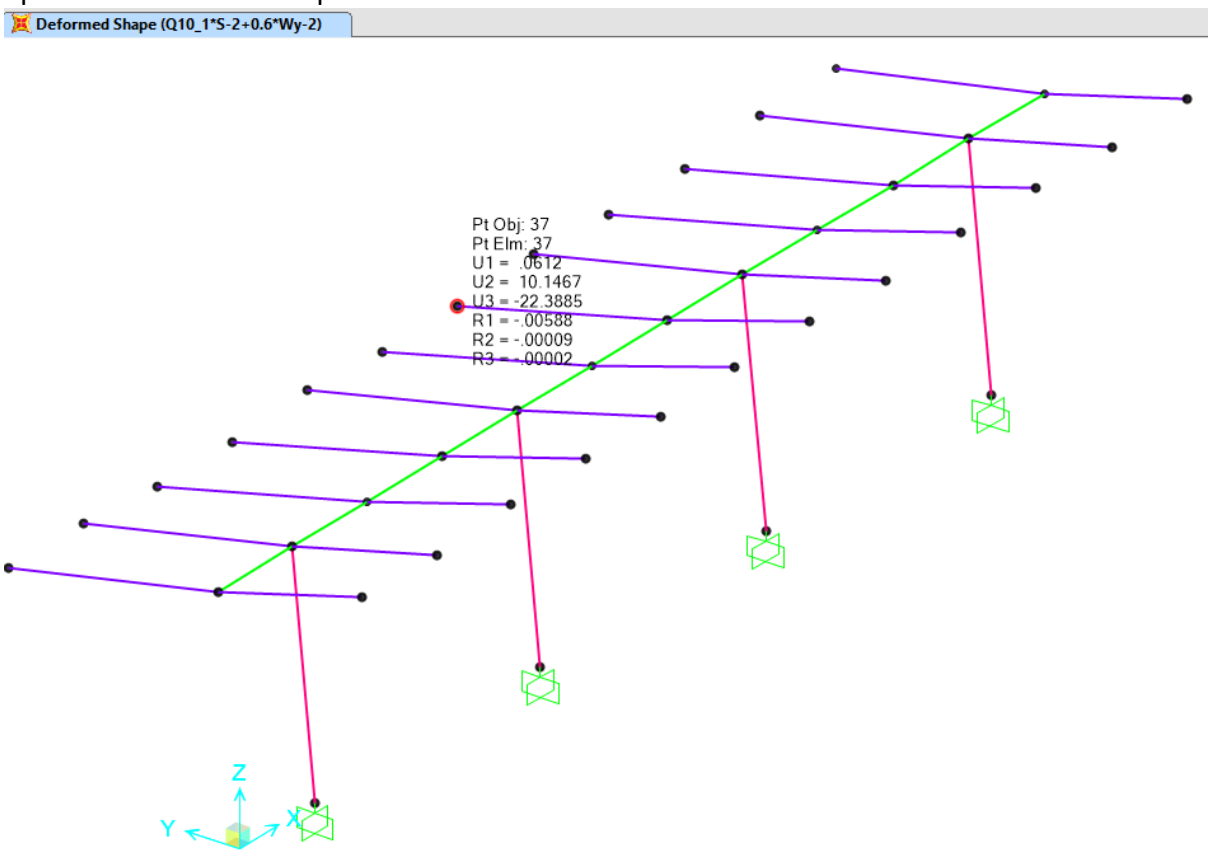
	K Factor	L Factor	k Factor	klt Factor	C1 Factor
Major Moment	2.000	2.000	1.002	0.996	1.000
Minor Moment	2.000	2.000	1.055		

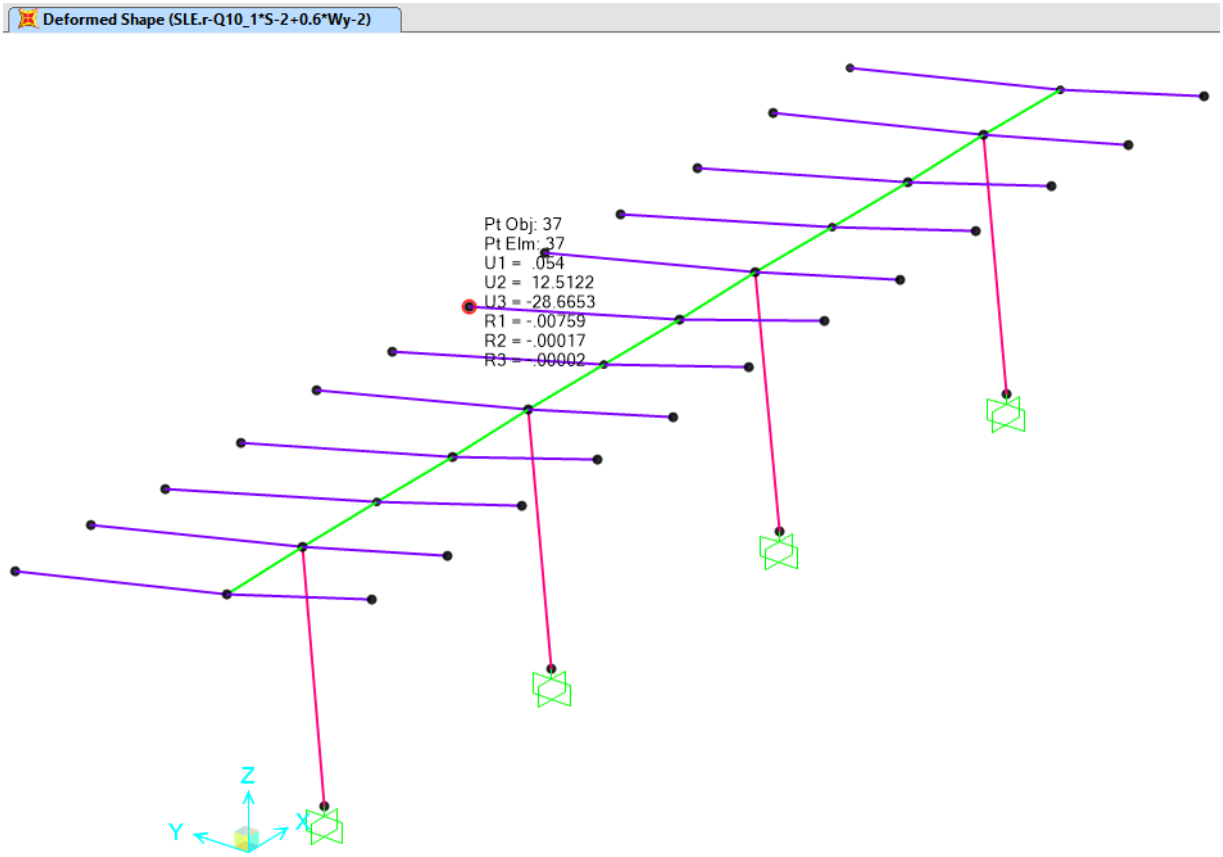
SHEAR DESIGN

	V.Sd Force	V.Rd Capacity	Stress Ratio	Status Check	Tu Torsion
Major Shear	25.493	669.534	0.038	OK	0.000
Minor Shear	0.000	975.997	0.000	OK	0.000

Verifiche SLE

Si riporta la deformata valutata tramite il software di calcolo SAP2000 per la combinazione che comporta la deformazione più alta.

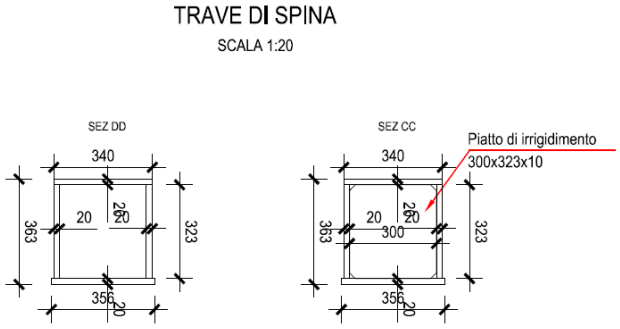




Luce	L	4	m
Coefficiente L_0	β	2	
Lunghezza libera di inflessione	L_0	8	m
Deformata da carichi variabili			
Limite deformata	L_0/	250	
Abbassamento limite	$\delta_{2,lim}$	32	mm
Abbassamento effettivo	$\delta_{2,d}$	22.39	mm
tasso di lavoro	w.r.	70%	
Deformata totale			
Limite deformata	L_0/	200	
Abbassamento limite	$\delta_{tot,lim}$	40	mm
Abbassamento effettivo	$\delta_{tot,d}$	28.66	mm
tasso di lavoro	w.r.	72%	

8.2.2 Trave di colmo

La trave di colmo è una trave continua con sezione scatolare come riportato di seguito ed una luce di calcolo pari all'interasse tra i pilastri, ovvero 6 m.



8.2.2.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 13 stazioni dall'inizio alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	2.9	4.2	3.3	7.6	7.9	14.8
0	SLV	Min	-2.9	-11.6	-3.3	-7.6	-7.9	-14.8
0	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	-48.4	-0.7	-27.3	-2.3	-53.0
0	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	-41.2	-0.4	-23.1	-2.3	-44.8
0	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-43.5	-1.1	-17.5	-1.9	-49.8
0	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	-49.3	-1.6	-31.2	-2.1	-56.2
0	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-40.9	-1.3	-21.9	-2.0	-46.8
0	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	-50.6	-1.5	-28.9	-2.1	-57.8
0	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	-42.8	-0.8	-36.5	-2.3	-46.8
0	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	-35.6	-0.5	-32.3	-2.3	-38.5
0	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-38.0	-1.2	-26.7	-1.9	-43.5

0	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-43.7	-1.7	-40.5	-2.1	-50.0
0	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-35.4	-1.4	-31.2	-2.0	-40.6
0	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-45.1	-1.6	-38.2	-2.1	-51.5
0	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	-35.6	-0.9	-18.1	-3.9	-37.2
0	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	-23.6	-0.4	-11.1	-3.8	-23.4
0	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-27.5	-1.5	-1.8	-3.1	-31.7
0	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-37.1	-2.3	-24.7	-3.6	-42.5
0	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-23.2	-1.9	-9.2	-3.3	-26.8
0	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-39.4	-2.1	-20.8	-3.4	-45.1
0	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	-32.9	-0.9	-22.8	-3.9	-34.0
0	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	-20.8	-0.4	-15.8	-3.8	-20.2
0	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-24.8	-1.6	-6.4	-3.1	-28.6
0	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-34.3	-2.3	-29.4	-3.6	-39.3
0	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-20.4	-1.9	-13.8	-3.3	-23.7
0	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-36.6	-2.2	-25.5	-3.4	-41.9
0	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-39.1	-1.7	-40.2	-2.2	-44.8
0	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-26.6	-2.4	-28.8	-3.6	-30.7
0.5	SLV	Max	2.9	4.2	3.3	7.6	6.4	12.7
0.5	SLV	Min	-2.9	-10.5	-3.3	-7.6	-6.4	-12.7
0.5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	-46.9	-0.7	-27.3	-2.0	-29.2
0.5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	-39.7	-0.4	-23.1	-2.1	-24.5
0.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-42.0	-1.1	-17.5	-1.3	-28.4
0.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	-47.8	-1.6	-31.2	-1.4	-32.0
0.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-39.4	-1.3	-21.9	-1.3	-26.7
0.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	-49.2	-1.5	-28.9	-1.3	-32.8
0.5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	-41.4	-0.8	-36.5	-1.9	-25.7
0.5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	-34.1	-0.5	-32.3	-2.0	-21.0
0.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-36.5	-1.2	-26.7	-1.2	-24.9
0.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-42.2	-1.7	-40.5	-1.3	-28.5
0.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-33.9	-1.4	-31.2	-1.3	-23.2
0.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-43.6	-1.6	-38.2	-1.3	-29.4
0.5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	-34.2	-0.9	-18.1	-3.5	-19.7
0.5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	-22.1	-0.4	-11.1	-3.6	-11.9
0.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-26.0	-1.5	-1.8	-2.3	-18.3
0.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-35.6	-2.3	-24.7	-2.4	-24.3
0.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-21.7	-1.9	-9.2	-2.4	-15.6
0.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-37.9	-2.1	-20.8	-2.4	-25.8
0.5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	-31.4	-0.9	-22.8	-3.4	-18.0
0.5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	-19.3	-0.4	-15.8	-3.6	-10.2
0.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-23.3	-1.6	-6.4	-2.3	-16.6
0.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-32.8	-2.3	-29.4	-2.4	-22.6
0.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-18.9	-1.9	-13.8	-2.4	-13.8
0.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-35.1	-2.2	-25.5	-2.3	-24.0
0.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-37.6	-1.7	-40.2	-1.3	-25.6
0.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-25.1	-2.4	-28.8	-2.4	-17.8
1	SLV	Max	2.9	4.2	3.3	7.6	4.9	10.6
1	SLV	Min	-2.9	-9.3	-3.3	-7.6	-4.9	-10.6
1	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	-45.4	-0.7	-27.3	-1.6	-6.1
1	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	-38.2	-0.4	-23.1	-1.9	-5.1
1	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-40.6	-1.1	-17.5	-0.7	-7.7
1	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	-46.3	-1.6	-31.2	-0.6	-8.5
1	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-37.9	-1.3	-21.9	-0.7	-7.4
1	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	-47.7	-1.5	-28.9	-0.6	-8.6
1	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	-39.9	-0.8	-36.5	-1.5	-5.4
1	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	-32.6	-0.5	-32.3	-1.8	-4.4
1	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-35.0	-1.2	-26.7	-0.6	-7.0
1	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-40.7	-1.7	-40.5	-0.5	-7.8
1	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-32.4	-1.4	-31.2	-0.6	-6.7

1	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-42.1	-1.6	-38.2	-0.5	-7.9
1	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	-32.7	-0.9	-18.1	-3.0	-3.0
1	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	-20.6	-0.4	-11.1	-3.4	-1.2
1	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-24.6	-1.5	-1.8	-1.5	-5.7
1	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-34.1	-2.3	-24.7	-1.3	-6.9
1	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-20.2	-1.9	-9.2	-1.5	-5.1
1	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-36.4	-2.1	-20.8	-1.3	-7.2
1	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	-29.9	-0.9	-22.8	-3.0	-2.7
1	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	-17.8	-0.4	-15.8	-3.4	-0.9
1	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-21.8	-1.6	-6.4	-1.5	-5.3
1	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-31.3	-2.3	-29.4	-1.2	-6.5
1	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-17.4	-1.9	-13.8	-1.4	-4.8
1	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-33.6	-2.2	-25.5	-1.3	-6.8
1	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-36.1	-1.7	-40.2	-0.5	-7.2
1	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-23.6	-2.4	-28.8	-1.2	-5.6
1.5	SLV	Max	2.9	4.2	3.3	7.6	3.6	8.5
1.5	SLV	Min	-2.9	-8.2	-3.3	-7.6	-3.6	-8.5
1.5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	-43.9	-0.7	-27.3	-1.3	16.2
1.5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	-36.7	-0.4	-23.1	-1.7	13.7
1.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-39.1	-1.1	-17.5	-0.2	12.2
1.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	-44.8	-1.6	-31.2	0.2	14.3
1.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-36.4	-1.3	-21.9	0.0	11.2
1.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	-46.2	-1.5	-28.9	0.1	14.8
1.5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	-38.4	-0.8	-36.5	-1.1	14.1
1.5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	-31.1	-0.5	-32.3	-1.5	11.6
1.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-33.5	-1.2	-26.7	0.0	10.1
1.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-39.2	-1.7	-40.5	0.4	12.2
1.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-30.9	-1.4	-31.2	0.1	9.1
1.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-40.6	-1.6	-38.2	0.3	12.7
1.5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	-31.2	-0.9	-18.1	-2.6	12.9
1.5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	-19.1	-0.4	-11.1	-3.2	8.7
1.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-23.1	-1.5	-1.8	-0.8	6.2
1.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-32.6	-2.3	-24.7	-0.1	9.8
1.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-18.7	-1.9	-9.2	-0.5	4.6
1.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-34.9	-2.1	-20.8	-0.3	10.6
1.5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	-28.4	-0.9	-22.8	-2.5	11.9
1.5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	-16.3	-0.4	-15.8	-3.1	7.7
1.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-20.3	-1.6	-6.4	-0.7	5.2
1.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-29.8	-2.3	-29.4	0.0	8.7
1.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-15.9	-1.9	-13.8	-0.4	3.6
1.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-32.1	-2.2	-25.5	-0.2	9.6
1.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-34.6	-1.7	-40.2	0.4	10.5
1.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-22.2	-2.4	-28.8	0.0	5.9
2	SLV	Max	2.9	4.2	3.3	7.6	2.6	6.4
2	SLV	Max	0.7	4.3	2.5	6.5	6.0	6.7
2	SLV	Min	-2.9	-7.0	-3.3	-7.6	-2.6	-6.4
2	SLV	Min	-0.7	-4.3	-2.5	-6.5	-6.0	-6.7
2	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	-42.4	-0.7	-27.3	-0.9	37.8
2	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	-0.2	-0.7	-2.1	-0.9	37.8
2	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	-35.2	-0.4	-23.1	-1.4	31.6
2	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	-0.8	-0.5	-2.6	-1.4	31.6
2	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-37.6	-1.1	-17.5	0.4	31.3
2	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-1.5	-0.3	-1.4	0.4	31.3
2	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	-43.3	-1.6	-31.2	1.0	36.3
2	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	-1.2	-0.4	-3.1	1.0	36.3
2	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-34.9	-1.3	-21.9	0.6	29.0
2	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-1.7	-0.3	-2.0	0.6	29.0
2	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	-44.7	-1.5	-28.9	0.8	37.5

2	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	-1.1	-0.4	-2.8	0.8	37.5
2	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	-36.9	-0.8	-36.5	-0.7	32.9
2	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	-0.5	-0.8	-3.1	-0.7	32.9
2	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	-29.6	-0.5	-32.3	-1.2	26.8
2	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	-1.1	-0.6	-3.7	-1.2	26.8
2	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-32.0	-1.2	-26.7	0.6	26.5
2	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-1.8	-0.4	-2.5	0.6	26.5
2	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-37.7	-1.7	-40.5	1.2	31.5
2	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-1.5	-0.6	-4.1	1.2	31.5
2	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-29.4	-1.4	-31.2	0.8	24.2
2	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-2.0	-0.4	-3.0	0.8	24.2
2	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-39.1	-1.6	-38.2	1.1	32.7
2	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-1.4	-0.5	-3.8	1.1	32.7
2	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	-29.7	-0.9	-18.1	-2.2	28.2
2	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	-0.3	-0.8	-0.7	-2.2	28.2
2	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	-17.6	-0.4	-11.1	-3.0	17.9
2	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	-1.3	-0.5	-1.5	-3.0	17.9
2	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-21.6	-1.5	-1.8	0.0	17.4
2	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-2.4	-0.2	0.5	0.0	17.4
2	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-31.1	-2.3	-24.7	1.0	25.7
2	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-1.9	-0.4	-2.2	1.0	25.7
2	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-17.2	-1.9	-9.2	0.4	13.6
2	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-2.7	-0.2	-0.4	0.4	13.6
2	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-33.4	-2.1	-20.8	0.8	27.7
2	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-1.7	-0.4	-1.8	0.8	27.7
2	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	-26.9	-0.9	-22.8	-2.0	25.7
2	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	-0.4	-0.9	-1.2	-2.0	25.7
2	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	-14.9	-0.4	-15.8	-2.9	15.5
2	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	-1.4	-0.5	-2.0	-2.9	15.5
2	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-18.8	-1.6	-6.4	0.1	14.9
2	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-2.6	-0.2	-0.1	0.1	14.9
2	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-28.3	-2.3	-29.4	1.1	23.3
2	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-2.0	-0.5	-2.8	1.1	23.3
2	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-14.4	-1.9	-13.8	0.5	11.1
2	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-2.8	-0.3	-1.0	0.5	11.1
2	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-30.6	-2.2	-25.5	0.9	25.3
2	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-1.9	-0.4	-2.3	0.9	25.3
2	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-33.1	-1.7	-40.2	1.2	27.5
2	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-1.8	-0.6	-4.1	1.2	27.5
2	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-20.7	-2.4	-28.8	1.2	16.6
2	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-2.5	-0.5	-2.7	1.2	16.6
2.5	SLV	Max	0.7	4.3	2.5	6.5	4.9	5.9
2.5	SLV	Min	-0.7	-4.3	-2.5	-6.5	-4.9	-4.5
2.5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	1.3	-0.7	-2.1	-0.6	37.5
2.5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	0.7	-0.5	-2.6	-1.2	31.7
2.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	0.0	-0.3	-1.4	0.5	31.7
2.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	0.3	-0.4	-3.1	1.2	36.5
2.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	-0.2	-0.3	-2.0	0.8	29.5
2.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	0.4	-0.4	-2.8	1.1	37.7
2.5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	1.0	-0.8	-3.1	-0.3	32.8
2.5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	0.4	-0.6	-3.7	-0.9	27.0
2.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	-0.3	-0.4	-2.5	0.8	27.0
2.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	0.0	-0.6	-4.1	1.5	31.8
2.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	-0.5	-0.4	-3.0	1.1	24.8
2.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	0.1	-0.5	-3.8	1.3	33.0
2.5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	1.2	-0.8	-0.7	-1.7	27.9
2.5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	0.2	-0.5	-1.5	-2.8	18.1
2.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-0.9	-0.2	0.5	0.1	18.2

2.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	-0.4	-0.4	-2.2	1.2	26.3
2.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	-1.2	-0.2	-0.4	0.5	14.5
2.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	-0.2	-0.4	-1.8	1.0	28.2
2.5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	1.1	-0.9	-1.2	-1.6	25.6
2.5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	0.1	-0.5	-2.0	-2.7	15.8
2.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-1.1	-0.2	-0.1	0.2	15.9
2.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-0.5	-0.5	-2.8	1.4	23.9
2.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	-1.3	-0.3	-1.0	0.7	12.2
2.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-0.4	-0.4	-2.3	1.1	25.8
2.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	-0.3	-0.6	-4.1	1.5	28.0
2.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	-1.0	-0.5	-2.7	1.4	17.4
3	SLV	Max	0.7	4.3	2.5	6.5	3.9	6.3
3	SLV	Min	-0.7	-4.3	-2.5	-6.5	-3.9	-2.4
3	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	2.8	-0.7	-2.1	-0.2	36.5
3	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	2.2	-0.5	-2.6	-1.0	31.0
3	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	1.5	-0.3	-1.4	0.6	31.3
3	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	1.8	-0.4	-3.1	1.4	36.0
3	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	1.3	-0.3	-2.0	0.9	29.2
3	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	1.9	-0.4	-2.8	1.3	37.1
3	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	2.5	-0.8	-3.1	0.1	32.0
3	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	1.9	-0.6	-3.7	-0.7	26.4
3	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	1.2	-0.4	-2.5	1.0	26.8
3	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	1.5	-0.6	-4.1	1.8	31.5
3	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	1.0	-0.4	-3.0	1.3	24.7
3	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	1.6	-0.5	-3.8	1.6	32.6
3	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	2.7	-0.8	-0.7	-1.3	26.9
3	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	1.7	-0.5	-1.5	-2.6	17.7
3	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	0.6	-0.2	0.5	0.1	18.3
3	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	1.1	-0.4	-2.2	1.5	26.1
3	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	0.3	-0.2	-0.4	0.6	14.7
3	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	1.2	-0.4	-1.8	1.2	27.9
3	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	2.6	-0.9	-1.2	-1.2	24.6
3	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	1.6	-0.5	-2.0	-2.4	15.4
3	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	0.4	-0.2	-0.1	0.3	16.0
3	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	1.0	-0.5	-2.8	1.6	23.8
3	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	0.2	-0.3	-1.0	0.8	12.5
3	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	1.1	-0.4	-2.3	1.4	25.7
3	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	1.2	-0.6	-4.1	1.8	27.7
3	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	0.5	-0.5	-2.7	1.7	17.6
3.5	SLV	Max	0.7	4.3	2.5	6.5	3.0	6.1
3.5	SLV	Min	-0.7	-4.3	-2.5	-6.5	-3.0	-1.1
3.5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	4.3	-0.7	-2.1	0.1	34.7
3.5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	3.7	-0.5	-2.6	-0.8	29.5
3.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	3.0	-0.3	-1.4	0.8	30.2
3.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	3.3	-0.4	-3.1	1.6	34.7
3.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	2.8	-0.3	-2.0	1.1	28.2
3.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	3.4	-0.4	-2.8	1.5	35.8
3.5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	4.0	-0.8	-3.1	0.5	30.4
3.5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	3.3	-0.6	-3.7	-0.4	25.1
3.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	2.7	-0.4	-2.5	1.2	25.8
3.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	3.0	-0.6	-4.1	2.0	30.3
3.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	2.5	-0.4	-3.0	1.5	23.8
3.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	3.1	-0.5	-3.8	1.9	31.4
3.5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	4.2	-0.8	-0.7	-0.9	25.2
3.5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	3.2	-0.5	-1.5	-2.3	16.4
3.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	2.1	-0.2	0.5	0.2	17.6
3.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	2.6	-0.4	-2.2	1.7	25.1
3.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	1.8	-0.2	-0.4	0.8	14.2

3.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	2.7	-0.4	-1.8	1.4	26.9
3.5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	4.1	-0.9	-1.2	-0.7	23.0
3.5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	3.1	-0.5	-2.0	-2.1	14.2
3.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	1.9	-0.2	-0.1	0.4	15.5
3.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	2.4	-0.5	-2.8	1.9	23.0
3.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	1.7	-0.3	-1.0	1.0	12.0
3.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	2.6	-0.4	-2.3	1.6	24.8
3.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	2.7	-0.6	-4.1	2.1	26.7
3.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	2.0	-0.5	-2.7	1.9	16.9
4	SLV	Max	0.7	4.3	2.5	6.5	2.8	5.3
4	SLV	Max	2.4	6.7	2.5	8.8	5.2	5.3
4	SLV	Min	-0.7	-4.3	-2.5	-6.5	-2.8	-2.0
4	SLV	Min	-2.4	-4.3	-2.5	-8.8	-5.2	-1.7
4	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	5.8	-0.7	-2.1	0.4	32.2
4	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	48.0	-0.7	23.1	0.4	32.2
4	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	5.2	-0.5	-2.6	-0.5	27.3
4	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	39.6	-0.5	17.8	-0.5	27.3
4	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	4.5	-0.3	-1.4	0.9	28.4
4	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	40.5	0.6	14.6	0.9	28.4
4	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	4.8	-0.4	-3.1	1.9	32.7
4	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	46.9	0.7	25.1	1.9	32.7
4	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	4.3	-0.3	-2.0	1.3	26.4
4	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	37.6	0.6	18.0	1.3	26.4
4	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	4.9	-0.4	-2.8	1.7	33.7
4	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	48.5	0.6	23.3	1.7	33.7
4	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	5.5	-0.8	-3.1	0.9	28.0
4	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	41.8	-0.8	30.2	0.9	28.0
4	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	4.8	-0.6	-3.7	-0.1	23.1
4	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	33.4	-0.6	25.0	-0.1	23.1
4	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	4.2	-0.4	-2.5	1.4	24.1
4	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	34.3	0.5	21.8	1.4	24.1
4	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	4.5	-0.6	-4.1	2.3	28.5
4	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	40.7	0.6	32.3	2.3	28.5
4	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	4.0	-0.4	-3.0	1.7	22.2
4	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	31.4	0.5	25.1	1.7	22.2
4	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	4.6	-0.5	-3.8	2.1	29.5
4	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	42.3	0.5	30.5	2.1	29.5
4	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	5.7	-0.8	-0.7	-0.5	22.7
4	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	35.1	-0.8	16.8	-0.5	22.7
4	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	4.7	-0.5	-1.5	-2.1	14.5
4	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	21.1	-0.5	8.1	-2.1	14.5
4	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	3.6	-0.2	0.5	0.3	16.2
4	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	22.7	1.2	2.7	0.3	16.2
4	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	4.1	-0.4	-2.2	1.9	23.5
4	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	33.3	1.4	20.2	1.9	23.5
4	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	3.3	-0.2	-0.4	0.9	12.9
4	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	17.8	1.4	8.3	0.9	12.9
4	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	4.2	-0.4	-1.8	1.6	25.2
4	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	35.9	1.4	17.3	1.6	25.2
4	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	5.6	-0.9	-1.2	-0.3	20.6
4	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	32.0	-0.9	20.4	-0.3	20.6
4	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	4.5	-0.5	-2.0	-1.9	12.3
4	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	18.0	-0.6	11.7	-1.9	12.3
4	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	3.4	-0.2	-0.1	0.5	14.1
4	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	19.6	1.2	6.3	0.5	14.1
4	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	3.9	-0.5	-2.8	2.1	21.4
4	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	30.2	1.4	23.8	2.1	21.4
4	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	3.1	-0.3	-1.0	1.1	10.8

4	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	14.7	1.3	11.9	1.1	10.8
4	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	4.1	-0.4	-2.3	1.8	23.1
4	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	32.8	1.3	20.9	1.8	23.1
4	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	4.2	-0.6	-4.1	2.3	25.0
4	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	35.6	0.6	32.0	2.3	25.0
4	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	3.5	-0.5	-2.7	2.2	15.6
4	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	21.7	1.4	23.4	2.2	15.6
4.5	SLV	Max	2.4	7.9	2.5	8.8	4.0	3.8
4.5	SLV	Min	-2.4	-4.3	-2.5	-8.8	-4.0	-3.8
4.5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	49.5	-0.7	23.1	0.8	7.9
4.5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	41.0	-0.5	17.8	-0.3	7.1
4.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	42.0	0.6	14.6	0.6	7.7
4.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	48.4	0.7	25.1	1.5	8.9
4.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	39.1	0.6	18.0	0.9	7.2
4.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	49.9	0.6	23.3	1.4	9.1
4.5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	43.3	-0.8	30.2	1.3	6.7
4.5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	34.8	-0.6	25.0	0.2	6.0
4.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	35.8	0.5	21.8	1.1	6.6
4.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	42.2	0.6	32.3	2.0	7.7
4.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	32.9	0.5	25.1	1.5	6.1
4.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	43.7	0.5	30.5	1.9	8.0
4.5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	36.6	-0.8	16.8	-0.1	4.7
4.5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	22.6	-0.5	8.1	-1.9	3.5
4.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	24.2	1.2	2.7	-0.3	4.5
4.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	34.8	1.4	20.2	1.2	6.4
4.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	19.3	1.4	8.3	0.2	3.6
4.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	37.4	1.4	17.3	0.9	6.9
4.5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	33.5	-0.9	20.4	0.2	4.2
4.5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	19.5	-0.6	11.7	-1.6	3.0
4.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	21.1	1.2	6.3	-0.1	4.0
4.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	31.7	1.4	23.8	1.4	5.9
4.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	16.2	1.3	11.9	0.5	3.1
4.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	34.3	1.3	20.9	1.2	6.3
4.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	37.1	0.6	32.0	2.0	6.8
4.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	23.2	1.4	23.4	1.4	4.3
5	SLV	Max	2.4	9.0	2.5	8.8	2.9	6.0
5	SLV	Min	-2.4	-4.3	-2.5	-8.8	-2.9	-6.0
5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	51.0	-0.7	23.1	1.1	-17.3
5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	42.5	-0.5	17.8	-0.1	-13.8
5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	43.5	0.6	14.6	0.3	-13.7
5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	49.9	0.7	25.1	1.2	-15.7
5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	40.6	0.6	18.0	0.6	-12.7
5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	51.4	0.6	23.3	1.0	-16.2
5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	44.8	-0.8	30.2	1.7	-15.3
5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	36.3	-0.6	25.0	0.5	-11.8
5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	37.3	0.5	21.8	0.9	-11.7
5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	43.7	0.6	32.3	1.8	-13.7
5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	34.4	0.5	25.1	1.2	-10.7
5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	45.2	0.5	30.5	1.6	-14.2
5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	38.1	-0.8	16.8	0.3	-13.9
5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	24.1	-0.5	8.1	-1.6	-8.1
5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	25.7	1.2	2.7	-0.9	-8.0
5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	36.3	1.4	20.2	0.5	-11.4
5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	20.8	1.4	8.3	-0.5	-6.4
5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	38.9	1.4	17.3	0.2	-12.2
5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	35.0	-0.9	20.4	0.6	-12.9
5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	21.0	-0.6	11.7	-1.3	-7.1
5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	22.6	1.2	6.3	-0.7	-7.0

5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	33.2	1.4	23.8	0.7	-10.4
5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	17.7	1.3	11.9	-0.2	-5.4
5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	35.8	1.3	20.9	0.5	-11.2
5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	38.6	0.6	32.0	1.7	-12.1
5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	24.7	1.4	23.4	0.7	-7.6
5.5	SLV	Max	2.4	10.2	2.5	8.8	1.9	8.1
5.5	SLV	Min	-2.4	-4.3	-2.5	-8.8	-1.9	-8.1
5.5	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	52.5	-0.7	23.1	1.4	-43.1
5.5	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	44.0	-0.5	17.8	0.2	-35.4
5.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	45.0	0.6	14.6	0.1	-35.8
5.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	51.4	0.7	25.1	0.9	-41.0
5.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	42.1	0.6	18.0	0.3	-33.4
5.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	52.9	0.6	23.3	0.7	-42.3
5.5	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	46.3	-0.8	30.2	2.1	-38.0
5.5	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	37.8	-0.6	25.0	0.8	-30.3
5.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	38.8	0.5	21.8	0.7	-30.7
5.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	45.2	0.6	32.3	1.5	-36.0
5.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	35.9	0.5	25.1	0.9	-28.3
5.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	46.7	0.5	30.5	1.4	-37.2
5.5	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	39.6	-0.8	16.8	0.7	-33.4
5.5	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	25.5	-0.5	8.1	-1.3	-20.5
5.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	27.2	1.2	2.7	-1.6	-21.2
5.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	37.8	1.4	20.2	-0.3	-29.9
5.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	22.3	1.4	8.3	-1.2	-17.2
5.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	40.4	1.4	17.3	-0.5	-32.0
5.5	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	36.5	-0.9	20.4	1.0	-30.8
5.5	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	22.4	-0.6	11.7	-1.0	-18.0
5.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	24.1	1.2	6.3	-1.3	-18.6
5.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	34.7	1.4	23.8	0.1	-27.3
5.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	19.2	1.3	11.9	-0.9	-14.6
5.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	37.3	1.3	20.9	-0.1	-29.5
5.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.5	40.1	0.6	32.0	1.4	-31.7
5.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.2	26.2	1.4	23.4	0.0	-20.3
6	SLV	Max	2.4	11.3	2.5	8.8	2.1	10.3
6	SLV	Min	-2.4	-4.3	-2.5	-8.8	-2.1	-12.8
6	SLU-Q1_1*S-1+0.6*Wx-1		-3.7	54.0	-0.7	23.1	1.8	-69.7
6	SLU-Q2_1*S-1+0.6*Wx-2		-3.6	45.5	-0.5	17.8	0.4	-57.8
6	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	46.5	0.6	14.6	-0.2	-58.7
6	SLU-Q4_1*S-1+0.6*Wy-2		-0.8	52.9	0.7	25.1	0.5	-67.1
6	SLU-Q5_1*S-1+0.6*Wy-3		-0.5	43.6	0.6	18.0	0.0	-54.8
6	SLU-Q6_1*S-1+0.6*Wy-4		-0.8	54.4	0.6	23.3	0.4	-69.1
6	SLU-Q7_1*S-2+0.6*Wx-1		-3.6	47.8	-0.8	30.2	2.5	-61.6
6	SLU-Q8_1*S-2+0.6*Wx-2		-3.4	39.3	-0.6	25.0	1.1	-49.6
6	SLU-Q9_1*S-2+0.6*Wy-1		-0.5	40.3	0.5	21.8	0.5	-50.5
6	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	46.7	0.6	32.3	1.2	-58.9
6	SLU-Q11_1*S-2+0.6*Wy-3		-0.4	37.4	0.5	25.1	0.7	-46.6
6	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	48.2	0.5	30.5	1.1	-61.0
6	SLU-Q13_0.5*S-1+1*Wx-1		-5.4	41.1	-0.8	16.8	1.1	-53.6
6	SLU-Q14_0.5*S-1+1*Wx-2		-5.1	27.0	-0.5	8.1	-1.1	-33.6
6	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	28.7	1.2	2.7	-2.2	-35.1
6	SLU-Q16_0.5*S-1+1*Wy-2		-0.5	39.3	1.4	20.2	-1.0	-49.2
6	SLU-Q17_0.5*S-1+1*Wy-3		-0.1	23.8	1.4	8.3	-1.9	-28.7
6	SLU-Q18_0.5*S-1+1*Wy-4		-0.5	41.9	1.4	17.3	-1.1	-52.6
6	SLU-Q19_0.5*S-2+1*Wx-1		-5.3	38.0	-0.9	20.4	1.5	-49.5
6	SLU-Q20_0.5*S-2+1*Wx-2		-5.1	23.9	-0.6	11.7	-0.7	-29.6
6	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	25.6	1.2	6.3	-1.9	-31.0
6	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	36.2	1.4	23.8	-0.6	-45.1
6	SLU-Q23_0.5*S-2+1*Wy-3		-0.1	20.7	1.3	11.9	-1.5	-24.6

6	SLU-Q24_0.5*S-2+1*Wy-4	-0.4	38.8	1.3	20.9	-0.8	-48.5
6	SLU-Q25_1*S-2+0.6*Wy-5	-0.5	41.6	0.6	32.0	1.1	-52.2
6	SLU-Q26_0.5*S-2+1*Wy-5	-0.2	27.7	1.4	23.4	-0.7	-33.8

8.2.2.2 Verifiche

Si riportano le verifiche effettuate tramite un foglio Excel autoprodotto per le azioni che comportano il tasso di lavoro più alto.

Dimensioni e materiale			
Base esterna	b	340	mm
Altezza esterna	h	363	mm
Spessore pareti	sp	20	mm
Tensione di snervamento caratteristica	fyk	355	Mpa
Tensione di snervamento di calcolo	fyd	338.1	Mpa
Azioni agenti			
Azione assiale	N	5.39	kN
Taglio - asse debole	V2	54.43	kN
Taglio - asse forte	V3	3.27	kN
Azione torcente	T	40.49	kNm
Momento - asse debole	M2	7.90	kNm
Momento - asse forte	M3	69.75	kNm
Verifica a torsione			*EN1993-1-1 §6.2.7(1)*
Area racchiusa da linea media	Ω	109760	mm²
Tensione tangenziale di calcolo	τt,Ed	184.4	Mpa
Tensione tangenziale resistente	τt,Rd	195.2	Mpa
Momento torcente di calcolo	Mt,Ed	40.49	kNm
Momento torcente resistente	Mt,Rd	42.9	kNm
Tasso di lavoro	w.r.	94%	
Verifica a taglio ridotto			*EN1993-1-1 §6.2.7(9)*
Azione da taglio	Ved	54.43	kN
Taglio resistente	Vpl,Rd	2834.3	kN
Taglio resistente ridotto per torsione	Vpl,T,Rd	156.1	kN
Tasso di lavoro	w.r.	35%	
Verifica a flessione			*EN1993-1-1 §6.2.8*
Azione da taglio	Ved	54.43	kN
Limite taglio resistente senza riduzioni a momento	0.5*Vpl,T,Rd	78.1	kN
Nessuna interazione taglio-momento	Ved	<	0.5*Vpl,T,Rd
Fattore di interazione taglio-momento	ρ	0.000	
Tensione di snervamento caratteristica a flessione	(1-ρ) fyk	355.0	Mpa
Tensione di snervamento di calcolo a flessione	(1-ρ) fyd	338.1	MPa
Momento di inerzia	I	5.128E+08	mm4

Modulo di resistenza elastico	w.el	2825275.4	mm3
Momento di calcolo	Med	69.75	kNm
Momento resistente	Mrd	955.21	kNm
Tasso di lavoro	w.r.	7%	

8.2.3 Colonna

La colonna ha sezione HEA360, con uno schema a pendolo inverso incastrata alla base ed una luce di calcolo di 4.347 m.

8.2.3.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 3 stazioni: all'inizio, in mezzeria ed alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	2.4	7.2	7.5	0.0	16.5	35.7
0	SLV	Min	-32.4	-7.2	-7.5	0.0	-16.5	-35.7
0	SLU-Q1_1*S-1+0.6*Wx-1		-153.9	-0.6	-2.9	0.0	-4.9	69.9
0	SLU-Q2_1*S-1+0.6*Wx-2		-128.6	-0.4	-2.9	0.0	-5.1	59.2
0	SLU-Q3_1*S-1+0.6*Wy-1		-134.2	3.8	-0.2	0.0	-0.3	59.8
0	SLU-Q4_1*S-1+0.6*Wy-2		-152.7	4.4	-0.2	0.0	-0.3	97.4
0	SLU-Q5_1*S-1+0.6*Wy-3		-125.7	4.1	-0.2	0.0	-0.2	72.4
0	SLU-Q6_1*S-1+0.6*Wy-4		-157.1	4.2	-0.2	0.0	-0.3	90.7
0	SLU-Q7_1*S-2+0.6*Wx-1		-135.9	-0.7	-2.8	0.0	-4.9	93.1
0	SLU-Q8_1*S-2+0.6*Wx-2		-110.7	-0.5	-2.9	0.0	-5.0	82.3
0	SLU-Q9_1*S-2+0.6*Wy-1		-116.2	3.7	-0.1	0.0	-0.2	82.9
0	SLU-Q10_1*S-2+0.6*Wy-2		-134.7	4.3	-0.2	0.0	-0.3	120.5
0	SLU-Q11_1*S-2+0.6*Wy-3		-107.8	4.0	-0.1	0.0	-0.2	95.6
0	SLU-Q12_1*S-2+0.6*Wy-4		-139.2	4.1	-0.2	0.0	-0.3	113.9
0	SLU-Q13_0.5*S-1+1*Wx-1		-115.3	-0.7	-4.6	0.0	-7.9	47.3
0	SLU-Q14_0.5*S-1+1*Wx-2		-73.3	-0.3	-4.7	0.0	-8.1	29.4
0	SLU-Q15_0.5*S-1+1*Wy-1		-82.5	6.6	-0.1	0.0	-0.1	30.4
0	SLU-Q16_0.5*S-1+1*Wy-2		-113.3	7.7	-0.1	0.0	-0.2	93.1
0	SLU-Q17_0.5*S-1+1*Wy-3		-68.4	7.2	0.0	0.0	-0.1	51.5
0	SLU-Q18_0.5*S-1+1*Wy-4		-120.7	7.4	-0.1	0.0	-0.2	82.0
0	SLU-Q19_0.5*S-2+1*Wx-1		-106.3	-0.8	-4.5	0.0	-7.9	58.9
0	SLU-Q20_0.5*S-2+1*Wx-2		-64.3	-0.4	-4.7	0.0	-8.1	40.9
0	SLU-Q21_0.5*S-2+1*Wy-1		-73.5	6.5	-0.1	0.0	-0.1	42.0
0	SLU-Q22_0.5*S-2+1*Wy-2		-104.3	7.6	-0.1	0.0	-0.2	104.7
0	SLU-Q23_0.5*S-2+1*Wy-3		-59.4	7.1	0.0	0.0	-0.1	63.1
0	SLU-Q24_0.5*S-2+1*Wy-4		-111.7	7.3	-0.1	0.0	-0.2	93.5
0	SLU-Q25_1*S-2+0.6*Wy-5		-119.8	4.4	-0.1	0.0	-0.2	120.2
0	SLU-Q26_0.5*S-2+1*Wy-5		-79.6	7.8	-0.1	0.0	-0.1	104.1
2.1735	SLV	Max	2.4	7.2	7.5	0.0	0.2	22.1
2.1735	SLV	Min	-29.9	-7.2	-7.5	0.0	-0.2	-22.1
2.1735	SLU-Q1_1*S-1+0.6*Wx-1		-150.6	-0.6	-2.0	0.0	0.4	71.3
2.1735	SLU-Q2_1*S-1+0.6*Wx-2		-125.4	-0.4	-2.1	0.0	0.4	60.0
2.1735	SLU-Q3_1*S-1+0.6*Wy-1		-130.9	3.0	-0.2	0.0	0.1	52.4
2.1735	SLU-Q4_1*S-1+0.6*Wy-2		-149.4	3.7	-0.2	0.0	0.1	88.6
2.1735	SLU-Q5_1*S-1+0.6*Wy-3		-122.4	3.4	-0.2	0.0	0.1	64.3
2.1735	SLU-Q6_1*S-1+0.6*Wy-4		-153.8	3.5	-0.2	0.0	0.1	82.3

2.1735	SLU-Q7_1*S-2+0.6*Wx-1		-132.6	-0.7	-2.0	0.0	0.3	94.7
2.1735	SLU-Q8_1*S-2+0.6*Wx-2		-107.4	-0.5	-2.1	0.0	0.4	83.4
2.1735	SLU-Q9_1*S-2+0.6*Wy-1		-113.0	2.9	-0.1	0.0	0.1	75.8
2.1735	SLU-Q10_1*S-2+0.6*Wy-2		-131.4	3.6	-0.2	0.0	0.1	112.0
2.1735	SLU-Q11_1*S-2+0.6*Wy-3		-104.5	3.2	-0.1	0.0	0.1	87.7
2.1735	SLU-Q12_1*S-2+0.6*Wy-4		-135.9	3.4	-0.2	0.0	0.1	105.7
2.1735	SLU-Q13_0.5*S-1+1*Wx-1		-112.0	-0.7	-3.2	0.0	0.5	48.9
2.1735	SLU-Q14_0.5*S-1+1*Wx-2		-70.0	-0.3	-3.3	0.0	0.5	30.1
2.1735	SLU-Q15_0.5*S-1+1*Wy-1		-79.2	5.3	-0.1	0.0	0.0	17.5
2.1735	SLU-Q16_0.5*S-1+1*Wy-2		-110.0	6.4	-0.1	0.0	0.1	77.8
2.1735	SLU-Q17_0.5*S-1+1*Wy-3		-65.1	5.9	0.0	0.0	0.0	37.3
2.1735	SLU-Q18_0.5*S-1+1*Wy-4		-117.5	6.1	-0.1	0.0	0.1	67.3
2.1735	SLU-Q19_0.5*S-2+1*Wx-1		-103.1	-0.8	-3.2	0.0	0.5	60.6
2.1735	SLU-Q20_0.5*S-2+1*Wx-2		-61.0	-0.4	-3.3	0.0	0.5	41.8
2.1735	SLU-Q21_0.5*S-2+1*Wy-1		-70.3	5.3	-0.1	0.0	0.0	29.2
2.1735	SLU-Q22_0.5*S-2+1*Wy-2		-101.0	6.4	-0.1	0.0	0.1	89.5
2.1735	SLU-Q23_0.5*S-2+1*Wy-3		-56.1	5.8	0.0	0.0	0.0	49.0
2.1735	SLU-Q24_0.5*S-2+1*Wy-4		-108.5	6.1	-0.1	0.0	0.1	79.0
2.1735	SLU-Q25_1*S-2+0.6*Wy-5		-116.6	3.7	-0.1	0.0	0.1	111.4
2.1735	SLU-Q26_0.5*S-2+1*Wy-5		-76.3	6.6	-0.1	0.0	0.0	88.5
4.347	SLV	Max	2.4	7.2	7.5	0.0	16.1	13.9
4.347	SLV	Min	-27.4	-7.2	-7.5	0.0	-16.1	-13.9
4.347	SLU-Q1_1*S-1+0.6*Wx-1		-147.3	-0.6	-1.2	0.0	3.9	72.7
4.347	SLU-Q2_1*S-1+0.6*Wx-2		-122.1	-0.4	-1.3	0.0	4.1	60.8
4.347	SLU-Q3_1*S-1+0.6*Wy-1		-127.6	2.2	-0.2	0.0	0.5	46.7
4.347	SLU-Q4_1*S-1+0.6*Wy-2		-146.1	2.9	-0.2	0.0	0.6	81.5
4.347	SLU-Q5_1*S-1+0.6*Wy-3		-119.2	2.6	-0.2	0.0	0.4	57.9
4.347	SLU-Q6_1*S-1+0.6*Wy-4		-150.6	2.7	-0.2	0.0	0.6	75.6
4.347	SLU-Q7_1*S-2+0.6*Wx-1		-129.4	-0.7	-1.2	0.0	3.8	96.3
4.347	SLU-Q8_1*S-2+0.6*Wx-2		-104.2	-0.5	-1.2	0.0	4.0	84.4
4.347	SLU-Q9_1*S-2+0.6*Wy-1		-109.7	2.1	-0.1	0.0	0.4	70.4
4.347	SLU-Q10_1*S-2+0.6*Wy-2		-128.2	2.8	-0.2	0.0	0.5	105.1
4.347	SLU-Q11_1*S-2+0.6*Wy-3		-101.2	2.5	-0.1	0.0	0.3	81.5
4.347	SLU-Q12_1*S-2+0.6*Wy-4		-132.6	2.6	-0.2	0.0	0.5	99.2
4.347	SLU-Q13_0.5*S-1+1*Wx-1		-108.8	-0.7	-1.8	0.0	5.9	50.6
4.347	SLU-Q14_0.5*S-1+1*Wx-2		-66.7	-0.3	-1.9	0.0	6.2	30.8
4.347	SLU-Q15_0.5*S-1+1*Wy-1		-76.0	4.0	-0.1	0.0	0.2	7.3
4.347	SLU-Q16_0.5*S-1+1*Wy-2		-106.8	5.1	-0.1	0.0	0.4	65.2
4.347	SLU-Q17_0.5*S-1+1*Wy-3		-61.9	4.6	0.0	0.0	0.1	25.9
4.347	SLU-Q18_0.5*S-1+1*Wy-4		-114.2	4.8	-0.1	0.0	0.4	55.4
4.347	SLU-Q19_0.5*S-2+1*Wx-1		-99.8	-0.8	-1.8	0.0	5.9	62.4
4.347	SLU-Q20_0.5*S-2+1*Wx-2		-57.8	-0.4	-1.9	0.0	6.2	42.6
4.347	SLU-Q21_0.5*S-2+1*Wy-1		-67.0	4.0	-0.1	0.0	0.1	19.1
4.347	SLU-Q22_0.5*S-2+1*Wy-2		-97.8	5.1	-0.1	0.0	0.3	77.0
4.347	SLU-Q23_0.5*S-2+1*Wy-3		-52.9	4.6	0.0	0.0	0.1	37.7
4.347	SLU-Q24_0.5*S-2+1*Wy-4		-105.2	4.8	-0.1	0.0	0.4	67.2
4.347	SLU-Q25_1*S-2+0.6*Wy-5		-113.3	2.9	-0.1	0.0	0.4	104.2
4.347	SLU-Q26_0.5*S-2+1*Wy-5		-73.0	5.3	-0.1	0.0	0.2	75.6

8.2.3.2 Verifiche

Si riportano le verifiche effettuate tramite un foglio Excel autoprodotto per le azioni che comportano il tasso di lavoro più alto.

LUNGHEZZA ELEMENTO

L	4.347 m	4 347 mm
AZIONI		
Ved_y	7.69 kN	7 690 N
Ved_z	7.49 kN	7 490 N
Ned (compressione)	157.11 kN	157 110 N
Ned (trazione)		0 N
Med_y	120.54 kNm	120 540 000 Nmm
Med_z	16.49 kNm	16 490 000 Nmm

Verifica a Taglio		
Avz	4 896	mm2
Ved	7 690	N
0,5*Vpl,rd	477 848	N
w.r.	0.0161	
A.fl	8 446	mm2
Ved_z	7 490	N
0,5*Vpl,rd	824 288	N
w.r.	0.0091	

Profilo		
HE		
Laminate ad I	HE 360 A	Bending
Classe	2	Bending355
g	112	kg/m
A	14 280	mm2
I_y	330 900 000	mm4
$W_{el.y}$	1 891 000	mm3
$W_{pl.y}$	2 088 000	mm3
i_y	152	mm
A_{vz}	4 896	mm2
I_z	78 870 000	mm4
$W_{el.z}$	525 800	mm3
$W_{pl.z}$	802 300	mm3
i_z	74	mm
I_t	1.49E+06	mm4
I_w	2.18E+12	mm6
h/b	1.17	
tf	18	

Centrod i taglio		
ym	0	mm
zm	0	mm

Eulero		
	y	
β_y	2	
L0_y	8694.00	mm
Ncr_y	9073535	N
	z	
β_z	2	
L0_z	8694.00	mm
Ncr_z	2162677	N

h/b	1.17	
tf	18	
caso_curv	caso3	

y		
C.d.Inst._y	b	
α_y	0.34	
λ_y	0.7475	
ϕ_y	0.8724	
χ_y	0.75624	
Nd_y	157 110.00	N
Nb,rd_y	3 651 146	N
Ef_rate_y	0.0430303	

z		
C.d.Inst._z	c	
α_z	0.49	
	z	
λ_z	1.5310	
ϕ_z	1.9981	
χ_z	0.30469	
Nd_z	157 110.00	N
Nb,rd_z	1 471 036	N
Ef_rate_z	0.1068023	

RESUME'		
Ef_rate	0.0430303	y
	0.1068023	z

Eulero	0.1068023	z
Nd_y	157110.00	N
Ncr_y	9.07E+06	N
χ_y	0.75624	
ϕ_y	0.87242	
λ_y	0.747	
Nd_z	157110.00	N
Ncr_z	2.16E+06	N
χ_z	0.30469	
ϕ_z	1.99812	
λ_z	1.531	
Nrk	5069400	N

Latero-Torsionale		
Mpl_y,Rd	7.06E+08	Nmm
Mpl_z,Rd	2.71E+08	Nmm

h/b	1.17
Sezioni	Laminate ad I
caso_curv	caso1
curva	b
αLT	0.34

y		
β_LT	2	
L,y	8694	mm
Mcr,max_y	6.24E+08	Nmm
λLT,0	1.0374	\
w	0.7047655	
A	1.12	**
B	1.3005586	**
Cm	1.161213	**
Mcr,y	5.37E+08	Nmm
λLT	1.1180	
ϕLT	1.2809579	
χLT	0.5245791	

Eulero + Latero-Torsionale				
Appendice A1 EC3-1-1				
Ned	157110 N		HP Ned << N_TF	

Med_y	1.21E+08	Nmm
Med_z	1.65E+07	Nmm
Nrk	5069400	N
My,rk	6.71E+08	Nmm
Mz,rk	1.87E+08	Nmm
Limite	elastico	

Cmy	1.000153	
Cmz	1.002179	
CmLT	1.047279	

kc	0.94	table 6,6
Ci	1.131734	
λLT,0	1.0374	
? λLT,0 <	2.07E-01	no
Cm_y0	1.00052	
Cm_z0	1.00218	

	si	no
Cmy	1.00052	1.000153
Cmz	1.00218	1.00218
CmLT	1	1.047279

λmax	1.531
εy	5.794
μy	9.96E-01
μz	9.48E-01
wy	1.104178
wz	1.5
npl	0.032541
aLT	0.995503
bLT	0.01
cLT	0.33
dLT	0.01
eLT	0.10
Cyy	0.986634
Cyz	0.795844
Czy	0.938219
Czz	0.963333

classe_sez	3	4	1	2
kyy	1.06134	1.06134	1.07571	1.07571
kyz	1.07607	1.07607	0.94556	0.94556
kzy	1.01084	1.01084	0.55463	0.55463
kzz	1.02486	1.02486	1.06387	1.06387

classe_sez	2
kyy	1.075715
kyz	0.945558
kzy	0.554628
kzz	1.063873

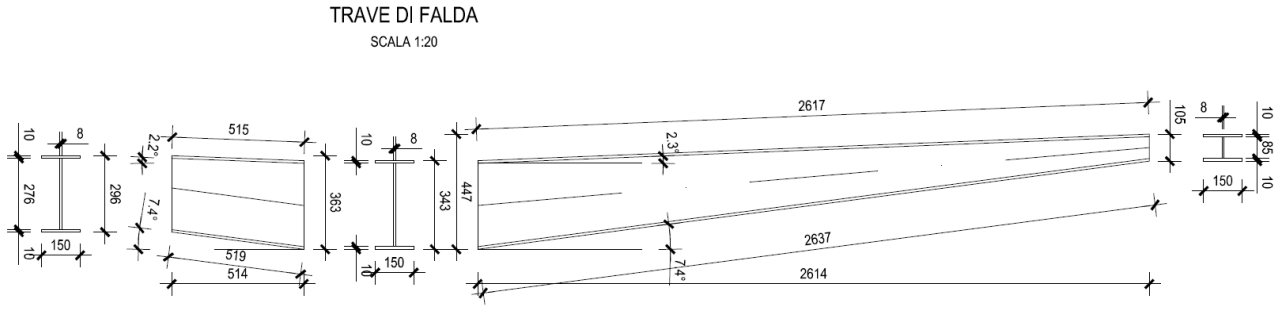
Verifica

	N	My	Mz	
Eulero y	0.04303	0.39	0.09	1
	0.5174			
Eulero z	0.106802	0.20	0.10	
	0.4048			

8.3 TIPO 2

8.3.1 Travi a sbalzo

La trave a sbalzo è una trave rastremata su luci di calcolo di 2.8 m e 0.7 m avente le sezioni di estremità riportate di seguito.



8.3.1.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 3 stazioni: all'inizio, in mezzeria ed alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	0.3	0.5	0.5	0.0	1.5	1.5
0	SLV	Min	-0.3	-1.1	-0.5	0.0	-1.5	-2.2
0	SLU-Q1_1*S-1+0.6*Wx-1		-1.1	-16.4	0.0	0.0	0.0	-23.9
0	SLU-Q2_1*S-1+0.6*Wx-2		-1.1	-13.2	0.0	0.0	0.0	-19.3
0	SLU-Q3_1*S-1+0.6*Wy-1		-1.1	-12.8	0.0	0.0	0.0	-18.7
0	SLU-Q4_1*S-1+0.6*Wy-2		-1.1	-17.0	0.0	0.0	0.0	-24.6
0	SLU-Q5_1*S-1+0.6*Wy-3		-1.1	-12.8	0.0	0.0	0.0	-18.7
0	SLU-Q6_1*S-1+0.6*Wy-4		-1.1	-17.0	0.0	0.0	0.0	-24.6
0	SLU-Q7_1*S-2+0.6*Wx-1		-1.1	-16.4	0.0	0.0	0.0	-23.9
0	SLU-Q8_1*S-2+0.6*Wx-2		-1.1	-13.2	0.0	0.0	0.0	-19.3
0	SLU-Q9_1*S-2+0.6*Wy-1		-1.1	-12.8	0.0	0.0	0.0	-18.7
0	SLU-Q10_1*S-2+0.6*Wy-2		-1.1	-17.0	0.0	0.0	0.0	-24.6
0	SLU-Q11_1*S-2+0.6*Wy-3		-1.1	-12.8	0.0	0.0	0.0	-18.7
0	SLU-Q12_1*S-2+0.6*Wy-4		-1.1	-17.0	0.0	0.0	0.0	-24.6
0	SLU-Q13_0.5*S-1+1*Wx-1		-0.7	-11.2	0.0	0.0	0.0	-16.5
0	SLU-Q14_0.5*S-1+1*Wx-2		-0.7	-5.8	0.0	0.0	0.0	-8.9
0	SLU-Q15_0.5*S-1+1*Wy-1		-0.7	-5.0	0.0	0.0	0.0	-7.8
0	SLU-Q16_0.5*S-1+1*Wy-2		-0.7	-12.1	0.0	0.0	0.0	-17.8
0	SLU-Q17_0.5*S-1+1*Wy-3		-0.7	-5.0	0.0	0.0	0.0	-7.8
0	SLU-Q18_0.5*S-1+1*Wy-4		-0.7	-12.1	0.0	0.0	0.0	-17.8
0	SLU-Q19_0.5*S-2+1*Wx-1		-0.7	-11.2	0.0	0.0	0.0	-16.5
0	SLU-Q20_0.5*S-2+1*Wx-2		-0.7	-5.8	0.0	0.0	0.0	-8.9
0	SLU-Q21_0.5*S-2+1*Wy-1		-0.7	-5.0	0.0	0.0	0.0	-7.8
0	SLU-Q22_0.5*S-2+1*Wy-2		-0.7	-12.1	0.0	0.0	0.0	-17.8
0	SLU-Q23_0.5*S-2+1*Wy-3		-0.7	-5.0	0.0	0.0	0.0	-7.8
0	SLU-Q24_0.5*S-2+1*Wy-4		-0.7	-12.1	0.0	0.0	0.0	-17.8
0	SLU-Q26_0.5*S-2+1*Wy-5		-0.7	-9.7	0.0	0.0	0.0	-14.3
0	SLU-Q25_1*S-2+0.6*Wy-5		-1.1	-15.5	0.0	0.0	0.0	-22.6
1.40382	SLV	Max	0.3	0.5	0.5	0.0	0.7	0.7
1.40382	SLV	Min	-0.3	-0.8	-0.5	0.0	-0.7	-0.9
1.40382	SLU-Q1_1*S-1+0.6*Wx-1		-0.6	-8.5	0.0	0.0	0.0	-6.4

1.40382	SLU-Q2_1*S-1+0.6*Wx-2		-0.6	-6.9	0.0	0.0	0.0	-5.2
1.40382	SLU-Q3_1*S-1+0.6*Wy-1		-0.6	-6.6	0.0	0.0	0.0	-5.1
1.40382	SLU-Q4_1*S-1+0.6*Wy-2		-0.6	-8.7	0.0	0.0	0.0	-6.6
1.40382	SLU-Q5_1*S-1+0.6*Wy-3		-0.6	-6.6	0.0	0.0	0.0	-5.1
1.40382	SLU-Q6_1*S-1+0.6*Wy-4		-0.6	-8.7	0.0	0.0	0.0	-6.6
1.40382	SLU-Q7_1*S-2+0.6*Wx-1		-0.6	-8.5	0.0	0.0	0.0	-6.4
1.40382	SLU-Q8_1*S-2+0.6*Wx-2		-0.6	-6.9	0.0	0.0	0.0	-5.2
1.40382	SLU-Q9_1*S-2+0.6*Wy-1		-0.6	-6.6	0.0	0.0	0.0	-5.1
1.40382	SLU-Q10_1*S-2+0.6*Wy-2		-0.6	-8.7	0.0	0.0	0.0	-6.6
1.40382	SLU-Q11_1*S-2+0.6*Wy-3		-0.6	-6.6	0.0	0.0	0.0	-5.1
1.40382	SLU-Q12_1*S-2+0.6*Wy-4		-0.6	-8.7	0.0	0.0	0.0	-6.6
1.40382	SLU-Q13_0.5*S-1+1*Wx-1		-0.4	-5.8	0.0	0.0	0.0	-4.5
1.40382	SLU-Q14_0.5*S-1+1*Wx-2		-0.4	-3.1	0.0	0.0	0.0	-2.6
1.40382	SLU-Q15_0.5*S-1+1*Wy-1		-0.4	-2.8	0.0	0.0	0.0	-2.4
1.40382	SLU-Q16_0.5*S-1+1*Wy-2		-0.4	-6.3	0.0	0.0	0.0	-4.9
1.40382	SLU-Q17_0.5*S-1+1*Wy-3		-0.4	-2.8	0.0	0.0	0.0	-2.4
1.40382	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-6.3	0.0	0.0	0.0	-4.9
1.40382	SLU-Q19_0.5*S-2+1*Wx-1		-0.4	-5.8	0.0	0.0	0.0	-4.5
1.40382	SLU-Q20_0.5*S-2+1*Wx-2		-0.4	-3.1	0.0	0.0	0.0	-2.6
1.40382	SLU-Q21_0.5*S-2+1*Wy-1		-0.4	-2.8	0.0	0.0	0.0	-2.4
1.40382	SLU-Q22_0.5*S-2+1*Wy-2		-0.4	-6.3	0.0	0.0	0.0	-4.9
1.40382	SLU-Q23_0.5*S-2+1*Wy-3		-0.4	-2.8	0.0	0.0	0.0	-2.4
1.40382	SLU-Q24_0.5*S-2+1*Wy-4		-0.4	-6.3	0.0	0.0	0.0	-4.9
1.40382	SLU-Q26_0.5*S-2+1*Wy-5		-0.4	-5.1	0.0	0.0	0.0	-4.0
1.40382	SLU-Q25_1*S-2+0.6*Wy-5		-0.6	-8.0	0.0	0.0	0.0	-6.1
2.80764	SLV	Max	0.3	0.5	0.5	0.0	0.0	0.0
2.80764	SLV	Min	-0.3	-0.5	-0.5	0.0	0.0	0.0
2.80764	SLU-Q1_1*S-1+0.6*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q2_1*S-1+0.6*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q3_1*S-1+0.6*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q4_1*S-1+0.6*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q5_1*S-1+0.6*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q6_1*S-1+0.6*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q7_1*S-2+0.6*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q8_1*S-2+0.6*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q9_1*S-2+0.6*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q10_1*S-2+0.6*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q11_1*S-2+0.6*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q12_1*S-2+0.6*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q13_0.5*S-1+1*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q14_0.5*S-1+1*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q15_0.5*S-1+1*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q16_0.5*S-1+1*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q17_0.5*S-1+1*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q18_0.5*S-1+1*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q19_0.5*S-2+1*Wx-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q20_0.5*S-2+1*Wx-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q21_0.5*S-2+1*Wy-1		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q22_0.5*S-2+1*Wy-2		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q23_0.5*S-2+1*Wy-3		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q24_0.5*S-2+1*Wy-4		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q26_0.5*S-2+1*Wy-5		0.0	-0.6	0.0	0.0	0.0	0.0
2.80764	SLU-Q25_1*S-2+0.6*Wy-5		0.0	-0.6	0.0	0.0	0.0	0.0

8.3.1.2 Verifiche

Verifiche SLU

Si riportano le verifiche effettuate tramite il software di calcolo SAP2000 per la combinazione che comporta il tasso di lavoro più alto.

EUROCODE 3-1993 STEEL SECTION CHECK
Combo : SLU-Q10_1*S-2+0.6*Wy-2
Units : KN, m, C

Frame	: 39	Design Sect:	B_343-105x150		
X Mid	: 12.000	Design Type:	Brace		
Y Mid	: 1.400	Frame Type :	Moment Resisting Frame		
Z Mid	: 4.380	Sect Class :	Class 2		
Length	: 2.808	Major Axis :	0.000 degrees counterclockwise from local 3		
Loc	: 0.000	RLLF :	1.000		
Area	: 0.006	SMajor :	6.161E-04	rMajor :	0.138
IMajor	: 1.057E-04	SMinor :	7.518E-05	rMinor :	0.032
IMinor	: 5.639E-06	ZMajor :	7.082E-04	E :	210000000.00
Ixy	: 0.000	ZMinor :	1.177E-04	Fy :	355000.000

AVMajor: 0.003
AVMinor: 0.003

STRESS CHECK FORCES & MOMENTS

Location	P	M33	M22	V2	V3	T
0.000	-1.148	-24.631	0.000	-17.000	0.000	0.000

PMM DEMAND/CAPACITY RATIO

Governing Equation	Total Ratio		P Ratio		MMajor Ratio		MMinor Ratio	Ratio Limit	Status Check
(5.5.4)	0.847	=	0.014	+	0.832	+	0.000	1.000	OK

AXIAL FORCE DESIGN

	Fc or Ft Force	Nc.Rd Capacity	Nt.Rd Capacity	Nb33.Rd Major	Nb22.Rd Minor
Axial	-1.148	79.804	1887.924	1046.405	79.804

MOMENT DESIGN

	M.Sd Moment	Mc.Rd Capacity	Mv.Rd Capacity	Mb.Rd Capacity
Major Moment	-24.631	239.425	239.425	29.341
Minor Moment	0.000	39.783	39.783	

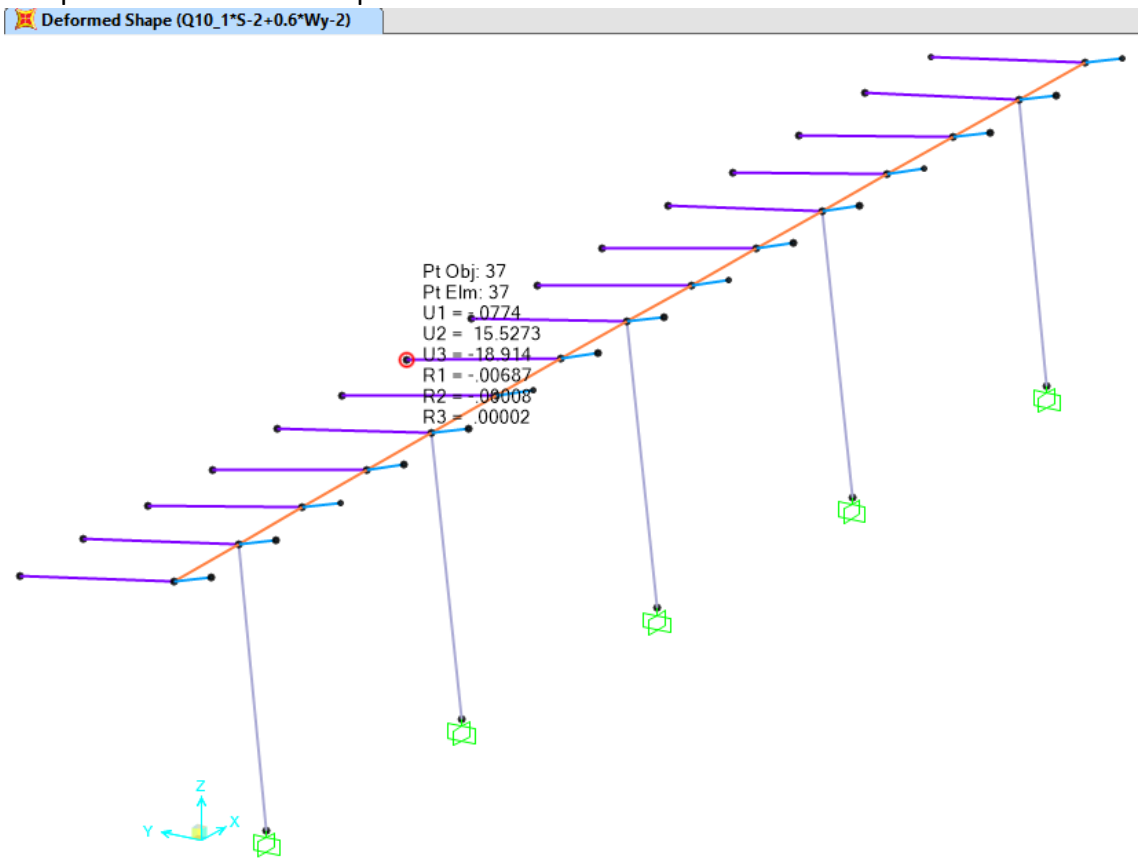
	K Factor	L Factor	k Factor	klt Factor	C1 Factor
Major Moment	2.000	2.000	1.002	0.992	1.000
Minor Moment	2.000	2.000	1.106		

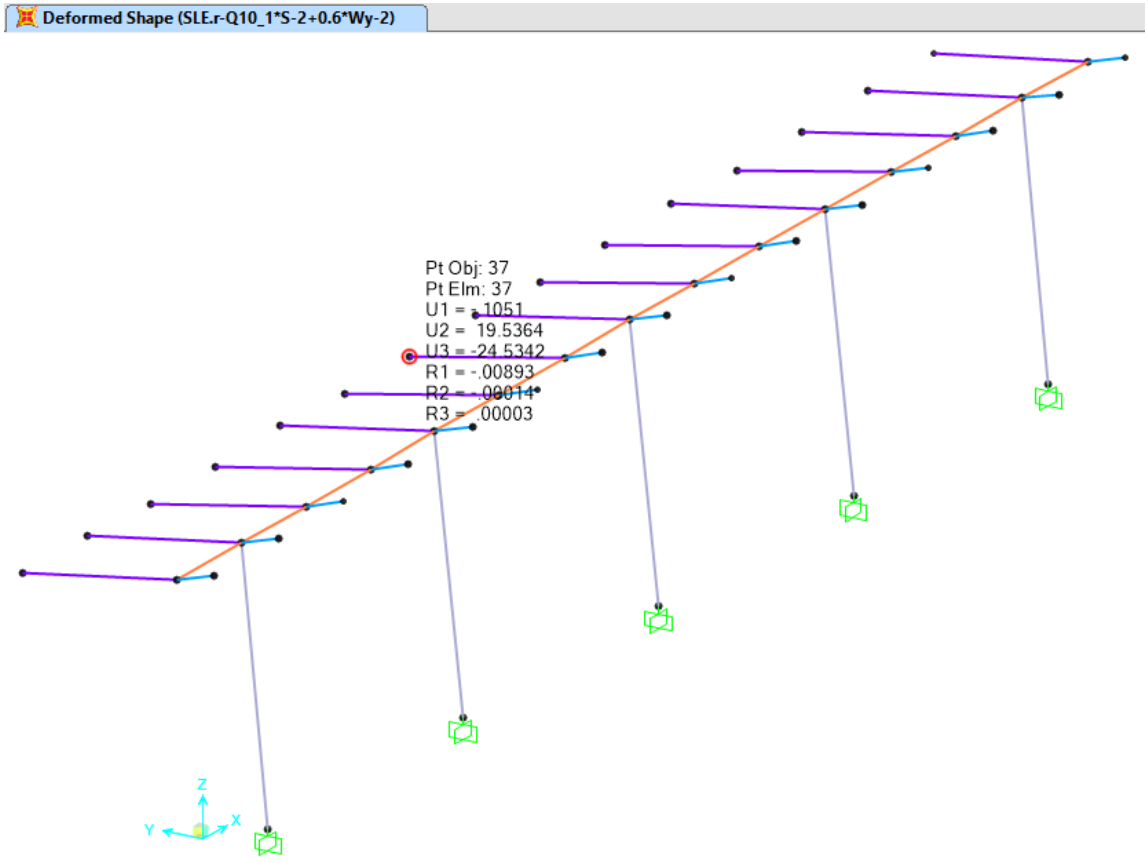
SHEAR DESIGN

	V.Sd Force	V.Rd Capacity	Stress Ratio	Status Check	Tu Torsion
Major Shear	17.000	535.627	0.032	OK	0.000
Minor Shear	0.000	487.998	0.000	OK	0.000

Verifiche SLE

Si riporta la deformata valutata tramite il software di calcolo SAP2000 per la combinazione che comporta la deformazione più alta.

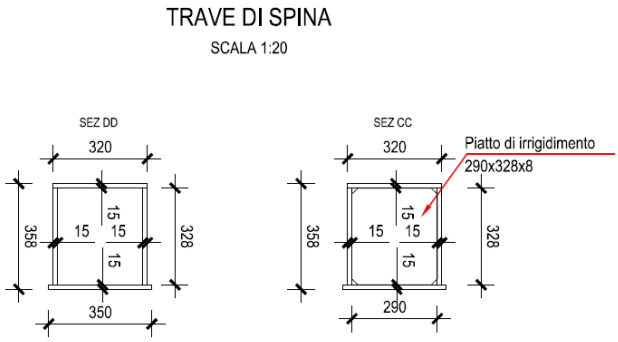




Luce	L	2.8	m
Coefficiente L_0	β	2	
Lunghezza libera di inflessione	L_0	5.6	m
Deformata da carichi variabili			
Limite deformata	L_0/	250	
Abbassamento limite	$\delta_{2,lim}$	22.4	mm
Abbassamento effettivo	$\delta_{2,d}$	18.91	mm
tasso di lavoro	w.r.	84%	
Deformata totale			
Limite deformata	L_0/	200	
Abbassamento limite	$\delta_{tot,lim}$	28	mm
Abbassamento effettivo	$\delta_{tot,d}$	24.53	mm
tasso di lavoro	w.r.	88%	

8.3.2 Trave di colmo

La trave di colmo è una trave continua con sezione scatolare come riportato di seguito ed una luce di calcolo pari all'interasse tra i pilastri, ovvero 6 m.



8.3.2.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 13 stazioni dall'inizio alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	1.2	1.9	1.3	2.2	2.7	6.6
0	SLV	Min	-1.2	-6.2	-1.3	-2.2	-2.7	-6.6
0	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	-25.5	-0.6	-24.4	-2.3	-26.0
0	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	-21.8	-0.2	-21.0	-2.1	-21.7
0	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-22.6	-1.3	-19.8	-1.1	-24.6
0	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-26.6	-1.7	-26.8	-1.4	-29.1
0	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-22.0	-1.3	-20.1	-1.2	-23.8
0	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-27.0	-1.6	-26.7	-1.4	-29.5
0	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	-24.1	-0.6	-25.0	-2.3	-24.4
0	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	-20.4	-0.2	-21.5	-2.1	-20.1
0	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-21.2	-1.3	-20.4	-1.1	-23.0
0	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-25.2	-1.7	-27.4	-1.4	-27.5
0	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-20.6	-1.3	-20.7	-1.2	-22.3

0	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-25.6	-1.6	-27.3	-1.4	-27.9
0	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	-18.8	-0.8	-15.8	-3.8	-17.1
0	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	-12.6	-0.1	-10.1	-3.5	-9.9
0	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-13.9	-1.9	-8.2	-1.8	-14.8
0	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-20.6	-2.5	-19.9	-2.4	-22.3
0	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-12.9	-2.0	-8.7	-1.9	-13.5
0	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-21.2	-2.5	-19.6	-2.3	-22.9
0	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	-18.1	-0.8	-16.1	-3.8	-16.3
0	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	-11.9	-0.1	-10.4	-3.5	-9.2
0	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-13.3	-1.9	-8.5	-1.8	-14.0
0	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-19.9	-2.5	-20.2	-2.4	-21.5
0	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-12.2	-2.0	-9.0	-1.9	-12.7
0	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-20.5	-2.5	-19.9	-2.3	-22.2
0	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-16.5	-2.4	-16.7	-2.3	-17.7
0	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	-23.2	-1.6	-25.3	-1.4	-25.2
0.5	SLV	Max	1.2	1.9	1.3	2.2	2.2	5.7
0.5	SLV	Min	-1.2	-5.4	-1.3	-2.2	-2.2	-5.7
0.5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	-24.5	-0.6	-24.4	-1.9	-13.5
0.5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	-20.7	-0.2	-21.0	-2.0	-11.1
0.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-21.6	-1.3	-19.8	-0.5	-13.5
0.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-25.5	-1.7	-26.8	-0.6	-16.1
0.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-20.9	-1.3	-20.1	-0.5	-13.1
0.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-25.9	-1.6	-26.7	-0.6	-16.3
0.5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	-23.1	-0.6	-25.0	-1.9	-12.6
0.5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	-19.3	-0.2	-21.5	-2.0	-10.2
0.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-20.2	-1.3	-20.4	-0.5	-12.7
0.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-24.2	-1.7	-27.4	-0.6	-15.2
0.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-19.5	-1.3	-20.7	-0.5	-12.2
0.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-24.5	-1.6	-27.3	-0.6	-15.4
0.5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	-17.7	-0.8	-15.8	-3.4	-8.0
0.5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	-11.5	-0.1	-10.1	-3.4	-3.9
0.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-12.9	-1.9	-8.2	-0.9	-8.0
0.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-19.5	-2.5	-19.9	-1.1	-12.3
0.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-11.8	-2.0	-8.7	-0.9	-7.4
0.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-20.1	-2.5	-19.6	-1.1	-12.6
0.5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	-17.0	-0.8	-16.1	-3.4	-7.5
0.5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	-10.8	-0.1	-10.4	-3.4	-3.5
0.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-12.2	-1.9	-8.5	-0.9	-7.6
0.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-18.8	-2.5	-20.2	-1.1	-11.8
0.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-11.1	-2.0	-9.0	-0.9	-6.9
0.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-19.4	-2.5	-19.9	-1.1	-12.2
0.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-15.5	-2.4	-16.7	-1.1	-9.7
0.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	-22.1	-1.6	-25.3	-0.6	-13.9
1	SLV	Max	1.2	1.9	1.3	2.2	1.8	4.8
1	SLV	Min	-1.2	-4.6	-1.3	-2.2	-1.8	-4.8
1	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	-23.4	-0.6	-24.4	-1.6	-1.5
1	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	-19.7	-0.2	-21.0	-1.9	-1.0
1	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-20.5	-1.3	-19.8	0.2	-3.0
1	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-24.5	-1.7	-26.8	0.2	-3.6
1	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-19.8	-1.3	-20.1	0.2	-2.9
1	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-24.8	-1.6	-26.7	0.2	-3.6
1	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	-22.0	-0.6	-25.0	-1.6	-1.3
1	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	-18.3	-0.2	-21.5	-1.9	-0.8
1	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-19.1	-1.3	-20.4	0.2	-2.8
1	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-23.1	-1.7	-27.4	0.2	-3.4
1	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-18.4	-1.3	-20.7	0.2	-2.8
1	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-23.4	-1.6	-27.3	0.2	-3.4
1	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	-16.6	-0.8	-15.8	-2.9	0.6

1	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	-10.4	-0.1	-10.1	-3.4	1.6
1	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-11.8	-1.9	-8.2	0.1	-1.9
1	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-18.5	-2.5	-19.9	0.2	-2.8
1	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-10.7	-2.0	-8.7	0.1	-1.7
1	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-19.0	-2.5	-19.6	0.2	-2.8
1	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	-15.9	-0.8	-16.1	-2.9	0.7
1	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	-9.7	-0.1	-10.4	-3.4	1.6
1	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-11.1	-1.9	-8.5	0.1	-1.8
1	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-17.8	-2.5	-20.2	0.2	-2.7
1	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-10.0	-2.0	-9.0	0.1	-1.6
1	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-18.3	-2.5	-19.9	0.2	-2.7
1	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-14.4	-2.4	-16.7	0.1	-2.2
1	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	-21.1	-1.6	-25.3	0.2	-3.1
1.5	SLV	Max	1.2	1.9	1.3	2.2	1.6	3.8
1.5	SLV	Min	-1.2	-3.8	-1.3	-2.2	-1.6	-3.8
1.5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	-22.3	-0.6	-24.4	-1.3	9.9
1.5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	-18.6	-0.2	-21.0	-1.8	8.6
1.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-19.4	-1.3	-19.8	0.8	6.9
1.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-23.4	-1.7	-26.8	1.1	8.4
1.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-18.8	-1.3	-20.1	0.8	6.7
1.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-23.8	-1.6	-26.7	1.1	8.5
1.5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	-20.9	-0.6	-25.0	-1.3	9.4
1.5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	-17.2	-0.2	-21.5	-1.8	8.1
1.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-18.0	-1.3	-20.4	0.8	6.4
1.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-22.0	-1.7	-27.4	1.1	7.9
1.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-17.4	-1.3	-20.7	0.9	6.2
1.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-22.4	-1.6	-27.3	1.1	8.0
1.5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	-15.6	-0.8	-15.8	-2.5	8.7
1.5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	-9.4	-0.1	-10.1	-3.3	6.5
1.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-10.7	-1.9	-8.2	1.0	3.8
1.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-17.4	-2.5	-19.9	1.4	6.2
1.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-9.6	-2.0	-8.7	1.1	3.4
1.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-18.0	-2.5	-19.6	1.4	6.4
1.5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	-14.9	-0.8	-16.1	-2.5	8.4
1.5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	-8.7	-0.1	-10.4	-3.3	6.2
1.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-10.0	-1.9	-8.5	1.0	3.5
1.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-16.7	-2.5	-20.2	1.5	6.0
1.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-9.0	-2.0	-9.0	1.1	3.1
1.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-17.3	-2.5	-19.9	1.4	6.2
1.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-13.3	-2.4	-16.7	1.4	4.7
1.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	-20.0	-1.6	-25.3	1.0	7.2
2	SLV	Max	1.2	1.9	1.3	2.2	1.6	2.9
2	SLV	Max	0.3	1.9	0.8	2.3	2.7	3.0
2	SLV	Min	-1.2	-2.9	-1.3	-2.2	-1.6	-2.9
2	SLV	Min	-0.3	-1.9	-0.8	-2.3	-2.7	-3.0
2	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	-21.2	-0.6	-24.4	-1.0	20.8
2	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	-0.1	-0.6	-2.4	-1.0	20.8
2	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	-17.5	-0.2	-21.0	-1.7	17.6
2	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	-0.4	-0.3	-3.2	-1.7	17.6
2	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-18.3	-1.3	-19.8	1.5	16.4
2	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	-1.1	-0.2	-2.8	1.5	16.4
2	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-22.3	-1.7	-26.8	1.9	19.9
2	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	-0.9	-0.2	-3.9	1.9	19.9
2	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-17.7	-1.3	-20.1	1.5	15.8
2	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-1.2	-0.2	-2.9	1.5	15.8
2	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-22.7	-1.6	-26.7	1.9	20.2
2	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	-0.9	-0.2	-3.9	1.9	20.2
2	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	-19.9	-0.6	-25.0	-1.0	19.6

2	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	-0.2	-0.6	-2.4	-1.0	19.6
2	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	-16.1	-0.2	-21.5	-1.7	16.4
2	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	-0.5	-0.3	-3.3	-1.7	16.4
2	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-17.0	-1.3	-20.4	1.5	15.2
2	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-1.2	-0.2	-2.9	1.5	15.2
2	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-21.0	-1.7	-27.4	1.9	18.7
2	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	-1.0	-0.2	-4.0	1.9	18.7
2	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-16.3	-1.3	-20.7	1.5	14.6
2	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-1.2	-0.2	-3.0	1.5	14.6
2	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-21.3	-1.6	-27.3	1.9	19.0
2	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	-0.9	-0.2	-3.9	1.9	19.0
2	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	-14.5	-0.8	-15.8	-2.1	16.2
2	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	0.0	-0.8	-0.7	-2.1	16.2
2	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	-8.3	-0.1	-10.1	-3.2	10.9
2	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	-0.5	-0.3	-2.1	-3.2	10.9
2	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-9.7	-1.9	-8.2	2.0	8.9
2	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-1.6	-0.1	-1.5	2.0	8.9
2	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-16.3	-2.5	-19.9	2.7	14.6
2	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-1.2	-0.2	-3.3	2.7	14.6
2	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-8.6	-2.0	-8.7	2.1	7.9
2	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-1.7	-0.1	-1.6	2.1	7.9
2	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-16.9	-2.5	-19.6	2.7	15.1
2	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-1.2	-0.2	-3.2	2.7	15.1
2	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	-13.8	-0.8	-16.1	-2.1	15.6
2	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	0.0	-0.8	-0.8	-2.1	15.6
2	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	-7.6	-0.1	-10.4	-3.2	10.3
2	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	-0.5	-0.3	-2.2	-3.2	10.3
2	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-9.0	-1.9	-8.5	2.0	8.3
2	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-1.7	-0.1	-1.5	2.0	8.3
2	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-15.6	-2.5	-20.2	2.7	14.0
2	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-1.3	-0.2	-3.3	2.7	14.0
2	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-7.9	-2.0	-9.0	2.1	7.3
2	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-1.7	-0.1	-1.6	2.1	7.3
2	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-16.2	-2.5	-19.9	2.7	14.5
2	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-1.2	-0.2	-3.3	2.7	14.5
2	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-12.2	-2.4	-16.7	2.6	11.1
2	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-1.5	-0.1	-2.8	2.6	11.1
2	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	-18.9	-1.6	-25.3	1.8	16.9
2	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	-1.1	-0.2	-3.7	1.8	16.9
2.5	SLV	Max	0.3	1.9	0.8	2.3	2.5	3.5
2.5	SLV	Min	-0.3	-1.9	-0.8	-2.3	-2.5	-2.1
2.5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	1.0	-0.6	-2.4	-0.7	20.6
2.5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	0.7	-0.3	-3.2	-1.5	17.6
2.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	0.0	-0.2	-2.8	1.5	16.7
2.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	0.2	-0.2	-3.9	2.0	20.0
2.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	-0.1	-0.2	-2.9	1.6	16.1
2.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	0.2	-0.2	-3.9	2.0	20.3
2.5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	0.9	-0.6	-2.4	-0.7	19.4
2.5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	0.6	-0.3	-3.3	-1.5	16.4
2.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	-0.1	-0.2	-2.9	1.6	15.5
2.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	0.1	-0.2	-4.0	2.0	18.9
2.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	-0.2	-0.2	-3.0	1.6	15.0
2.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	0.1	-0.2	-3.9	2.0	19.2
2.5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	1.1	-0.8	-0.7	-1.7	15.9
2.5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	0.6	-0.3	-2.1	-3.1	10.9
2.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	-0.6	-0.1	-1.5	2.0	9.4
2.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	-0.2	-0.2	-3.3	2.8	15.0
2.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	-0.6	-0.1	-1.6	2.1	8.5

2.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	-0.1	-0.2	-3.2	2.8	15.5
2.5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	1.1	-0.8	-0.8	-1.7	15.3
2.5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	0.6	-0.3	-2.2	-3.1	10.3
2.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	-0.6	-0.1	-1.5	2.0	8.8
2.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	-0.2	-0.2	-3.3	2.8	14.4
2.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	-0.7	-0.1	-1.6	2.1	7.9
2.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	-0.2	-0.2	-3.3	2.8	14.9
2.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	-0.4	-0.1	-2.8	2.6	11.6
2.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	0.0	-0.2	-3.7	1.9	17.2
3	SLV	Max	0.3	1.9	0.8	2.3	2.2	3.6
3	SLV	Min	-0.3	-1.9	-0.8	-2.3	-2.2	-1.1
3	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	2.0	-0.6	-2.4	-0.4	19.8
3	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	1.7	-0.3	-3.2	-1.3	17.0
3	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	1.0	-0.2	-2.8	1.6	16.4
3	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	1.3	-0.2	-3.9	2.1	19.7
3	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	1.0	-0.2	-2.9	1.7	15.9
3	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	1.3	-0.2	-3.9	2.1	19.9
3	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	1.9	-0.6	-2.4	-0.4	18.7
3	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	1.6	-0.3	-3.3	-1.3	15.9
3	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	0.9	-0.2	-2.9	1.6	15.3
3	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	1.2	-0.2	-4.0	2.2	18.5
3	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	0.9	-0.2	-3.0	1.7	14.8
3	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	1.2	-0.2	-3.9	2.1	18.8
3	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	2.2	-0.8	-0.7	-1.3	15.1
3	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	1.7	-0.3	-2.1	-2.9	10.3
3	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	0.5	-0.1	-1.5	2.0	9.4
3	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	0.9	-0.2	-3.3	2.9	14.8
3	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	0.4	-0.1	-1.6	2.1	8.5
3	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	0.9	-0.2	-3.2	2.8	15.3
3	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	2.1	-0.8	-0.8	-1.3	14.5
3	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	1.6	-0.3	-2.2	-2.9	9.8
3	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	0.5	-0.1	-1.5	2.0	8.9
3	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	0.9	-0.2	-3.3	2.9	14.2
3	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	0.4	-0.1	-1.6	2.1	8.0
3	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	0.9	-0.2	-3.3	2.9	14.7
3	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	0.7	-0.1	-2.8	2.7	11.5
3	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	1.1	-0.2	-3.7	2.0	16.9
3.5	SLV	Max	0.3	1.9	0.8	2.3	2.0	3.3
3.5	SLV	Min	-0.3	-1.9	-0.8	-2.3	-2.0	-0.4
3.5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	3.1	-0.6	-2.4	-0.1	18.6
3.5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	2.8	-0.3	-3.2	-1.2	15.8
3.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	2.1	-0.2	-2.8	1.7	15.7
3.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	2.3	-0.2	-3.9	2.3	18.8
3.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	2.1	-0.2	-2.9	1.8	15.1
3.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	2.4	-0.2	-3.9	2.2	19.0
3.5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	3.0	-0.6	-2.4	-0.1	17.5
3.5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	2.7	-0.3	-3.3	-1.2	14.8
3.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	2.0	-0.2	-2.9	1.7	14.6
3.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	2.2	-0.2	-4.0	2.3	17.7
3.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	2.0	-0.2	-3.0	1.8	14.1
3.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	2.3	-0.2	-3.9	2.3	18.0
3.5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	3.2	-0.8	-0.7	-1.0	13.7
3.5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	2.7	-0.3	-2.1	-2.7	9.2
3.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	1.6	-0.1	-1.5	2.1	8.9
3.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	2.0	-0.2	-3.3	3.0	14.1
3.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	1.5	-0.1	-1.6	2.2	8.1
3.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	2.0	-0.2	-3.2	2.9	14.5
3.5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	3.2	-0.8	-0.8	-0.9	13.2

3.5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	2.7	-0.3	-2.2	-2.7	8.7
3.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	1.5	-0.1	-1.5	2.1	8.4
3.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	1.9	-0.2	-3.3	3.0	13.5
3.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	1.5	-0.1	-1.6	2.2	7.5
3.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	2.0	-0.2	-3.3	2.9	14.0
3.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	1.7	-0.1	-2.8	2.8	10.9
3.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	2.1	-0.2	-3.7	2.2	16.1
4	SLV	Max	0.3	1.9	0.8	2.3	1.9	2.7
4	SLV	Max	1.0	3.2	1.1	2.7	2.8	2.7
4	SLV	Min	-0.3	-1.9	-0.8	-2.3	-1.9	-0.8
4	SLV	Min	-1.0	-1.9	-1.1	-2.7	-2.8	-0.7
4	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	4.2	-0.6	-2.4	0.2	16.7
4	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	25.3	-0.5	19.6	0.2	16.7
4	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	3.9	-0.3	-3.2	-1.0	14.2
4	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	21.0	-0.5	14.5	-1.0	14.2
4	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	3.2	-0.2	-2.8	1.8	14.3
4	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	20.4	0.9	14.1	1.8	14.3
4	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	3.4	-0.2	-3.9	2.4	17.3
4	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	24.9	1.2	19.0	2.4	17.3
4	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	3.1	-0.2	-2.9	1.9	13.9
4	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	19.7	1.0	14.3	1.9	13.9
4	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	3.4	-0.2	-3.9	2.4	17.6
4	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	25.2	1.2	18.9	2.4	17.6
4	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	4.1	-0.6	-2.4	0.2	15.7
4	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	23.7	-0.5	20.1	0.2	15.7
4	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	3.8	-0.3	-3.3	-1.0	13.1
4	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	19.4	-0.5	15.0	-1.0	13.1
4	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	3.1	-0.2	-2.9	1.8	13.3
4	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	18.8	0.9	14.6	1.8	13.3
4	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	3.3	-0.2	-4.0	2.4	16.3
4	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	23.3	1.2	19.5	2.4	16.3
4	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	3.0	-0.2	-3.0	1.9	12.8
4	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	18.1	1.0	14.8	1.9	12.8
4	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	3.3	-0.2	-3.9	2.4	16.6
4	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	23.7	1.1	19.4	2.4	16.6
4	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	4.3	-0.8	-0.7	-0.6	11.8
4	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	18.9	-0.7	14.4	-0.6	11.8
4	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	3.8	-0.3	-2.1	-2.6	7.6
4	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	11.6	-0.6	5.9	-2.6	7.6
4	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	2.6	-0.1	-1.5	2.1	7.8
4	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	10.7	1.8	5.2	2.1	7.8
4	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	3.0	-0.2	-3.3	3.1	12.8
4	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	18.1	2.2	13.3	3.1	12.8
4	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	2.6	-0.1	-1.6	2.2	7.0
4	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	9.5	1.9	5.5	2.2	7.0
4	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	3.1	-0.2	-3.2	3.0	13.3
4	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	18.8	2.1	13.2	3.0	13.3
4	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	4.3	-0.8	-0.8	-0.6	11.3
4	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	18.1	-0.7	14.6	-0.6	11.3
4	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	3.8	-0.3	-2.2	-2.6	7.1
4	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	10.9	-0.6	6.1	-2.6	7.1
4	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	2.6	-0.1	-1.5	2.1	7.3
4	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	9.9	1.8	5.4	2.1	7.3
4	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	3.0	-0.2	-3.3	3.1	12.3
4	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	17.4	2.2	13.6	3.1	12.3
4	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	2.5	-0.1	-1.6	2.2	6.5
4	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	8.7	1.8	5.7	2.2	6.5
4	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	3.0	-0.2	-3.3	3.0	12.7

4	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	18.0	2.1	13.4	3.0	12.7
4	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	2.8	-0.1	-2.8	2.9	9.8
4	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	13.6	2.1	11.1	2.9	9.8
4	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	3.2	-0.2	-3.7	2.3	14.8
4	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	21.0	1.1	18.0	2.3	14.8
4.5	SLV	Max	1.0	4.0	1.1	2.7	2.4	1.6
4.5	SLV	Min	-1.0	-1.9	-1.1	-2.7	-2.4	-1.6
4.5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	26.4	-0.5	19.6	0.5	3.8
4.5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	22.0	-0.5	14.5	-0.8	3.4
4.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	21.5	0.9	14.1	1.3	3.9
4.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	25.9	1.2	19.0	1.8	4.6
4.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	20.7	1.0	14.3	1.4	3.8
4.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	26.3	1.2	18.9	1.8	4.7
4.5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	24.8	-0.5	20.1	0.5	3.6
4.5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	20.5	-0.5	15.0	-0.7	3.2
4.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	19.9	0.9	14.6	1.4	3.6
4.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	24.4	1.2	19.5	1.8	4.4
4.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	19.2	1.0	14.8	1.4	3.5
4.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	24.8	1.1	19.4	1.8	4.4
4.5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	19.9	-0.7	14.4	-0.2	2.1
4.5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	12.7	-0.6	5.9	-2.3	1.5
4.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	11.7	1.8	5.2	1.2	2.2
4.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	19.2	2.2	13.3	2.0	3.5
4.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	10.5	1.9	5.5	1.3	2.0
4.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	19.8	2.1	13.2	2.0	3.6
4.5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	19.2	-0.7	14.6	-0.2	2.0
4.5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	11.9	-0.6	6.1	-2.3	1.4
4.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	11.0	1.8	5.4	1.2	2.1
4.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	18.4	2.2	13.6	2.0	3.4
4.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	9.7	1.8	5.7	1.3	1.9
4.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	19.1	2.1	13.4	2.0	3.5
4.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	14.6	2.1	11.1	1.8	2.7
4.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	22.1	1.1	18.0	1.7	4.0
5	SLV	Max	1.0	4.8	1.1	2.7	1.9	2.5
5	SLV	Min	-1.0	-1.9	-1.1	-2.7	-1.9	-2.5
5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	27.4	-0.5	19.6	0.7	-9.6
5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	23.1	-0.5	14.5	-0.5	-7.9
5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	22.5	0.9	14.1	0.9	-7.1
5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	27.0	1.2	19.0	1.2	-8.6
5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	21.8	1.0	14.3	0.9	-6.9
5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	27.4	1.2	18.9	1.2	-8.7
5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	25.9	-0.5	20.1	0.8	-9.1
5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	21.6	-0.5	15.0	-0.5	-7.3
5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	21.0	0.9	14.6	0.9	-6.6
5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	25.5	1.2	19.5	1.2	-8.1
5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	20.2	1.0	14.8	0.9	-6.4
5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	25.8	1.1	19.4	1.2	-8.2
5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	21.0	-0.7	14.4	0.1	-8.1
5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	13.8	-0.6	5.9	-2.0	-5.1
5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	12.8	1.8	5.2	0.3	-3.9
5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	20.3	2.2	13.3	0.9	-6.4
5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	11.6	1.9	5.5	0.4	-3.5
5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	20.9	2.1	13.2	0.9	-6.6
5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	20.2	-0.7	14.6	0.1	-7.8
5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	13.0	-0.6	6.1	-2.0	-4.9
5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	12.0	1.8	5.4	0.3	-3.6
5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	19.5	2.2	13.6	0.9	-6.1
5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	10.8	1.8	5.7	0.4	-3.2

5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	20.1	2.1	13.4	0.9	-6.3
5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	15.7	2.1	11.1	0.7	-4.9
5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	23.2	1.1	18.0	1.1	-7.3
5.5	SLV	Max	1.0	5.6	1.1	2.7	1.5	3.5
5.5	SLV	Min	-1.0	-1.9	-1.1	-2.7	-1.5	-3.9
5.5	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	28.5	-0.5	19.6	1.0	-23.6
5.5	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	24.2	-0.5	14.5	-0.3	-19.7
5.5	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	23.6	0.9	14.1	0.4	-18.6
5.5	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	28.1	1.2	19.0	0.6	-22.4
5.5	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	22.9	1.0	14.3	0.4	-18.0
5.5	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	28.5	1.2	18.9	0.6	-22.7
5.5	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	27.0	-0.5	20.1	1.0	-22.3
5.5	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	22.6	-0.5	15.0	-0.3	-18.4
5.5	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	22.0	0.9	14.6	0.4	-17.4
5.5	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	26.5	1.2	19.5	0.7	-21.1
5.5	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	21.3	1.0	14.8	0.4	-16.7
5.5	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	26.9	1.1	19.4	0.7	-21.4
5.5	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	22.1	-0.7	14.4	0.4	-18.9
5.5	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	14.8	-0.6	5.9	-1.7	-12.3
5.5	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	13.9	1.8	5.2	-0.6	-10.6
5.5	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	21.3	2.2	13.3	-0.2	-16.8
5.5	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	12.7	1.9	5.5	-0.6	-9.6
5.5	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	22.0	2.1	13.2	-0.2	-17.3
5.5	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	21.3	-0.7	14.6	0.4	-18.2
5.5	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	14.1	-0.6	6.1	-1.7	-11.6
5.5	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	13.1	1.8	5.4	-0.5	-9.9
5.5	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	20.6	2.2	13.6	-0.2	-16.1
5.5	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	11.9	1.8	5.7	-0.6	-8.9
5.5	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	21.2	2.1	13.4	-0.2	-16.7
5.5	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	16.8	2.1	11.1	-0.3	-13.0
5.5	SLU-Q25_1*S-2+0.6*Wy-5		-0.4	24.2	1.1	18.0	0.6	-19.2
6	SLV	Max	1.0	6.5	1.1	2.7	1.2	4.4
6	SLV	Min	-1.0	-1.9	-1.1	-2.7	-1.2	-7.0
6	SLU-Q1_1*S-1+0.6*Wx-1		-2.2	29.6	-0.5	19.6	1.3	-38.1
6	SLU-Q2_1*S-1+0.6*Wx-2		-2.1	25.2	-0.5	14.5	-0.1	-32.0
6	SLU-Q3_1*S-1+0.6*Wy-1		-0.4	24.7	0.9	14.1	-0.1	-30.7
6	SLU-Q4_1*S-1+0.6*Wy-2		-0.5	29.1	1.2	19.0	0.0	-36.7
6	SLU-Q5_1*S-1+0.6*Wy-3		-0.4	23.9	1.0	14.3	-0.1	-29.7
6	SLU-Q6_1*S-1+0.6*Wy-4		-0.5	29.5	1.2	18.9	0.1	-37.2
6	SLU-Q7_1*S-2+0.6*Wx-1		-2.2	28.0	-0.5	20.1	1.3	-36.1
6	SLU-Q8_1*S-2+0.6*Wx-2		-2.1	23.7	-0.5	15.0	0.0	-30.0
6	SLU-Q9_1*S-2+0.6*Wy-1		-0.4	23.1	0.9	14.6	0.0	-28.6
6	SLU-Q10_1*S-2+0.6*Wy-2		-0.5	27.6	1.2	19.5	0.1	-34.6
6	SLU-Q11_1*S-2+0.6*Wy-3		-0.3	22.4	1.0	14.8	-0.1	-27.7
6	SLU-Q12_1*S-2+0.6*Wy-4		-0.5	28.0	1.1	19.4	0.1	-35.1
6	SLU-Q13_0.5*S-1+1*Wx-1		-3.3	23.1	-0.7	14.4	0.8	-30.2
6	SLU-Q14_0.5*S-1+1*Wx-2		-3.1	15.9	-0.6	5.9	-1.5	-20.0
6	SLU-Q15_0.5*S-1+1*Wy-1		-0.2	15.0	1.8	5.2	-1.4	-17.8
6	SLU-Q16_0.5*S-1+1*Wy-2		-0.3	22.4	2.2	13.3	-1.3	-27.7
6	SLU-Q17_0.5*S-1+1*Wy-3		-0.2	13.7	1.9	5.5	-1.5	-16.2
6	SLU-Q18_0.5*S-1+1*Wy-4		-0.4	23.1	2.1	13.2	-1.3	-28.6
6	SLU-Q19_0.5*S-2+1*Wx-1		-3.2	22.4	-0.7	14.6	0.8	-29.1
6	SLU-Q20_0.5*S-2+1*Wx-2		-3.1	15.1	-0.6	6.1	-1.5	-18.9
6	SLU-Q21_0.5*S-2+1*Wy-1		-0.2	14.2	1.8	5.4	-1.4	-16.7
6	SLU-Q22_0.5*S-2+1*Wy-2		-0.3	21.6	2.2	13.6	-1.3	-26.7
6	SLU-Q23_0.5*S-2+1*Wy-3		-0.2	13.0	1.8	5.7	-1.5	-15.1
6	SLU-Q24_0.5*S-2+1*Wy-4		-0.3	22.3	2.1	13.4	-1.2	-27.5
6	SLU-Q26_0.5*S-2+1*Wy-5		-0.3	17.8	2.1	11.1	-1.4	-21.6

6	SLU-Q25_1*S-2+0.6*Wy-5	-0.4	25.3	1.1	18.0	0.0	-31.6

8.3.2.2 Verifiche

Si riportano le verifiche effettuate tramite un foglio Excel autoprodotto per le azioni che comportano il tasso di lavoro più alto.

Dimensioni e materiale			
Base esterna	b	320	mm
Altezza esterna	h	358	mm
Spessore pareti	sp	15	mm
Tensione di snervamento caratteristica	fyk	355	Mpa
Tensione di snervamento di calcolo	fyd	338.1	Mpa

Azioni agenti			
Azione assiale	N	3.26	kN
Taglio - asse debole	V2	29.58	kN
Taglio - asse forte	V3	2.54	kN
Azione torcente	T	27.42	kNm
Momento - asse debole	M2	3.78	kNm
Momento - asse forte	M3	38.14	kNm

Verifica a torsione			*EN1993-1-1 §6.2.7(1)*
Area racchiusa da linea media	Ω	104615	mm²
Tensione tangenziale di calcolo	τt,Ed	131.1	Mpa
Tensione tangenziale resistente	τt,Rd	195.2	Mpa
Momento torcente di calcolo	Mt,Ed	27.42	kNm
Momento torcente resistente	Mt,Rd	40.8	kNm
Tasso di lavoro	w.r.	67%	

Verifica a taglio ridotto			*EN1993-1-1 §6.2.7(9)*
Azione da taglio	Ved	29.58	kN
Taglio resistente	Vpl,Rd	2096.4	kN
Taglio resistente ridotto per torsione	Vpl,T,Rd	688.9	kN
Tasso di lavoro	w.r.	4%	

Verifica a flessione				*EN1993-1-1 §6.2.8*
Azione da taglio	Ved		29.58	kN
Limite taglio resistente senza riduzioni a momento	0.5*Vpl,T,Rd		344.5	kN
Nessuna interazione taglio-momento	Ved	<		0.5*Vpl,T,Rd
Fattore di interazione taglio-momento	ρ		0.000	
Tensione di snervamento caratteristica a flessione	(1-ρ) fyk		355.0	Mpa
Tensione di snervamento di calcolo a flessione	(1-ρ) fyd		338.1	MPa
Momento di inerzia	I		3.708E+08	mm4
Modulo di resistenza elastico	w.el		2071265.3	mm3
Momento di calcolo	Med		38.14	kNm
Momento resistente	Mrd		700.28	kNm
Tasso di lavoro	w.r.		5%	

8.3.3 Colonna

La colonna ha sezione HEA300, con uno schema a pendolo inverso incastrata alla base ed una luce di calcolo di 4.726 m.

8.3.3.1 Sollecitazioni

Si riportano le sollecitazioni per l'elemento più sollecitato, valutate longitudinalmente in 3 stazioni: all'inizio, in mezzeria ed alla fine.

TABLE: Element Forces - Frames

Station	OutputCase	StepType	P	V2	V3	T	M2	M3
m	Text	Text	KN	KN	KN	KN-m	KN-m	KN-m
0	SLV	Max	1.3	3.5	3.0	0.0	7.3	18.0
0	SLV	Min	-18.3	-3.5	-3.0	0.0	-7.3	-18.0
0	SLU-Q1_1*S-1+0.6*Wx-1		-79.4	0.0	-2.9	0.0	-4.9	62.5
0	SLU-Q2_1*S-1+0.6*Wx-2		-73.4	-0.3	-2.7	0.0	-4.7	55.0
0	SLU-Q3_1*S-1+0.6*Wy-1		-69.5	5.7	0.0	0.0	0.0	70.7
0	SLU-Q4_1*S-1+0.6*Wy-2		-82.1	6.7	0.0	0.0	0.0	92.5
0	SLU-Q5_1*S-1+0.6*Wy-3		-67.5	5.9	0.0	0.0	0.0	72.1
0	SLU-Q6_1*S-1+0.6*Wy-4		-83.2	6.6	0.0	0.0	0.0	91.7
0	SLU-Q7_1*S-2+0.6*Wx-1		-75.1	0.0	-2.9	0.0	-4.9	64.0
0	SLU-Q8_1*S-2+0.6*Wx-2		-69.1	-0.3	-2.7	0.0	-4.7	56.5
0	SLU-Q9_1*S-2+0.6*Wy-1		-65.2	5.7	0.0	0.0	0.0	72.2
0	SLU-Q10_1*S-2+0.6*Wy-2		-77.7	6.7	0.0	0.0	0.0	94.0
0	SLU-Q11_1*S-2+0.6*Wy-3		-63.1	5.9	0.0	0.0	0.0	73.6
0	SLU-Q12_1*S-2+0.6*Wy-4		-78.8	6.6	0.0	0.0	0.0	93.2
0	SLU-Q13_0.5*S-1+1*Wx-1		-58.7	0.0	-4.8	0.0	-8.2	41.2
0	SLU-Q14_0.5*S-1+1*Wx-2		-48.7	-0.5	-4.5	0.0	-7.8	28.8
0	SLU-Q15_0.5*S-1+1*Wy-1		-42.2	9.5	0.0	0.0	0.0	54.9
0	SLU-Q16_0.5*S-1+1*Wy-2		-63.2	11.1	0.0	0.0	0.0	91.2
0	SLU-Q17_0.5*S-1+1*Wy-3		-38.8	9.8	0.0	0.0	0.0	57.2
0	SLU-Q18_0.5*S-1+1*Wy-4		-65.0	11.0	0.0	0.0	0.0	89.9
0	SLU-Q19_0.5*S-2+1*Wx-1		-56.5	0.0	-4.8	0.0	-8.2	42.0
0	SLU-Q20_0.5*S-2+1*Wx-2		-46.6	-0.5	-4.5	0.0	-7.8	29.5
0	SLU-Q21_0.5*S-2+1*Wy-1		-40.0	9.5	0.0	0.0	0.0	55.6
0	SLU-Q22_0.5*S-2+1*Wy-2		-61.0	11.1	0.0	0.0	0.0	91.9
0	SLU-Q23_0.5*S-2+1*Wy-3		-36.6	9.8	0.0	0.0	0.0	58.0
0	SLU-Q24_0.5*S-2+1*Wy-4		-62.8	11.0	0.0	0.0	0.0	90.7
0	SLU-Q26_0.5*S-2+1*Wy-5		-50.3	10.8	0.0	0.0	0.0	81.7
0	SLU-Q25_1*S-2+0.6*Wy-5		-71.3	6.5	0.0	0.0	0.0	87.9
2.363	SLV	Max	1.3	3.5	3.0	0.0	0.2	9.9
2.363	SLV	Min	-16.2	-3.5	-3.0	0.0	-0.2	-9.9
2.363	SLU-Q1_1*S-1+0.6*Wx-1		-76.7	0.0	-1.7	0.0	0.5	62.5
2.363	SLU-Q2_1*S-1+0.6*Wx-2		-70.7	-0.3	-1.5	0.0	0.3	55.7
2.363	SLU-Q3_1*S-1+0.6*Wy-1		-66.8	4.5	0.0	0.0	0.0	58.6
2.363	SLU-Q4_1*S-1+0.6*Wy-2		-79.3	5.5	0.0	0.0	0.0	78.1
2.363	SLU-Q5_1*S-1+0.6*Wy-3		-64.7	4.7	0.0	0.0	0.0	59.6
2.363	SLU-Q6_1*S-1+0.6*Wy-4		-80.4	5.4	0.0	0.0	0.0	77.5
2.363	SLU-Q7_1*S-2+0.6*Wx-1		-72.3	0.0	-1.7	0.0	0.5	64.0
2.363	SLU-Q8_1*S-2+0.6*Wx-2		-66.3	-0.3	-1.5	0.0	0.3	57.2
2.363	SLU-Q9_1*S-2+0.6*Wy-1		-62.4	4.5	0.0	0.0	0.0	60.1
2.363	SLU-Q10_1*S-2+0.6*Wy-2		-75.0	5.5	0.0	0.0	0.0	79.6
2.363	SLU-Q11_1*S-2+0.6*Wy-3		-60.3	4.7	0.0	0.0	0.0	61.1
2.363	SLU-Q12_1*S-2+0.6*Wy-4		-76.1	5.4	0.0	0.0	0.0	79.0
2.363	SLU-Q13_0.5*S-1+1*Wx-1		-56.0	0.0	-2.8	0.0	0.8	41.2

2.363	SLU-Q14_0.5*S-1+1*Wx-2		-46.0	-0.5	-2.5	0.0	0.5	29.9
2.363	SLU-Q15_0.5*S-1+1*Wy-1		-39.4	7.6	0.0	0.0	0.0	34.7
2.363	SLU-Q16_0.5*S-1+1*Wy-2		-60.4	9.2	0.0	0.0	0.0	67.2
2.363	SLU-Q17_0.5*S-1+1*Wy-3		-36.0	7.8	0.0	0.0	0.0	36.4
2.363	SLU-Q18_0.5*S-1+1*Wy-4		-62.2	9.0	0.0	0.0	0.0	66.3
2.363	SLU-Q19_0.5*S-2+1*Wx-1		-53.8	0.0	-2.8	0.0	0.8	42.0
2.363	SLU-Q20_0.5*S-2+1*Wx-2		-43.8	-0.5	-2.5	0.0	0.5	30.6
2.363	SLU-Q21_0.5*S-2+1*Wy-1		-37.2	7.6	0.0	0.0	0.0	35.4
2.363	SLU-Q22_0.5*S-2+1*Wy-2		-58.2	9.2	0.0	0.0	0.0	68.0
2.363	SLU-Q23_0.5*S-2+1*Wy-3		-33.8	7.8	0.0	0.0	0.0	37.2
2.363	SLU-Q24_0.5*S-2+1*Wy-4		-60.0	9.0	0.0	0.0	0.0	67.0
2.363	SLU-Q26_0.5*S-2+1*Wy-5		-47.5	8.9	0.0	0.0	0.0	58.5
2.363	SLU-Q25_1*S-2+0.6*Wy-5		-68.6	5.3	0.0	0.0	0.0	73.9
4.726	SLV	Max	1.3	3.5	3.0	0.0	7.0	5.2
4.726	SLV	Min	-14.0	-3.5	-3.0	0.0	-7.0	-3.5
4.726	SLU-Q1_1*S-1+0.6*Wx-1		-73.9	0.0	-0.5	0.0	3.0	62.5
4.726	SLU-Q2_1*S-1+0.6*Wx-2		-67.9	-0.3	-0.3	0.0	2.5	56.3
4.726	SLU-Q3_1*S-1+0.6*Wy-1		-64.0	3.4	0.0	0.0	0.0	49.2
4.726	SLU-Q4_1*S-1+0.6*Wy-2		-76.6	4.3	0.0	0.0	0.0	66.5
4.726	SLU-Q5_1*S-1+0.6*Wy-3		-61.9	3.5	0.0	0.0	0.0	49.9
4.726	SLU-Q6_1*S-1+0.6*Wy-4		-77.7	4.2	0.0	0.0	0.0	66.1
4.726	SLU-Q7_1*S-2+0.6*Wx-1		-69.5	0.0	-0.5	0.0	3.0	64.0
4.726	SLU-Q8_1*S-2+0.6*Wx-2		-63.5	-0.3	-0.3	0.0	2.5	57.8
4.726	SLU-Q9_1*S-2+0.6*Wy-1		-59.6	3.4	0.0	0.0	0.0	50.7
4.726	SLU-Q10_1*S-2+0.6*Wy-2		-72.2	4.3	0.0	0.0	0.0	68.0
4.726	SLU-Q11_1*S-2+0.6*Wy-3		-57.6	3.5	0.0	0.0	0.0	51.4
4.726	SLU-Q12_1*S-2+0.6*Wy-4		-73.3	4.2	0.0	0.0	0.0	67.6
4.726	SLU-Q13_0.5*S-1+1*Wx-1		-53.2	0.0	-0.8	0.0	5.0	41.2
4.726	SLU-Q14_0.5*S-1+1*Wx-2		-43.2	-0.5	-0.5	0.0	4.1	31.0
4.726	SLU-Q15_0.5*S-1+1*Wy-1		-36.7	5.6	0.0	0.0	0.0	19.1
4.726	SLU-Q16_0.5*S-1+1*Wy-2		-57.6	7.2	0.0	0.0	0.0	47.9
4.726	SLU-Q17_0.5*S-1+1*Wy-3		-33.2	5.9	0.0	0.0	0.0	20.3
4.726	SLU-Q18_0.5*S-1+1*Wy-4		-59.4	7.1	0.0	0.0	0.0	47.3
4.726	SLU-Q19_0.5*S-2+1*Wx-1		-51.0	0.0	-0.8	0.0	5.0	42.0
4.726	SLU-Q20_0.5*S-2+1*Wx-2		-41.0	-0.5	-0.5	0.0	4.1	31.7
4.726	SLU-Q21_0.5*S-2+1*Wy-1		-34.5	5.6	0.0	0.0	0.0	19.9
4.726	SLU-Q22_0.5*S-2+1*Wy-2		-55.4	7.2	0.0	0.0	0.0	48.6
4.726	SLU-Q23_0.5*S-2+1*Wy-3		-31.1	5.9	0.0	0.0	0.0	21.0
4.726	SLU-Q24_0.5*S-2+1*Wy-4		-57.3	7.1	0.0	0.0	0.0	48.0
4.726	SLU-Q26_0.5*S-2+1*Wy-5		-44.8	6.9	0.0	0.0	0.0	39.8
4.726	SLU-Q25_1*S-2+0.6*Wy-5		-65.8	4.1	0.0	0.0	0.0	62.7

8.3.3.2 Verifiche

Si riportano le verifiche effettuate tramite un foglio Excel autoprodotto per le azioni che comportano il tasso di lavoro più alto.

LUNGHEZZA ELEMENTO		
L	4.726 m	4 726 mm
AZIONI		
Ved_y	11.12 kN	11 120 N
Ved_z	4.79 kN	4 790 N
Ned (compressione)	83.18 kN	83 180 N

Ned (trazione)		0 N
Med_y	93.96 kNm	93 960 000 Nmm
Med_z	8.23 kNm	8 230 000 Nmm

Verifica a Taglio		
Avz	3 728	mm2
Ved	11 120	N
0,5*Vpl,rd	281 857	N
w.r.	0.0395	
A.fl	6 770	mm2
Ved_z	4 790	N
0,5*Vpl,rd	511 833	N
w.r.	0.0094	

Profilo		
HE		
Laminate ad I	HE 300 A	Bending
Classe	3	Bending275
g	88	kg/m
A	11 250	mm2
I_y	182 600 000	mm4
Wel.y	1 260 000	mm3
Wpl.y	1 383 000	mm3
iy	127	mm
Avz	3 728	mm2
Iz	63 100 000	mm4
Wel.z	420 600	mm3
Wpl.z	641 200	mm3
iz	75	mm
It	8.52E+05	mm4
Iw	1.20E+12	mm6
h/b	0.97	
tf	14	

Centrod i taglio		
ym	0	mm
zm	0	mm

Eulero
y

β_y	2	
L0_y	9452.00	mm
Ncr_y	4236160	N
	z	
β_z	2	
L0_z	9452.00	mm
Ncr_z	1463865	N

h/b	0.97	
tf	14	
caso_curv	caso3	

	y	
C.d.Inst._y	b	
α_y	0.34	
λ_y	0.8546	
ϕ_y	0.9764	
χ_y	0.69023	
Nd_y	83 180.00	N
Nb,rd_y	2 033 717	N
Ef_rate_y	0.0409005	

	z	
C.d.Inst._z	c	
α_z	0.49	
	z	
λ_z	1.4538	
ϕ_z	1.8639	
χ_z	0.33000	
Nd_z	83 180.00	N
Nb,rd_z	972 311	N
Ef_rate_z	0.0855487	

RESUME'		
Ef_rate	0.0409005	y
	0.0855487	z
Eulero	0.0855487	z
Nd_y	83180.00	N
Ncr_y	4.24E+06	N
χ_y	0.69023	
ϕ_y	0.97644	
λ_y	0.855	

Nd_z	83180.00	N
Ncr_z	1.46E+06	N
χ_z	0.33000	
ϕ_z	1.86388	
λ_z	1.454	
Nrk	3093750	N

Latero-Torsionale		
Mpl_y,Rd	3.62E+08	Nmm
Mpl_z,Rd	1.68E+08	Nmm

h/b	0.97	
Sezioni	Laminate ad I	
caso_curv	caso1	
curva	b	
αLT	0.34	

y		
β_LT	2	
L,y	9452	mm
Mcr,max_y	3.76E+08	Nmm
λLT,0	0.9598	\
w	0.6361509	
A	1.12	**
B	1.2780188	**
Cm	1.1410882	**
Mcr,y	3.30E+08	Nmm
λLT	1.0253	
ϕLT	1.1659406	
χLT	0.5810415	

Eulero + Latero-Torsionale

Appendice A1 EC3-1-1

Ned	83180	N
Med_y	9.40E+07	Nmm
Med_z	8.23E+06	Nmm
Nrk	3093750	N
My,rk	3.47E+08	Nmm
Mz,rk	1.16E+08	Nmm
Limite	elastico	

HP Ned << N_TF

kc	0.94	table 6,6
Ci	1.131734	
λLT,0	0.9598	
? λLT,0 <	2.09E-01	no
Cm_y0	1.00059	
Cm_z0	1.00170	

Cmy	1.000142
Cmz	1.001705
CmLT	1.034945

	si	no
Cmy	1.00059	1.000142
Cmz	1.00170	1.00170
CmLT	1	1.034945

λmax	1.454
εy	10.086
μy	9.94E-01
μz	9.61E-01
wy	1.097619
wz	1.5
npl	0.028231
aLT	0.995336
bLT	0.01
cLT	0.43
dLT	0.01
eLT	0.16
Cyy	0.990198
Cyz	0.756942
Czy	0.953424
Czz	0.972099

classe_sez	3	4	1	2
kyy	1.04931	1.04931	1.05970	1.05970
kyz	1.05550	1.05550	0.97807	0.97807
kzy	1.01486	1.01486	0.54632	0.54632
kzz	1.02085	1.02085	1.05015	1.05015

classe_sez	3
kyy	1.049313
kyz	1.055504
kzy	1.014859
kzz	1.020847

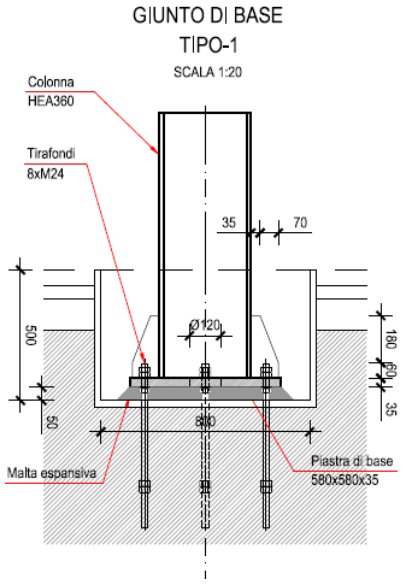
Verifica

	N	My	Mz	
Eulero y	0.0409	0.51	0.08	1
	0.6340			
Eulero z	0.085549	0.50	0.08	
	0.6591			

9 VERIFICHE FONDAZIONI

9.1 TIPO 1 – FONDAZIONI SUPERFICIALI SU PLINTO CENTRATO

La colonna ha piano di imposta a quota z = -0.5 m dalla quota di calpestio finita, ed entra con un dettaglio a bicchiere nel plinto per 30 cm come indicato nella figura seguente.



Il plinto ha dimensioni 1.65 x 1.65 m in pianta e 1.5 m in altezza (misurata da quota di imposta colonna a quota estradosso magrone). Considerando la porzione non strutturale attorno al giunto a bicchiere, il plinto ha una profondità lorda di 1.8 m.
Quota di imposta fondazione: almeno a z = -2 m dal p.c.:
Quota di imposta magrone: occorre scavare fino al raggiungimento del secondo strato di terreno indicato nella stratigrafia di progetto nel paragrafo precedente e riempire eventualmente con magrone fino a quota di imposta fondazione.

9.1.1 Sollecitazioni

Si riportano le azioni alla base del pilastro più sollecitato, alle quali va aggiunto il peso proprio del plinto di fondazione.

TABLE: Joint Reactions

Joint	OutputCase	CaseType	StepType	F1	F2	F3	M1	M2	M3
10	SLU-Q19_0.5*S-2+1*Wx-1	Combination		-7.4	0.1	121.8	29.6	-13.4	0.0
10	SLU-Q20_0.5*S-2+1*Wx-2	Combination		-7.1	0.1	111.6	29.6	-13.0	0.0
10	SLU-Q25_1*S-2+0.6*Wy-5	Combination		0.1	-5.9	150.0	111.3	0.1	0.0
10	SLU-Q26_0.5*S-2+1*Wy-5	Combination		0.0	-10.1	97.5	116.4	0.0	0.0
10	SLU-Q6_1*S-1+0.6*Wy-4	Combination		0.1	-5.3	207.0	19.7	0.2	0.0
10	SLV	Combination	Max	7.1	7.1	43.0	27.9	16.5	0.0
10	SLV	Combination	Min	-7.1	-7.1	-2.5	-27.9	-16.5	0.0

9.1.2 Verifiche geotecniche

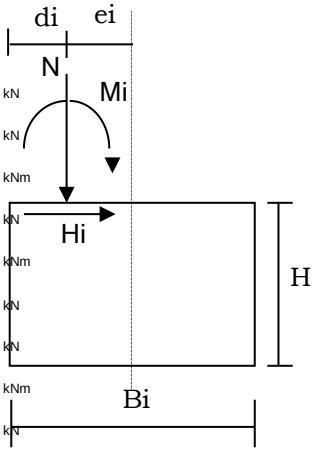
CARATTERISTICHE GEOMETRICHE DELLA FONDAZIONE

B_x =	1.65	1.65	1.65	1.65	1.65	1.65	1.65	m

B_y =	1.65	1.65	1.65	1.65	1.65	1.65	1.65	m
H =	1.50	1.50	1.50	1.50	1.50	1.50	1.50	m
p.p.fond =	102.09	102.09	102.09	102.09	102.09	102.09	102.09	kN
γ_{Gpp} =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

SOLLECITAZIONI

Comb	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLU-Q19_0.5*S-2+1*Wx-1	SLU-Q20_0.5*S-2+1*Wx-2	SLVMax	SLVMin	
Sollecitazioni e punto di applicazione ad estradosso fondazione								
N_G =	150.01	97.54	206.99	121.83	111.62	42.98	-2.46	kN
$H_{G;x}$ =	5.85	10.07	5.32	-0.14	-0.14	7.14	7.14	kN
$M_{G;x}$ =	111.33	116.41	19.75	29.63	29.63	27.92	-27.92	kNm
$H_{G;y}$ =	0.05	0.01	0.10	-7.39	-7.14	7.12	-7.12	kN
$M_{G;y}$ =	0.08	0.01	0.15	-13.38	-13.00	16.45	-16.45	kNm
N_Q =								kN
$H_{Q;x}$ =								kN
$M_{Q;x}$ =								kNm
$H_{Q;y}$ =								kN
$M_{Q;y}$ =								kNm
d_x =	0.83	0.83	0.83	0.83	0.83	0.83	0.83	m
e_x =								m
d_y =	0.83	0.83	0.83	0.83	0.83	0.83	0.83	m
e_y =								m
Sollecitazioni nel baricentro della fondazione ad imposta plinto								
N_G =	252.10	199.64	309.09	223.92	213.71	145.08	99.63	kN
$H_{G;x}$ =	5.85	10.07	5.32	-0.14	-0.14	7.14	7.14	kN
$M_{G;x}$ =	120.11	131.52	27.72	29.43	29.43	38.63	-17.21	kNm
$H_{G;y}$ =	0.05	0.01	0.10	-7.39	-7.14	7.12	-7.12	kN
$M_{G;y}$ =	0.16	0.03	0.30	-24.47	-23.71	27.12	-27.12	kNm
N_Q =								kN
$H_{Q;x}$ =								kN
$M_{Q;x}$ =								kNm
$H_{Q;y}$ =								kN
$M_{Q;y}$ =								kNm
Sollecitazioni di verifica:								
γ_G =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
γ_Q =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
N_{Ed} =	252.10	199.64	309.09	223.92	213.71	145.08	99.63	kN
$H_{Ed;x}$ =	5.85	10.07	5.32	0.14	0.14	7.14	7.14	kN
$M_{Ed;x}$ =	120.11	131.52	27.72	29.43	29.43	38.63	17.21	kNm
e_x =	0.48	0.66	0.09	0.13	0.14	0.27	0.17	m
B'x =	0.70	0.33	1.47	1.39	1.37	1.12	1.30	m
$H_{Ed;y}$ =	0.05	0.01	0.10	7.39	7.14	7.12	7.12	kN
$M_{Ed;y}$ =	0.16	0.03	0.30	24.47	23.71	27.12	27.12	kNm



= Bx-2ex = larghezza efficace di fondazione

e_y =	0.00	0.00	0.00	0.11	0.11	0.19	0.27	m
B'y =	1.65	1.65	1.65	1.43	1.43	1.28	1.11	m = By-2ey = larghezza efficace di fondazione

CARATTERISTICHE GEOTECNICHE

Comb	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLU-Q19_0.5*S-2+1*Wx-1	SLU-Q20_0.5*S-2+1*Wx-2	SLVMax	SLVMin	
$\gamma_{c'}$ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
$\gamma_{\phi'}$ =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
$\gamma_{R;v}$ =	2.30	2.30	2.30	2.30	2.30	2.30	2.30	
γ_{γ} =	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
c'_k =								= coesione
φ_k =	30.00	30.00	30.00	30.00	30.00	30.00	30.00	= angolo di attrito del terreno
γ_{ak} =	10.00	10.00	10.00	10.00	10.00	10.00	10.00	= peso di volume effettivo dell'acqua di falda
γ_{1k}=	17.00	17.00	17.00	17.00	17.00	17.00	17.00	= peso di volume effettivo del terreno SOPRA il piano di posa
γ_{2k} =	20.00	20.00	20.00	20.00	20.00	20.00	20.00	= peso di volume effettivo del terreno SOTTO il piano di posa
c'_d =								
φ_d =	30°	30°	30°	30°	30°	30°	30°	
γ_{ad} =	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
γ_{1d}=	17.00	17.00	17.00	17.00	17.00	17.00	17.00	
γ_{2d} =	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
z =	6.00	6.00	6.00	6.00	6.00	6.00	6.00	= dislivello tra piano campagna e quota falda
Df =	2.00	2.00	2.00	2.00	2.00	2.00	2.00	= dislivello tra piano campagna e piano di posa
q' =								
q_0=	34.00	34.00	34.00	34.00	34.00	34.00	34.00	= pressione permanente ai bordi della fondazione
B' =	0.70	0.33	1.47	1.39	1.37	1.12	1.11	m
L' =	1.65	1.65	1.65	1.43	1.43	1.28	1.30	m

VERIFICHE GEOTECNICHE

Verifica in direzione

x

Comb	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLU-Q19_0.5*S-2+1*Wx-1	SLU-Q20_0.5*S-2+1*Wx-2	SLVMax	SLVMin	
N_{Ed} =	252.10	199.64	309.09	223.92	213.71	145.08	99.63	kN carico verticale
V_{Ed} =	5.85	10.07	5.32	0.14	0.14	7.14	7.14	kN carico orizzontale direzione x
N_q=	18.40	18.40	18.40	18.40	18.40	18.40	18.40	
N_γ=	22.40	22.40	22.40	22.40	22.40	22.40	22.40	
N_c=	30.14	30.14	30.14	30.14	30.14	30.14	30.14	
s_q=	1.24	1.12	1.52	1.56	1.56	1.51	1.49	coefficienti di forma
s_γ=	0.83	0.92	0.64	0.61	0.61	0.65	0.66	
s_c=s_c^0=	1.26	1.12	1.54	1.59	1.59	1.53	1.52	
m=m^0=	1.70	1.83	1.53	1.51	1.51	1.53	1.46	inclinazione del carico
i_q=	0.96	0.91	0.97	1.00	1.00	0.93	0.90	
i_γ=	0.94	0.86	0.96	1.00	1.00	0.88	0.83	
i_c=								
d_q=	1.36	1.41	1.27	1.28	1.28	1.31	1.29	profondità piano di posa

d_γ=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
$d_c=d_c^0$=	1.49	1.56	1.37	1.39	1.39	1.42	1.40		
ε =									inclinazione piano di posa rispetto l'orizzontale
b_q=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b_γ=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b_c=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
ω =									inclinazione piano campagna rispetto l'orizzontale
g_q=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
g_γ=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
g_c=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Q_{lim}=	1306.07	522.10	3333.86	2851.80	2813.96	1827.97	1783.17	kN	Carico limite
R_d=	567.86	227.00	1449.51	1239.91	1223.46	794.77	775.29	kN	Resistenza di progetto
N_{Ed}=	252.10	199.64	309.09	223.92	213.71	145.08	99.63	kN	carico verticale
Verifica	ok	ok	ok	ok	ok	ok	ok		
CS =	2.25	1.14	4.69	5.54	5.72	5.48	7.78		

Verifica in direzione y

Comb	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLU-Q19_0.5*S-2+1*Wx-1	SLU-Q20_0.5*S-2+1*Wx-2	SLVMax	SLVMin		
NEd =	252.10	199.64	309.09	223.92	213.71	145.08	99.63	kN	carico verticale
VEd =	0.05	0.01	0.10	7.39	7.14	7.12	7.12	kN	carico orizzontale direzione y
N_q=	18.40	18.40	18.40	18.40	18.40	18.40	18.40		
N_γ=	22.40	22.40	22.40	22.40	22.40	22.40	22.40		
N_c=	30.14	30.14	30.14	30.14	30.14	30.14	30.14		
s_q=	1.24	1.12	1.52	1.56	1.56	1.51	1.49		coefficienti di forma
s_γ=	0.83	0.92	0.64	0.61	0.61	0.65	0.66		
$s_c=s_c^0$=	1.26	1.12	1.54	1.59	1.59	1.53	1.52		
$m=m^0$=	1.30	1.17	1.47	1.49	1.49	1.47	1.54		inclinazione del carico
i_q=	1.00	1.00	1.00	0.95	0.95	0.93	0.89		
i_γ=	1.00	1.00	1.00	0.92	0.92	0.88	0.83		
i_c=									
d_q=	1.25	1.25	1.25	1.27	1.27	1.29	1.31		profondità piano di posa
d_γ=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
$d_c=d_c^0$=	1.35	1.35	1.35	1.38	1.38	1.40	1.43		
ε =									inclinazione piano di posa rispetto l'orizzontale
b_q=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b_γ=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
b_c=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
ω =									inclinazione piano campagna rispetto l'orizzontale
g_q=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
g_γ=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
g_c=	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Q_{lim}=	1474.53	666.64	3455.80	2706.52	2669.89	1842.71	1763.16	kN	Carico limite
R_d=	641.10	289.84	1502.52	1176.75	1160.82	801.18	766.59	kN	Resistenza di progetto
N_{Ed}=	252.10	199.64	309.09	223.92	213.71	145.08	99.63	kN	carico verticale

Verifica	ok	ok	ok	ok	ok	ok	ok
CS =	2.54	1.45	4.86	5.26	5.43	5.52	7.69

Riepilogo generale verifiche

Comb	**SLU-Q25_1*S-2+0.6*Wy-5**	**SLU-Q26_0.5*S-2+1*Wy-5**	**SLU-Q6_1*S-1+0.6*Wy-4**	**SLU-Q19_0.5*S-2+1*Wx-1**	**SLU-Q20_0.5*S-2+1*Wx-2**	**SLVMax**	**SLVMin**
Verifica	ok	ok	ok	ok	ok	ok	ok
CS =	2.25	1.14	4.69	5.26	5.43	5.48	7.69

q_{Rd} =	557.78	528.59	619.95	592.61	591.29	561.89	531.54	kN/m²	pressione resistente di progetto
$q_{t,Ed}$ =	219.34	364.08	127.53	112.77	108.86	101.75	69.08	kN/m²	pressioni sul terreno

q_{Rd} =	5.58	5.29	6.20	5.93	5.91	5.62	5.32	kg/cm²	pressione resistente di progetto
$q_{t,Ed}$ =	2.19	3.64	1.28	1.13	1.09	1.02	0.69	kg/cm²	pressioni sul terreno

Verifiche a scorrimento

		M1	
Angolo di attrito terreno	ϕ_k =	30.00	
Angolo di attrito terra-opera	δ_{fond}=	20.00	
Coesione efficace	c'_k =	0.00	kPa
Coesione non drenata	c_{uk} =	0.00	kPa
	$\gamma_{R;h}$ =	1.1	

Tipo	*Comb*	*Azione* ***N*** kN	B' m	L' m	*Resistenza allo scorrimento*	*Azioni sollecitanti* ***Vx*** kN	***Vy*** ***kN***	*Verifica* ***dir x***	***dir y***	*CS* ***dir x***	***dir y***
M1	SLU-Q25_1*S-2+0.6*Wy-5	-252.10	0.84	1.65	83.42	5.85	0.05	ok	ok	14.25	1573.89
M1	SLU-Q26_0.5*S-2+1*Wy-5	-199.64	0.64	1.65	66.06	10.07	0.01	ok	ok	6.56	6865.16
M1	SLU-Q6_1*S-1+0.6*Wy-4	-309.09	1.57	1.65	102.27	5.32	0.10	ok	ok	19.24	1022.71
M1	SLU-Q19_0.5*S-2+1*Wx-1	-223.92	1.38	1.43	74.09	0.14	7.39	ok	ok	544.78	10.02
M1	SLU-Q20_0.5*S-2+1*Wx-2	-213.71	1.37	1.43	70.71	0.14	7.14	ok	ok	519.96	9.91
M1	SLVMax	-145.08	1.12	1.28	48.00	7.14	7.12	ok	ok	6.72	6.75
M1	SLVMin	-99.63	0.87	1.11	32.97	7.14	7.12	ok	ok	4.62	4.63

Verifiche a ribaltamento

Comb	*Azione* ***N***	*Mstab* ***MRdx***	***MRdy***	*Mrib* ***MEd,x***	***MEd,y***	*Verifica* ***dir x***	***dir y***	*CS* ***dir x***	***dir y***
SLU-Q25_1*S-2+0.6*Wy-5	-252.10	207.98	207.98	120.11	0.16	ok	ok	1.73	1295.05
SLU-Q26_0.5*S-2+1*Wy-5	-199.64	164.70	164.70	131.52	0.03	ok	ok	1.25	5653.42

SLU-Q6_1*S-1+0.6*Wy-4	-309.09	255.00	255.00	27.72	0.30	ok	ok	9.20	841.01
SLU-Q19_0.5*S-2+1*Wx-1	-223.92	184.73	184.73	29.43	24.47	ok	ok	6.28	7.55
SLU-Q20_0.5*S-2+1*Wx-2	-213.71	176.31	176.31	29.43	23.71	ok	ok	5.99	7.44
SLVMax	-145.08	119.69	119.69	38.63	27.12	ok	ok	3.10	4.41
SLVMin	-99.63	82.20	82.20	17.21	27.12	ok	ok	4.78	3.03

9.1.3 *Verifiche strutturali*

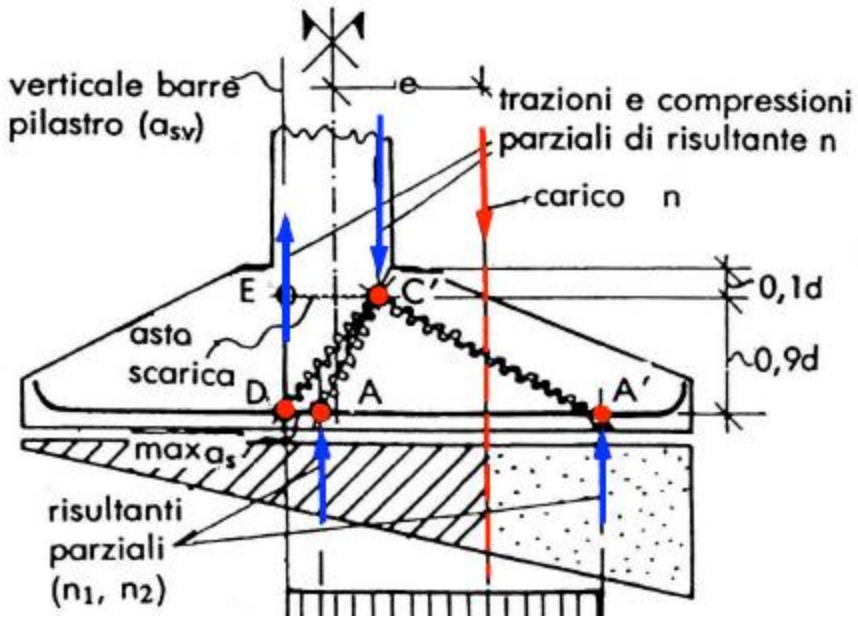
CARATTERISTICHE GEOMETRICHE E DEI MATERIALI

f_{ck} =	25	N/mmq	γc =	1.5	
α_{cc} =	0.85		f_{cd} =	14.17	N/mmq
ACCIAIO	B450C		f_{yk} =	450	N/mmq
γs =	1.15		f_{yd} =	391	N/mmq

DIMENSIONI PLINTO			DIMENSIONI COLONNA				
Bx =	1.65	m	bx =	0.58	m	Bx/6	0.275 m
By =	1.65	m	by =	0.58	m	By/6	0.275 m
H =	1.50	m	d.x =	0.5394	m		
Dx =	1.452	m	dc.x =	0.124	m		
Dy =	1.436	m	d.y =	0.5394	m		
Wx =	0.749	m³	dc.y =	0.124	m		
Wy =	0.749	m³	wx =	0.033	m³		
			wy =	0.033	m³		

ARMATURA - a	n°	ϕ1	n°	ϕ2	mm²	c [mm]
arm. superiore (compr.)	0	0	8	16	1608	40
arm. inferiore (tesa)	0	0	8	16	1608	40

ARMATURA - b	n°	ϕ1	n°	ϕ2	mm²	c [mm]
arm. superiore (compr.)	0	0	8	16	1608	56
arm. inferiore (tesa)	0	0	8	16	1608	56



SOLLECITAZIONI

	SLU-Q25_	SLU-Q26_	SLU-Q6_1	SLU-Q19_	SLU-Q20_	SLVMax	SLVMin	0
N_{ed} [kN]	150.01	97.54	206.99	121.83	111.62	42.98	-2.46	100.00
$H_{Ed;x}$ [kN]	5.85	10.07	5.32	0.14	0.14	7.14	7.14	0.00
$M_{Ed;x}$ [kNm]	120.11	131.52	27.72	29.43	29.43	38.63	17.21	0.00
e_x [m]	0.47643	0.66	0.09	0.13	0.14	0.27	0.17	0.00
B'x [m]	0.70	0.33	1.47	1.39	1.37	1.12	1.30	1.65
$H_{Ed;y}$ [kN]	0.05	0.01	0.10	7.39	7.14	7.12	7.12	0.00
$M_{Ed;y}$ [kNm]	0.16	0.03	0.30	24.47	23.71	27.12	27.12	0.00
e_y [m]	0.00	0.00	0.00	0.11	0.11	0.19	0.27	0.00
B'y [m]	1.65	1.65	1.65	1.43	1.43	1.28	1.11	1.65

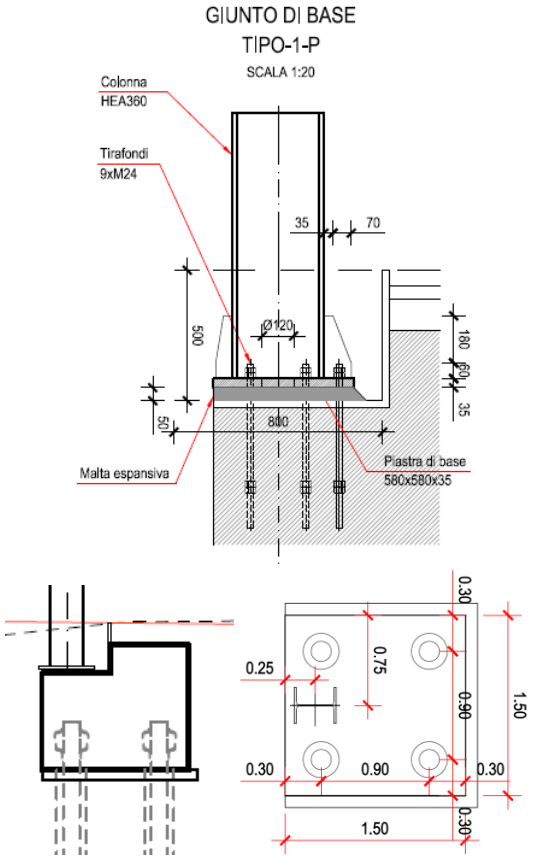
VERIFICA LATO x

B [m]	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	Base fondazione
L [m]	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	Profondità fondazione
D [m]	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	Altezza utile fondazione
W [m³]	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	Modulo di resistenza fondazione
b [m]	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	Base pilastro
l [m]	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	Profondità pilastro
e [m]	0.48	0.66	0.09	0.13	0.14	0.27	0.17	0.00	eccentricità
d [m]	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	altezza utile trazioni pilastro
dc [m]	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	distanza centro compressioni pilastro da
ξ.C [m]	0.659	0.659	0.659	0.659	0.659	0.659	0.659	0.659	distanza dal lembo più sollecitato del no
σN [kN/m²]	55.10	35.83	76.03	44.75	41.00	15.79	-0.90	36.73	tensione sforzo assiale
σM [kN/m²]	160.43	175.67	37.03	39.30	39.30	51.60	22.98	0.00	tensione momento
σ+ [kN/m²]	215.53	211.50	113.06	84.05	80.30	67.39	22.08	36.73	tensione massima
σ- [kN/m²]	-105.33	-139.84	39.00	5.45	1.70	-35.81	-23.89	36.73	tensione minima
FOND. parzializz	1	1	0	0	0	1	1	0	fondazione a sezione parzializzata?
a.neg [m]	0.542	0.657	0.000	0.000	0.000	0.573	0.857	0.000	tratto di fondazione a tensioni negative
σ.1-2 [kN/m²]	147.7	176.1	80.1	51.0	47.6	32.4	3.9	36.7	tensione in corrispondenza della divisio
N1 [kN]	104.47	53.14	117.15	77.28	72.50	46.02	13.99	50.00	Risultante trapezio tensioni
ξ.N1 [m]	0.16	0.08	0.35	0.32	0.31	0.25	0.25	0.41	distanza dal lembo più sollecitato della r
αN1 [°]	69.2	66.1	76.6	75.4	75.2	72.5	72.6	79.3	inclinazione risultante 1
C1 [kN]	111.7	58.1	120.4	79.9	75.0	48.3	14.7	50.9	Puntone 1
T1 [kN]	39.6	23.5	28.0	20.1	19.1	14.5	4.4	9.4	Tirante 1
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	6%	4%	4%	3%	3%	2%	1%	1%	tasso di lavoro
N2 [kN]	92.61	120.17	89.84	44.54	39.12	13.88	0.45	50.00	Risultante trapezio tensioni
ξ.N2 [m]	0.6018	0.442	1.140	1.043	1.019	0.732	0.699	1.238	distanza dal lembo più sollecitato della r
αN2 [°]	87.5	80.6	-69.8	-73.6	-74.6	-86.8	-88.2	-66.1	inclinazione risultante 2
C2 [kN]	92.7	121.8	95.7	46.4	40.6	13.9	0.5	54.7	Puntone 2
T2 [kN]	4.1	20.0	33.1	13.1	10.8	0.8	0.0	22.1	Tirante 2
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	1%	3%	5%	2%	2%	0%	0%	4%	tasso di lavoro

VERIFICA LATO y									
B [m]	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	Base fondazione
L [m]	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	Profondità fondazione
D [m]	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	Altezza utile fondazione
W [m³]	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	Modulo di resistenza fondazione
b [m]	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	Base pilastro
l [m]	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	Profondità pilastro
e [m]	0.00	0.00	0.00	0.11	0.11	0.19	0.27	0.00	eccentricità
d [m]	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	altezza utile trazioni pilastro
dc [m]	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	distanza centro compressioni pilastro da
ξ.C [m]	0.659	0.659	0.659	0.659	0.659	0.659	0.659	0.659	distanza dal lembo più sollecitato del no
σN [kN/m²]	55.10	35.83	76.03	44.75	41.00	15.79	-0.90	36.73	tensione sforzo assiale
σM [kN/m²]	0.21	0.04	0.40	32.68	31.66	36.23	36.23	0.00	tensione momento
σ+ [kN/m²]	55.31	35.87	76.44	77.43	72.66	52.02	35.33	36.73	tensione massima
σ- [kN/m²]	54.89	35.79	75.63	12.07	9.34	-20.44	-37.13	36.73	tensione minima
FOND. parzializz	0	0	0	0	0	1	1	0	fondazione a sezione parzializzata?
a.neg [m]	0.000	0.000	0.000	0.000	0.000	0.465	0.846	0.000	tratto di fondazione a tensioni negative
σ.1-2 [kN/m²]	55.1	35.8	76.0	49.1	45.3	24.0	11.1	36.7	tensione in corrispondenza della divisio
N1 [kN]	75.09	48.79	103.65	74.70	69.47	40.01	21.15	50.00	Risultante trapezio tensioni
ξ.N1 [m]	0.41	0.41	0.41	0.33	0.33	0.28	0.23	0.41	distanza dal lembo più sollecitato della r
αN1 [°]	79.2	79.2	79.2	75.8	75.7	73.6	71.6	79.2	inclinazione risultante 1
C1 [kN]	76.5	49.7	105.5	77.1	71.7	41.7	22.3	50.9	Puntone 1
T1 [kN]	14.4	9.3	19.8	19.0	17.7	11.7	7.1	9.5	Tirante 1
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	2%	1%	3%	3%	3%	2%	1%	2%	tasso di lavoro
N2 [kN]	74.92	48.75	103.34	47.13	42.15	10.82	2.29	50.00	Risultante trapezio tensioni
ξ.N2 [m]	1.2369	1.2374	1.2366	1.0886	1.0794	0.8202	0.6366	1.2375	distanza dal lembo più sollecitato della r
αN2 [°]	-65.9	-65.9	-65.9	-71.6	-72.0	-82.9	89.0	-65.9	inclinazione risultante 2
C2 [kN]	82.1	53.4	113.2	49.7	44.3	10.9	2.3	54.8	Puntone 2
T2 [kN]	33.5	21.8	46.2	15.7	13.7	1.3	0.0	22.4	Tirante 2
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	5%	3%	7%	2%	2%	0%	0%	4%	tasso di lavoro

9.2 TIPO 1-P – FONDAZIONI PROFONDE SU PLINTO ZOPPO

La colonna ha piano di imposta a quota z = -0.5 m dalla quota di calpestio finita, ed entra con un dettaglio a bicchiere nel plinto per 30 cm come indicato nella figura seguente.



Il plinto di testa ha dimensioni 1.5 x 1.5 m in pianta e 1 m in altezza (misurata da quota di imposta colonna a quota estradosso magrone). Considerando la porzione non strutturale attorno al giunto a bicchiere, il plinto ha una profondità lorda di 1.8 m.
La fondazione si compone di N.4 micropali di lunghezza L = 10 m ad interasse i = 900 mm a distanza c = 300 mm dal bordo, del diametro di Ø300 mm con camicia metallica Ø168.3 sp. 6.3 mm S355.

9.2.1 Sollecitazioni

Si riportano le azioni alla base del pilastro più sollecitato, alle quali va aggiunto il peso proprio del plinto e dei pali di fondazione.

TABLE: Joint Reactions

Joint	OutputCase	CaseType	StepType	F1	F2	F3	M1	M2	M3
10	SLE.f-Q19-f_0.2*Wx-1	Combination		-1.0	0.0	58.4	0.0	-1.8	0.0
10	SLE.f-Q20-f_0.2*Wx-2	Combination		-1.0	0.0	57.0	0.0	-1.7	0.0
10	SLE.f-Q25-f_0.2*Wy-5	Combination		0.0	-1.4	55.1	11.6	0.0	0.0
10	SLE.f-Q7-f_0.2*S-2	Combination		0.0	0.0	69.7	7.9	0.0	0.0
10	SLE.qp	Combination		0.0	0.0	58.2	0.0	0.0	0.0
10	SLE.r-Q19_0.5*S-2+1*Wx-1	Combination		-4.9	0.1	88.1	19.8	-8.9	0.0
10	SLE.r-Q20_0.5*S-2+1*Wx-2	Combination		-4.8	0.1	81.3	19.8	-8.7	0.0
10	SLE.r-Q25_1*S-2+0.6*Wy-5	Combination		0.0	-3.9	106.9	74.2	0.1	0.0

10	SLE.r-Q26_0.5*S-2+1*Wy-5	Combination		0.0	-6.7	71.9	77.6	0.0	0.0
10	SLU-Q19_0.5*S-2+1*Wx-1	Combination		-7.4	0.1	121.8	29.6	-13.4	0.0
10	SLU-Q20_0.5*S-2+1*Wx-2	Combination		-7.1	0.1	111.6	29.6	-13.0	0.0
10	SLU-Q25_1*S-2+0.6*Wy-5	Combination		0.1	-5.9	150.0	111.3	0.1	0.0
10	SLU-Q26_0.5*S-2+1*Wy-5	Combination		0.0	-10.1	97.5	116.4	0.0	0.0
10	SLU-Q6_1*S-1+0.6*Wy-4	Combination		0.1	-5.3	207.0	19.7	0.2	0.0
10	SLV	Combination	Max	7.1	7.1	43.0	27.9	16.5	0.0
10	SLV	Combination	Min	-7.1	-7.1	-2.5	-27.9	-16.5	0.0

9.2.2 *Verifiche geotecniche*

STRATIGRAFIA

Descrizione	strato	$q_{sup.}$ strato [m]	quota base strato	H strato	γ_k [t/mc]	γ'_k [t/mc]	ϕ_k [°]	$Cu_{,k}$ [t/mq]
I	1	0.00	-2.00	2	1.70	1.70	22	
II	2	-2.00	-6.00	4	2.00	2.00	30	
II-w	3	-6.00	-20.00	14	2.00	1.00	30	
	4	-20.00	inf.	inf.		-1.00		
	5		inf.	inf.		0.00		
	6		inf.	inf.		0.00		
	7		inf.	inf.		0.00		
	8		inf.	inf.		0.00		
	9		inf.	inf.		0.00		
	10		inf.	inf.		0.00		
	11		inf.	inf.		0.00		

quota falda q_f = -6.00 m.s.m.m. (o rispetto p.c.) falda presente

CARATTERISTICHE DEL PALO

D = 0.30 m diametro palo — q_t = -1.00 m.s.m.m. (o rispetto p.c.) quota testa palo

L_{palo} = 10.00 m lunghezza palo — q_b = -11.00 m.s.m.m. (o rispetto p.c.) quota base palo

q' = 0 t/mq carico su p.c. — γ_{palo} = 2.50 t/mc — W_{palo} = 1.77 t

CALCOLO DELLA PORTANZA DEL PALO SOGGETTO A CARICHI ASSIALI

γ_γ = 1.00 $\gamma_{c'}$ = 1.00 γ_{cu} = 1.00 $\gamma_{\phi'}$ = 1.00

PORTATA LATERALE

strato	H strato	γ' [t/mc]	σ_v [t/mq]	As [mq]	ϕ [°]	μ	k	Cu [t/mq]	α	Rs [t]
1	1.00	1.70	2.55	0.94	22	0.40	0.55	0.00	0.00	0.53
2	4.00	2.00	7.40	3.77	30	0.58	0.55	0.00	0.00	8.86
3	5.00	1.00	13.90	4.71	30	0.58	0.55	0.00	0.00	20.80
4	0.00	0.00	16.40	0.00	0	0.00	0.55	0.00	0.00	0.00
5	0.00	0.00	16.40	0.00	0	0.00	0.55	0.00	0.00	0.00
6	0.00	0.00	16.40	0.00	0	0.00	0.55	0.00	0.00	0.00
7	0.00	0.00	16.40	0.00	0	0.00	0.55	0.00	0.00	0.00
8	0.00	0.00	16.40	0.00	0	0.00		0.00	0.00	0.00

9	0.00	0.00	16.40	0.00	0	0.00		0.00	0.00	0.00
10	0.00	0.00	16.40	0.00	0	0.00		0.00	0.00	0.00
11	0.00	0.00	16.40	0.00	0	0.00		0.00	0.00	0.00
									$R_{s;tot}$ =	**30.19**

PORTATA DI PUNTA

tipo terreno incoerente	γ' [t/mc]	Ap [mq]	$\sigma_{v,b}$ [t/mq]	terreno incoerente		terreno coerente		R_b [t]
				ϕ [°]	Nq	α	Cu [t/mq]	
	1.00	0.07	16.40	27.00	6.61	9.00	0.00	**7.66**

modifica paramenti alla punta: Δϕ [°] = -3 ; ΔCu [t/mq] = 0

CAPACITA' PORTANTE DEL PALO SINGOLO

n° verticali indagate: 1 ; fattore di correlazione: ζ_3 = 1.70 ; ζ_4 = 1.70

$$R_{s,tot} = \sum_{i=1}^{N} A_{lat,i}\,(k\mu\sigma'_{vz} + \alpha c)_i$$
$$R_b = A_b\,(N_q\sigma'_{vb} + \alpha c)$$

	Pali trivellati		
	R1	R2	R3
$\gamma_{R;base}$ =	1.00	1.70	1.35
$\gamma_{R;lat;c}$ =	1.00	1.45	1.15
$\gamma_{R;lat;t}$ =	1.00	1.60	1.25
$R_{c,d}$ = $(R_{s,tot}/\gamma_{R;lat;c}+R_b/\gamma_{R;base})/\zeta_4$ =	**22.27**	**14.90**	**18.78**
$R_{t,d}$ = $R_{s,tot}/\gamma_{R;lat;t}/\zeta_4+W_{palo}$ =	**19.53**	**12.87**	**15.98**

VERIFICA CAPACITA' PORTANTE DELLA PALIFICATA

PALO n°	COMB.	Tipo	N_{Ed} [t]	R_d [t]	Fs	tipo di verifica	coeff. rid. gruppo
1	SLU-Q25_1*S-2+0.6*Wy-5	A1-M1	-14.61	18.78	1.29	R3	1.00
2	SLU-Q26_0.5*S-2+1*Wy-5	A1-M1	-0.64	18.78	29.15	R3	1.00
3	SLV	SLV-M1	-7.14	18.78	2.63	R3	1.00
4	SLV	SLV-M1	-1.07	18.78	17.58	R3	1.00

RESISTENZA DI PALI INCASTRATI IN TESTA SOGGETTI A CARICHI TRASVERSALI

Secondo quanto indicato dalle NTC 2008 deve essere verificata la seguente disuguaglianza:

$$F_{tRd} \leq R_{tRd}$$

dove:

F_{tRd} è il carico orizzontale massimo agente in testa al palo per la combinazione peggiorativa;

R_{tRd} è la resistenza di progetto agli SLU del singolo palo.

Tale resistenza deve essere calcolata con il seguente procedimento:

$R_{tRd} = R_{tRk} / \gamma_T$ dove:

$R_{tRk} = R_{tRcal} / \xi =$ resistenza caratteristica ai carichi orizzontali

$\gamma_T =$ coefficiente di sicurezza parziale per le verifiche agli SLU

da cui :

$R_{tRd} = R_{tRcal} / (\xi \times \gamma_T) = R_{tRcal} / Fs$

Per la determinazione del valore di progetto $R_{tr,d}$ della resistenza di pali soggetti a carichi trasversali valgono le indicazioni del § 6.4.3.1.1, applicando i coefficienti parziali γ_T della Tab. 6.4.VI.

Tabella 6.4.VI - Coefficienti parziali γ_T per le verifiche agli stati limite ultimi di pali soggetti a carichi trasversali:

coeff. parziale **(R1)**	coeff. parziale **(R2)**	coeff. parziale **(R3)**
γ_T =1,0	γ_T =1,6	γ_T =1,3

$R_{t,cal}$ rappresenta la resistenza di calcolo del palo ai carichi orizzontali H_{lim} valutata in accordo alla teoria proposta da Broms (1984).

Le ipotesi assunte da Broms sono le seguenti:

- Terreno omogeneo;
- Comportamento dell'interfaccia palo-terreno di tipo rigido-perfettamente plastico;
- la forma del palo è ininfluente e l'interazione palo-terreno è determinata solo dalla dimensione caratteristica D della sezione del palo (il diametro per sezioni circolari, il lato per sezioni quadrate, etc.) misurata normalmente alla direzione del movimento;
- il palo ha comportamento rigido-perfettamente plastico, cioè si considerano trascurabili le deformazioni elastiche del palo.

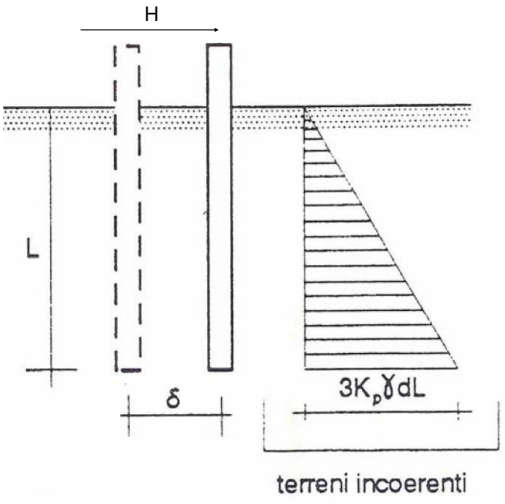
Questa ultima ipotesi comporta che il palo abbia solo moti rigidi finchè non si raggiunge il momento di plasticizzazione M_y del palo. A questo punto si ha la formazione di una cerniera plastica in cui la rotazione continua indefinitamente con momento costante.

In accordo alla condizione di vincolo dei pali nei plinti di fondazione, il palo è considerato impedito di ruotare in testa.

Terreno a comportamento incoerente

Per un terreno incoerente si assume che la resistenza opposta dal terreno alla traslazione del palo vari linearmente con la profondità con legge:

$$p = 3\ k_p \times \gamma \times Z \times D$$



I valori del carico limite corrispondenti ai diversi meccanismi di rottura sono di seguito riportati:

$$H_{lim} = 1{,}50 \cdot k_p \cdot \gamma \cdot D^3 \cdot \left(\frac{L}{D}\right)^2$$ palo corto

$$H_{lim} = \frac{1}{2} \cdot k_p \cdot \gamma \cdot D^3 \cdot \left(\frac{L}{D}\right)^2 + \frac{M_y}{L}$$ palo intermedio

$$H_{lim} = k_p \cdot \gamma \cdot D^3 \cdot \sqrt[3]{\left(3{,}676 \cdot \frac{M_y}{k_p \cdot \gamma \cdot D^4}\right)}$$ palo lungo

Nel caso di palo scalzato e per il caso di palo lungo, il valore di H_{lim} si ottiene risolvendo il seguente sistema di equazioni:

$$H_{lim} = 1{,}50 \cdot k_p \cdot \gamma \cdot D \cdot f^2$$

$$f^3 + 1{,}50 \cdot D \cdot f^2 - \left(\frac{2 \cdot M_y}{\gamma \cdot k_p \cdot D}\right) = 0$$

essendo: f = profondità dal piano campagna della cerniera plastica.

DATI DI INPUT:

L =	10.00	m	lunghezza del palo
d =	0.30	m	diametro del palo
My =	55.93	kNm	momento di plasticizzazione della sezione
φ' =	29	°	angolo di attrito del terreno
kp =	2.91		coeff. di spinta passiva (kp = (1+sinφ')/(1-sinφ'))
c_u =	0.00	kN/m^2	resistenza al taglio non-drenata
γ =	17.00	kN/m^3	peso di unità di volume del terreno (se è presente la falda γ = γ')
n =	1		numero di verticali indagate
ξ =	1.7		fattore di correlazione per la determinazione della Res. Caratt.

Fs = coefficiente di sicurezza

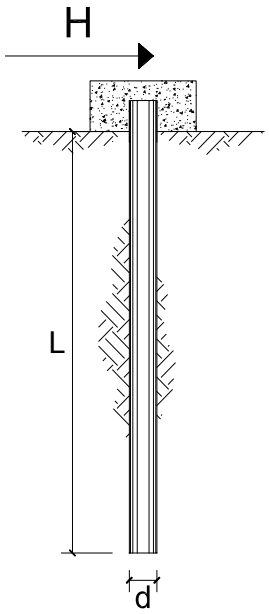
γ_T = coefficiente parziale per le verifiche agli SLU

Le azioni agenti in testa al palo sono le seguenti:

Comb	H kN	γ_T	Fs
A1+M1+R3 Q26_0.5*S-2+1*	2.52	1.3	2.21

CARICO LIMITE ORIZZONTALE DI UN PALO IN TERRENI INCOERENTI
PALI CON ROTAZIONE IN TESTA IMPEDITA

TEORIA DI BASE - TENSIONI EFFICACI :
(Broms, 1964)



H = carico limite orizzontale = F_{tRd}

Palo corto:
$$H = 1.5 k_p \gamma d^3 \left(\frac{L}{d}\right)^2$$

Palo intermedio:
$$H = \frac{1}{2} k_p \gamma d^3 \left(\frac{L}{d}\right)^2 + \frac{M_y}{L}$$

Palo lungo:
$$H = k_p \gamma d^3 \sqrt[3]{\left(3.676 \frac{M_y}{k_p \gamma d^4}\right)^2}$$

Dalle caratteristiche geometriche in oggetto si ha:

Palo corto:
H1 = 2 222.46 kN
Palo intermedio:
H2 = 746.41 kN
Palo lungo:
H3 = 85.56 kN

H lim = min(H1, H2, H3) = 85.56 kN palo lungo

Comb	H kN	$H_{tr,d}$ kN	Fs
A1+M1+R3 Q26_0.5*S-2+1*	2.52	38.71	15.36

CEDIMENTI DEI PALI DI FONDAZIONE

PALO SINGOLO

Il calcolo del cedimento del singolo palo viene condotto mediante i grafici proposti da Poulos Davis nel riferimento bibliografico “Elastic solutions for soil and rock mechanics”.

Conoscendo la lunghezza del palo, il suo diametro, i carichi applicati sui singoli pali, e le ca-ratteristiche del terreno si procede al calcolo del cedimento secondo la formula nel seguito proposta e con il grafico riportato.

La formula generica è pari a:

$$\rho = \frac{P \cdot I_P}{L \cdot E_S} \qquad K = \frac{E_P}{E_S}$$

Dove E_p, E_s rappresentano i moduli elastici del palo e del terreno, P il carico applicato ed L la lunghezza del palo.

P =	86	kN	carico verticale applicato	SLE.r-Q25_1*S-2+0.6*Wy-5	
L =	10.00	m	lunghezza del palo		
D =	0.30	m	diametro palo		
E_s =	40	MPa	modulo di elasticità del terreno (in corrispondenza della punta del palo)		
E_p =	31 447	MPa	modulo di elasticità del palo		
L / D =	33.3	-	si assume	L/D=	25
K = E_p/E_s =	786	-			
ν =	0.5	-	coefficiente di Poisson, si assume a favore di sicurezza ν =	0.5	
Ip =	2.2	-	(da grafico)		
ρ =	0.47	mm	cedimento testa palo	ρ / D =	0.002

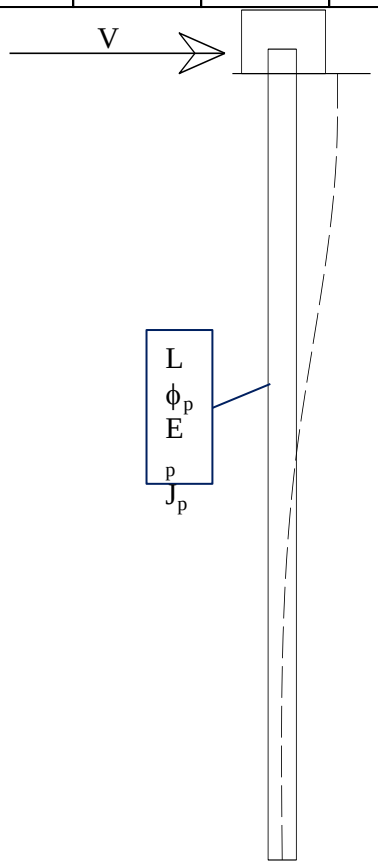
Il valore risulta compatibile con le esigenze strutturali.

9.2.3 *Verifiche strutturali*

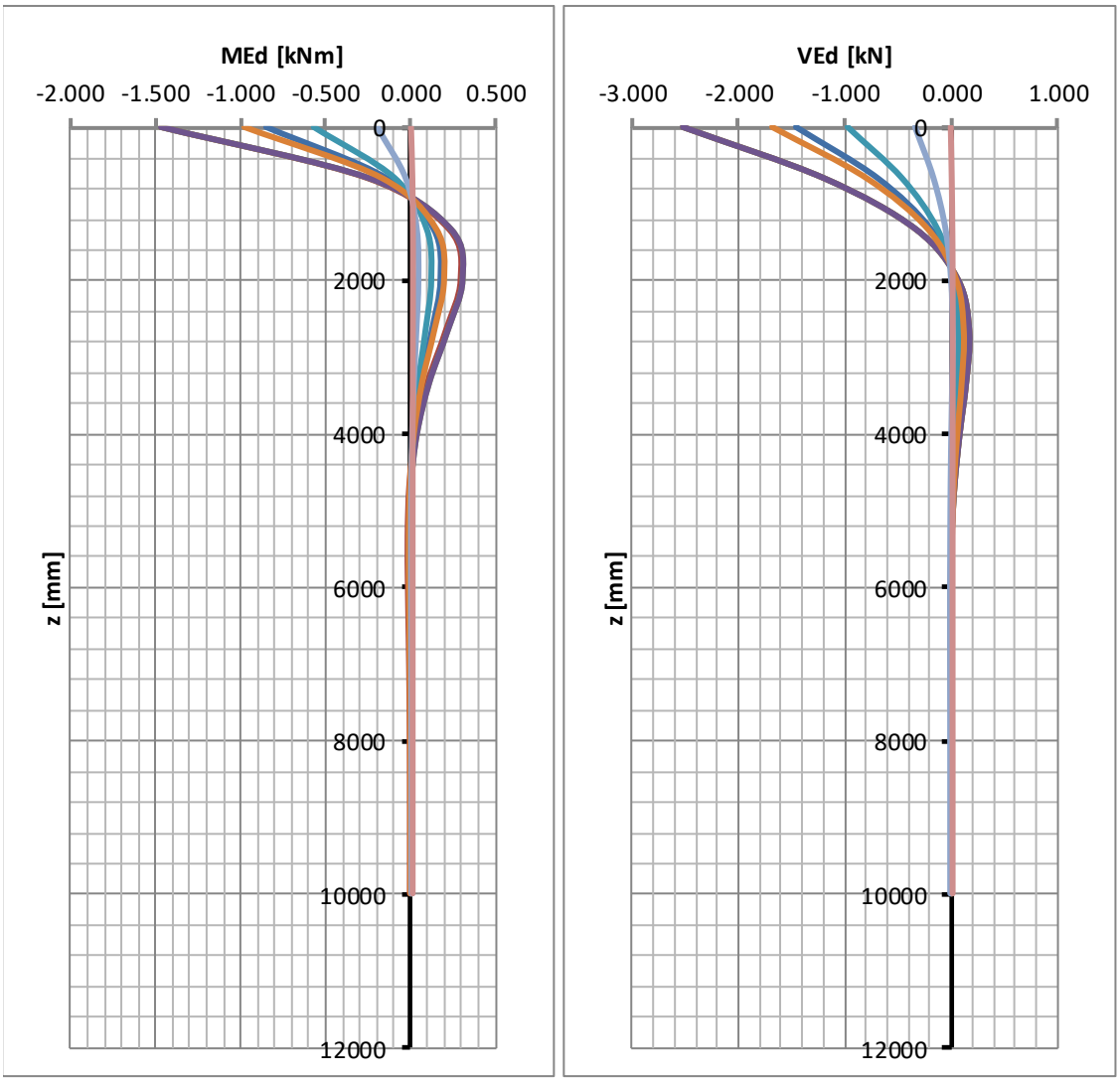
PALO IN TERRENO ALLA WINKLER VINCOLATO IN TESTA ALLA ROTAZIONE SOGGETTO A FORZA ORIZZONTALE A TESTA PALO

ϕ_p =	300	mm	diametro palo
E_p =	31 447	N/mm²	modulo elastico palo
J_p =	397607820	mm^4	momento d'inerzia del palo
k =	0.09	N/mm³	costante di sottofondo
λ =	1167	mm	lunghezza caratteristica o lunghezza d'onda
L =	10000	mm	lunghezza palo

AZIONI								
	SLU A1-M1		SLV-M1		SLE RARA		SLE FREQ	SLE QPER
Comb.	25_1*S-2+0.26_0.5*S-2+		SLV	SLV	25_1*S-2+0.26_0.5*S-2+		-Q25-f_0.2*	SLE.qp
V_{Ed} [kN]	1.46	2.52	2.52	2.52	0.98	1.68	0.34	0.00



SOLLECITAZIONI MASSIME								
Comb.	25_1*S-2+0.26_0.5*S-2+		SLV	SLV	25_1*S-2+0.26_0.5*S-2+		-Q25-f_0.2*	SLE.qp
$V_{Ed,max}$	1.46	2.52	2.52	2.52	0.98	1.68	0.34	0.00
$M_{Ed,max}$	0.85	1.47	1.47	1.47	0.57	0.98	0.20	0.00
w_{max}	0.05	0.08	0.08	0.08	0.03	0.05	0.01	0.00


MEd [kNm]
-2.000
-1.500
-1.000
-0.500
0.000
0.500
0
2000
4000
6000
8000
10000
12000
z [mm]
VEd [kN]
-3.000
-2.000
-1.000
0.000
1.000
0
2000
4000
6000
8000
10000
12000
z [mm]

Verifica di instabilità a flessione e compressione assiale

Si esegue la verifica a flessione e compressione assiale dell'asta, controllando inoltre che l'instabilità non sia una potenziale causa di collasso.

Le massime sollecitazioni agenti valgono:

N_{Ed} =	123.16	kN	azione assiale di progetto
$M_{y,Ed}$ =	1.47	kNm	momento flettente attorno all'asse y-y di progetto
$M_{z,Ed}$ =	0.00	kNm	momento flettente attorno all'asse z-z di progetto
$V_{y,Ed}$ =	2.52	kN	azione tagliante di progetto lungo l'asse y
$V_{z,Ed}$ =	0.00	kN	azione tagliante di progetto lungo l'asse z

Le sollecitazioni risultanti sono quindi:

N_{Ed} =	123.16	kN	
M_{Ed} =	1.47	kNm	
V_{Ed} =	2.52	kN	
ΔM_{Ed} =	0.00	kNm	momento flettente aggiuntivo per sezioni di classe 4
e_N =	0	mm	eccentricità del baricentro della sezione efficace

La sezione oggetto delle verifiche è costituito da un tubo tondo 168.3x6.3 dalle seguenti caratteristiche:

Caratteristiche geometriche della sezione

A =	3206	mm²	A_v =	2041	mm²	A_{eff} =	3206	mm²
d =	168.3	mm	t =	6.3	mm	classe =	3	
W_{pl} =	165421	mm³	W_{el} =	125184	mm³	W_{eff} =	125184	mm³
L_0 =	10000	mm	I =	10534205	mm4	i =	57	mm

Caratteristiche del materiale

f_y =	355	MPa	E =	210000	MPa	G =	80769	MPa
γ_{M0} =	1.05		γ_{M1} =	1.05				

Resistenze caratteristiche e di progetto:

N_{Rk} =	$A \bullet f_y$ =	1138.24	kN		
N_{Rd} =	$A \bullet f_y / \gamma_{M0}$ =	1084.04	kN		0
M_{Rk} =	$W \bullet f_y$ =	44.44	kNm		
M_{Rd} =	$W \bullet f_y / \gamma_{M0}$ =	42.32	kNm		
$V_{pl,Rd}$ =	$A_v \bullet (f_y/\sqrt{3}) / \gamma_{M0}$ =	398.44	kN	>	V_{Ed}

Verifica di resistenza per flessione e compressione

0,50 $V_{pl,Rd}$ =	199.22	kN	>	V_{Ed}	

l'effetto dell'azione tagliante può essere trascurato nella valutazione del momento resistente della sezione

$N_{Ed}/N_{Rd}+(M_{Ed}+\Delta M_{Ed})/M_{Rd}$ = 0.148 < 1

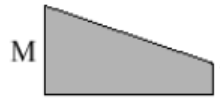
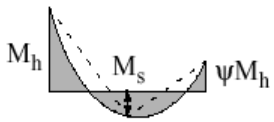
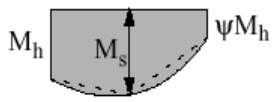
Verifica di instabilità per flessione e compressione

$N_{Ed}/(\chi N_{Rk}/\gamma_{M1})+k_{yy}(M_{Ed}+\Delta M_{Ed})/(M_{Rk}/\gamma_{M1})$ = 0.73 < 1

dove:

W =	[mm³]	125184
χ =	$1/[\phi+(\phi^2-\underline{\lambda}^2)^{0,5}]$=	0.16
ϕ =	$0,50 \bullet [1+\alpha \bullet (\underline{\lambda}-0,2)+\underline{\lambda}^2]$=	3.62
α =		0.49
curva =		c
$\underline{\lambda}$ =	$\lambda/\lambda_1 [\beta]^{0,5}$ =	2.28
λ_i =	$L_{0,i}/i_i$ =	174.46
λ_{1i} =	$93,9\ \varepsilon$	76.40
ε =	$(235/f_y)^{0,5}$ =	0.81
k_{yy} =		0.00
ψ_i =	coeff. di variazione M flettente	1.00
C_{mi} =		1.00 variazione del momento lineare?

Table B.3: Equivalent uniform moment factors C_m in Tables B.1 and B.2

Moment diagram	range		C_{my} and C_{mz} and C_{mLT}	
			uniform loading	concentrated load
	$-1 \le \psi \le 1$		$0,6 + 0,4\psi \ge 0,4$	
 $\alpha_s = M_s/M_h$	$0 \le \alpha_s \le 1$	$-1 \le \psi \le 1$	$0,2 + 0,8\alpha_s \ge 0,4$	$0,2 + 0,8\alpha_s \ge 0,4$
	$-1 \le \alpha_s < 0$	$0 \le \psi \le 1$	$0,1 - 0,8\alpha_s \ge 0,4$	$-0,8\alpha_s \ge 0,4$
		$-1 \le \psi < 0$	$0,1(1-\psi) - 0,8\alpha_s \ge 0,4$	$0,2(-\psi) - 0,8\alpha_s \ge 0,4$
 $\alpha_h = M_h/M_s$	$0 \le \alpha_h \le 1$	$-1 \le \psi \le 1$	$0,95 + 0,05\alpha_h$	$0,90 + 0,10\alpha_h$
	$-1 \le \alpha_h < 0$	$0 \le \psi \le 1$	$0,95 + 0,05\alpha_h$	$0,90 + 0,10\alpha_h$
		$-1 \le \psi < 0$	$0,95 + 0,05\alpha_h(1+2\psi)$	$0,90 - 0,10\alpha_h(1+2\psi)$

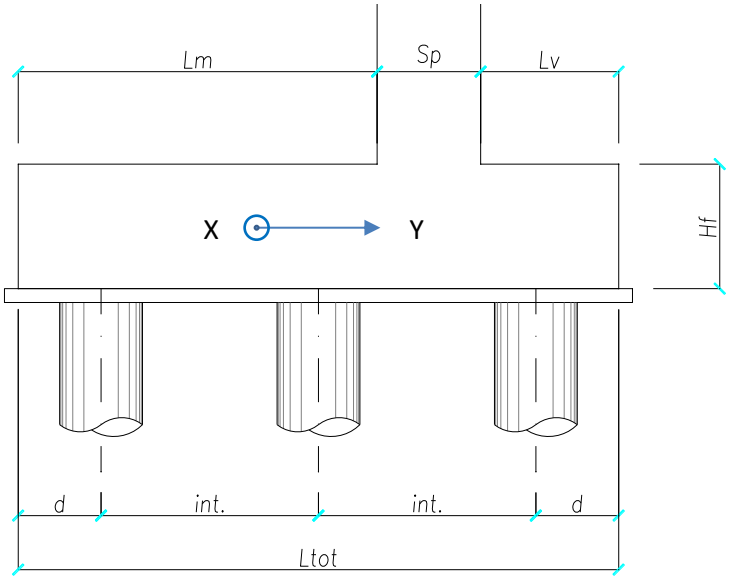
For members with sway buckling mode the equivalent uniform moment factor should be taken $C_{my} = 0,9$ or $C_{Mz} = 0,9$ respectively.

C_{my} , C_{mz} and C_{mLT} should be obtained according to the bending moment diagram between the relevant braced points as follows:

moment factor	bending axis	points braced in direction
C_{my}	y-y	z-z
C_{mz}	z-z	y-y
C_{mLT}	y-y	y-y

VERIFICA DEL PLINTO DI FONDAZIONE

Caratteristiche geometriche



fusto spalla

Sp =	0.35	m	spessore paramento verticale

plinto

L_m =	1.08	m	sbalzo lato monte
L_v =	0.08	m	sbalzo lato valle
B_{tot} =	1.50	m	dimensione trasversale plinto
L_{tot} =	1.50	m	dimensione longitudinale plinto
Hf =	1.00	m	altezza plinto
dx =	0.30	m	distanza dal bordo del palo lungo x
dy =	0.30	m	distanza dal bordo del palo lungo y
int,x =	0.90	m	interasse pali lungo x
int,y =	0.90	m	interasse pali lungo y
A_{plinto} =	2.3	m^2	area impronta plinto
V_{plinto} =	2.3	m^3	volume plinto
W_{plinto} =	56.25	kN	peso plinto
ϕ_{palo} =	0.30	m	diametro del palo
n° file di pali	2		

rinterro

$h_{rinterro,monte}$ =	0.00	m	altezza media rinterro, lato monte
$h_{rinterro,valle}$ =	0.00	m	altezza media rinterro, lato valle
$\gamma_{terrreno}$ =	18.00	kN/m^3	peso per unità di volume terreno

PLINTO DI VALLE

Sollecitazioni di progetto

Per le verifiche a punzonamento e dell'armatura resistente si devono considerare come azioni esterne le azioni nette trasmesse dai pali, ottenute detraendo dalle azioni massime agenti su essi i contributi che derivano dal peso proprio del plinto e del terreno sovrastante.

w_{plinto} =	25.0	kN/m²	γ_{G1} =	1.00	peso proprio del plinto, lato valle
$w_{rin,valle}$ =	0.0	kN/m²	γ_{G2} =	1.00	peso del terreno sovrastante, lato va

I carichi su esposti saranno detratti all'azione massima agente in proporzione all'area di influenza afferente al palo.
Questa sarà determinata ipotizzando una dimensione longitudinale pari allo sbalzo di valle e trasversalmente pari alla larghezza di competenza del puntone compresso.
La larghezza trasversale dei puntoni viene determinata mediante una ripartizione a 45° delle tensioni dalla sommità del palo fino allo spiccato della mensola, nel limite delle dimensioni dello stesso e dell'interasse rispetto agli altri pali. Si ha quindi:

$b_{puntoni}$ =	0.73	m	palo d'angolo	0.425
$A_{infl,palo}$ =	0.05	m²		0.45

$W_{plinto+rinterro} = \gamma_{G1}W_{plinto}+\gamma_{G2}w_{rin,valle}$ = 1.36 kN peso totale del plinto e

Le azioni nette trasmesse dal palo al plinto di fondazione sono così calcolate:

$$V = N_{Ed} - W_{plinto+rinterro}$$

AZIONE SUL PALO		N_{Ed} [kN]	V [kN]
SLU-A1M1	25_1*S-2+0.(	123.16	122
SLU-A1M1	26_0.5*S-2+	-16.53	-18
SLV-M1	SLV	53.68	52
SLV-M1	SLV	4.38	3
RARA	25_1*S-2+0	86.26	85
RARA	26_0.5*S-2+	-6.86	-8
FREQ	f-Q25-f_0.2*V	38.50	37
QPERM	SLE.qp	32.83	31

Resistenze a compressione dei nodi

La pressione di progetto per i *nodi compressi senza tiranti* è pari a:

$\sigma_{1Rd,max} = k_1 \nu' f_{cd} = \quad = 14.95 \quad N/mm^2$

La pressione di progetto per i *nodi compressi-tesi* con tiranti ancorati disposti in una sola direzione:

$\sigma_{2Rd,max} = k_2 \nu' f_{cd} = \quad = 12.70 \quad N/mm^2$

La pressione massima per *nodi compressi-tesi* con tiranti ancorati disposti in più di una direzione è

$\sigma_{3Rd,max} = k_3 \nu' f_{cd} = \quad = 11.21 \quad N/mm^2$

dove:

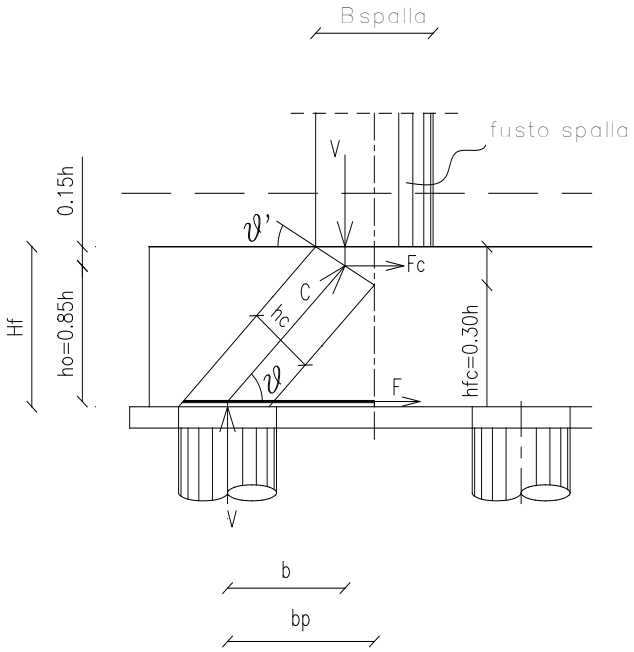
$\sigma_{iRd,max}$ = massima tensione che può essere applicata ai bordi del nodo

$k_1 = 1.0$ $k_2 = 0.85$ $k_3 = 0.75$

$\nu' = [1 - (f_{ck} / 250)] / 0,85 = 1.06$

Verifiche strutturali

Si verificano l'armatura resistente del plinto di fondazione in direzione longitudinale al di sopra del palo maggiormente sollecitato. Allo scopo si utilizza lo schema resistente puntone-tirante illustrato in figura.
Nello schema adottato per la verifica i puntoni rappresentano le risultanti dei campi tensionali di compressione, i tiranti sono le risultanti degli sforzi di trazione nelle barre di armatura, o anche nel calcestruzzo, ed i nodi coincidono con le zone di calcestruzzo dove i puntoni compressi sono deviati dalle barre di armatura o da altri puntoni.



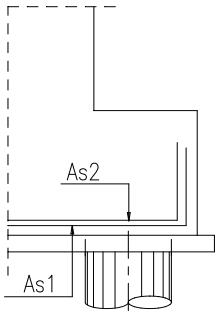
geometria meccanismo

Hf =	1.00	m	b =	0.36	m	
h =	0.92	m	b_p =	0.45	m	
h_0 =	0.78	m	hfc =	0.28	m	
θ =	arctg(h_0 / b) =	1.137	rad	=	65.13°	
θ' =	arctg(hfc / (B_{spalla} / 2)) =	1.006	rad	=	57.62°	
hc =	(B_{spalla} / 2) / cosθ' * cos(90 - θ - θ')	0.27	m			

La larghezza trasversale dei puntoni è la stessa calcolata precedentemente.

$b_{puntoni}$ = 0.27 m

armatura disposta (nel puntone)



	n.	ø(mm)	c (mm)	A_s (mm²)	p (mm)
ordine inferiore (As1)	3	16	80	603	92
ordine superiore (As2)	1	0	104	0	0
			$A_{s,tot}$ =	603	

Verifiche Stati Limite Ultimi

Si conduce la verifica per il nodo superiore (in corrispondenza del paramento verticale) che risulta compresso senza tiranti, del nodo in corrispondenza del palo che risulta compresso-teso e del tirante teso per la situazione di carico più gravosa.

Azioni di progetto

$V_{max,SLU}$ =	121.80	kN	SLU-A1M1 25_1*S-2+0.6*Wy-5	
$F_{cd,1}$ = $V_{max,SLU}/tg\theta$ =	56.46	kN	nodo compresso	
$F_{cd,2}$ = $/_{max,SLU}/sen\theta$ =	134.25	kN	nodo compresso-teso	
F_{td} = $V_{max,SLU}/tg\theta$ =	56.46	kN	tirante teso	

Resistenze di progetto

$F_{cd,1,Rd}$ =	$\sigma_{1Rd,max}$ *($b_{puntone}$ * hfc) =	1133.82	kN	>	$F_{cd,1}$
$F_{cd,2,Rd}$ =	$\sigma_{2Rd,max}$ *($b_{puntone}$ * hc) =	959.72	kN	>	$F_{cd,2}$
$F_{td,Rd}$ =	$f_{yd} A_s$ =	236.03	kN	>	F_{td}

Si nota che in tutte le combinazioni le sollecitazioni di verifica sono inferiori alle resistenze di progett

Verifiche Stati Limite di Esercizio

Come concesso dalla circolare esplicativa n°617 del 02/02/2009 al p.to C4.1.2.2.4.6, la verifica a fessurazione viene condotta limitando il livello tensionale nell'armatura tesa, si limita inoltre la massima tensione di compressione agente nei puntoni compressi.

	RARA SLE.r-Q25_1*S-2+0	FREQ f-Q25-f_0.2*V	QPERM SLE.qp		
$V_{max,SLE}$ =	84.90	37.14	31.47	kN	
$F_{cd,1}$ = $V_{max,SLE}/tg\theta$ =	39.36	17.22	14.59	kN	nodo compresso
$F_{cd,2}$ = $/_{max,SLE}/sen\theta$ =	93.58	40.94	34.68	kN	nodo compresso-teso
F_{td} = $V_{max,SLE}/tg\theta$ =	39.36	17.22	14.59	kN	tirante teso
σ_c =	1.24	0.54	0.46	N/mm²	
$\sigma_{c,max}$ =	14.94	-	11.21	N/mm²	
σ_s =	65.25	28.54	24.18	N/mm²	
$\sigma_{s,max}$ =	360	-	-	N/mm²	
$\sigma_{s,fess}$ =	-	160	160	N/mm²	

Verifica a punzonamento

Un eventuale rottura per punzonamento del plinto da parte del palo maggiormente caricato o del fusto della pila è tanto più probabile quanto più grande risulta la snellezza del plinto di fondazione.

Facendo riferimento all'allegato J.3 dell'EN 1992-1-1 si può definire un limite geometrico oltre al quale è plausibile che una rottura per punzonamento non possa avvenire.
In particolare se:
ac < 0.5 hc meccanismo a traliccio, non necessaria la verifica a punzonamento
ac > 0.5 hc gli effetti taglianti risultano significativi e quindi si considera la verifica a punzonamento

dove:
a_c = distanza fra in carico e la parete di contrasto max(L_v - dy)
h_c = altezza dell'elemento (Hf)

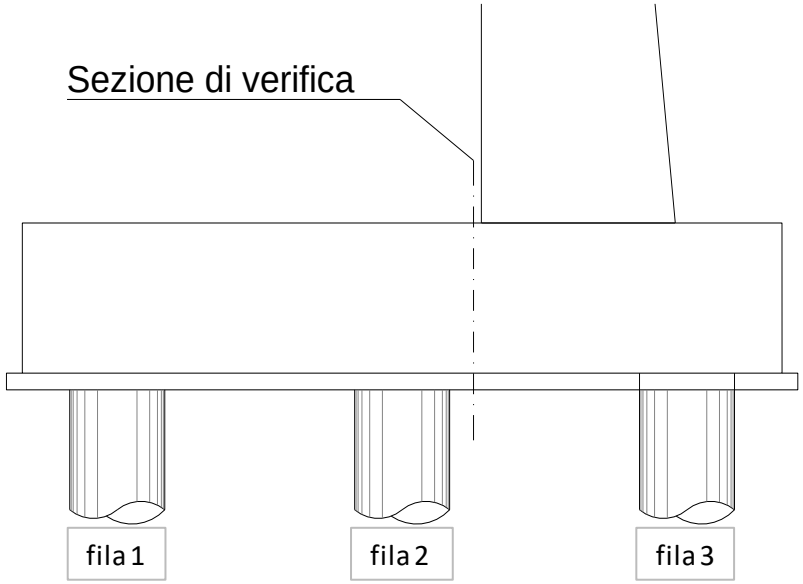
Nel caso specifico:

a_c =	-0.23	m	<	0.5 h_c =	0.50	m

Verifica a punzonamento omessa.

PLINTO DI MONTE

Si verifica la sezione d'incastro della platea di fondazione con il paramento frontale. Si assume un comportamento a mensola ipotizzando che i pali agiscano solamente con una forza e non come vincoli. I carichi sono dati dal riempimento della spalla, dal peso proprio del plinto e dal sovraccarico accidentale nonché dalla reazione dei pali.



				max	min	
w_{plinto} =	25.0	kN/m²	γ_{G1} =	1.00	1.00	peso proprio del plinto, l
$w_{rin,monte}$ =	0.0	kN/m²	γ_{G2} =	1.00	1.00	peso del terreno sovrast
q_k =	20.0	kN/m²	γ_{Qk} =	1.50	0.00	sovraccarico

I carichi su esposti saranno detratti all'azione massima agente in proporzione alla larghezza di influenza afferente al palo.

Questa sarà determinata ipotizzando una dimensione longitudinale pari allo sbalzo di valle e trasversalmente pari alla larghezza di competenza del palo.
La larghezza trasversale di influenza viene determinata mediante una ripartizione a 45° delle tensioni dalla sommità del palo fino allo spiccato della mensola, nel limite delle dimensioni dello stesso e dell'interasse rispetto agli altri pali. Si ha quindi:

fila =	1	2	
Palo =	2	2	
posizione =	d'angolo	d'angolo	
$B_{influ,palo}$ =	0.75	0.00	m

Sollecitazioni di progetto

Sulla base delle precedenti ripartizioni delle azioni si ottengono le sollecitazioni agenti sui pali di interesse

	Palo =	2	2
COMB.		N_{Ed} [kN]	
A1-M1 Nmax	SLU-Q25_1*S-2+0.(	123.16	0.00
A1-M1 Nmin	SLU-Q20_0.5*S-2+	60.91	0.00
SLV-M1 Nmax	SLV	53.68	0.00
SLV-M1 Nmin	SLV	-6.99	0.00
RARA Nmax	SLE.r-Q25_1*S-2+0	86.26	0.00
RARA Nmin	SLE.r-Q20_0.5*S-2+	44.76	0.00
FREQ Nmax	SLE.f-Q7-f_0.2*	40.10	0.00
FREQ Nmin	SLE.f-Q20-f_0.2*\	31.56	0.00
QPERM Nmax	SLE.qp	32.82	0.00
QPERM Nmin	SLE.qp	32.82	0.00

nel seguito si riporta la verifica strutturale del plinto per le due condizioni dimensionanti: una con reazione massima dei pali e minimo sovraccarico superiore e la seconda opposta alla prima.
Per le verifiche agli stati limite ultimi si considera la sola situazione dimensionante fra condizioni statiche e sismiche.

Stati limite ultimi

Massima reazione sui pali - Minimo carico distribuito

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLU-Q25_1*S-2+0.6*Wy-5		123.16	0.78	123	95	2
SLU-Q25_1*S-2+0.6*Wy-5		0.00	0.00	0	0	2
$\gamma_{G1}w_{plinto} + \gamma_{G2}w_{rin,monte} + \gamma_{Qk}q_k$	-25			-27	-14	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
137	113

Minima reazione sui pali - Massimo carico distribuito

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLV		-6.99	0.78	-7	-5	2
SLV		0.00	0.00	0	0	2
$\gamma_{G1}w_{plinto} + \gamma_{G2}w_{rin,monte} + \gamma_{Qk}q_k$	-45			-48	-26	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
-58	-33

Stati limite di esercizio - Rara

Massima reazione sui pali - Minimo carico distribuito

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLE.r-Q25_1*S-2+0.6*Wy-5		86.26	0.78	86	67	2
SLE.r-Q25_1*S-2+0.6*Wy-5		0.00	0.00	0	0	2
$w_{plinto} + w_{rin,monte}$	-25			-27	-14	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
88	75

Minima reazione sui pali - Massimo carico distribuito

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLE.r-Q20_0.5*S-2+1*Wx-2		44.76	0.78	45	35	2
SLE.r-Q20_0.5*S-2+1*Wx-2		0.00	0.00	0	0	2
$w_{plinto} + w_{rin,monte} + q_k$	-45			-48	-26	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
11	20

Stati limite di esercizio - Frequente

Massima reazione sui pali - Minimo carico distribuito

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLE.f-Q7-f_0.2*S-2		40.10	0.78	40	31	2
SLE.f-Q7-f_0.2*S-2		0.00	0.00	0	0	2
$w_{plinto} + w_{rin,monte}$	-25			-27	-14	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
27	27

Minima reazione sui pali - Massimo carico distribuito

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLE.f-Q20-f_0.2*Wx-2		31.56	0.78	32	24	2
SLE.f-Q20-f_0.2*Wx-2		0.00	0.00	0	0	2
$w_{plinto} + w_{rin,monte} + \psi_1 q_k$	-40			-43	-23	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
-1	10

Stati limite di esercizio - Q. Permanente

Comb.	$q_{terreno}$ [kN/m/m]	N [kN]	braccio [m]	$V_{incastro}$ [kN]	$M_{incastro}$ [kNm]	Palo -
SLE.qp		32.82	0.78	33	25	2
SLE.qp		0.00	0.00	0	0	2
$w_{plinto} + w_{rin,monte} + \psi_2 q_k$	-25			-27	-14	/m

Si ottengono le seguenti sollecitazioni per metro di fondazione :

Sollecitazioni nella sezione d'incastro	
$V_{incastro}$ / m [kN/m]	$M_{incastro}$ / m [kNm/m]
17	19

Caratteristiche meccaniche dei materiali

Icestruzzo	C25/30	R_{ck} =	30	N/mm²	f_{ck} =	25	N/mm²
γ_c =	1.5	α_{cc} =	0.85		f_{cd} =	14.17	N/mm²
		E_c =	31476	N/mm²	f_{ctm} =	2.56	N/mm²
Acciaio	B450C	E_s =	200000	N/mm²	f_{yk} =	450	N/mm²
γ_s =	1.15	ε'_{se}	1.96		f_{yd} =	391.3	N/mm²

Caratteristiche geometriche della sezione

B =	1000	mm base
H =	1000	mm altezza
c =	100	mm coprifer.
N_{Ed} positivo di compressione		
M_{Ed} positivo se tende le fibre inferiori della sezione		
y distanza dell'armatura dal lembo superiore		

n.	ø(mm)	A_s (mm²)	y (mm)
3	16	603	100
		-	900
3	16	603	900
		-	
	Σ	1206	mm²

Verifiche agli Stati Limite Ultimi

Flessione

Combinazione	posizione	N_{Ed} [kN]	M_{Ed} [kNm]	V_{Ed} [kN]	M_{Rd} [kNm]	$\frac{M_{Rd}}{M_{Ed}}$
SLU-Q25_1*S-2+0.6*Wy-S	incastro		112.82	137.34	202.98	**1.80**
SLV	incastro		-33.22	-57.69	202.98	**6.11**

Taglio

ϕ_{staffe} =	0	mm	α =	90	° inclinazione staffa
n_b =	0	n° braccia	θ =	21.80	° inclinazione puntone compresso
s =	300	mm passo			

Combinazione	posizione	$V_{Rd,0}$ [kN]	$V_{Rd,s}$ [kN]	$V_{Rd,c}$ [kN]	V_{Rd} [kN]	$\frac{V_{Rd}}{V_{Ed}}$
SLU-Q25_1*S-2+0.6*Wy-S	incastro	281.11	0.00	1978.45	281.11	**2.05**
SLV	incastro	281.11	0.00	1978.45	281.11	**4.87**

Verifiche agli Stati Limite Esercizio - Tensioni in esercizio

Comb. caratteristica σ_c = 15.0 N/mm² σ_s = 360.0 N/mm²

Combinazione	posizione	N_{Ed} [kN]	M_{Ed} [kNm]	M_{Rd} [kNm]	$\frac{M_{Rd}}{M_{Ed}}$
SLE.r-Q25_1*S-2+0.6*Wy-	incastro		74.69	184.31	**2.47**
SLE.r-Q20_0.5*S-2+1*Wx-	incastro		20.25	184.31	**9.10**

Comb. Quasi perm. σ_c = 11.3 N/mm² σ_s = 360.0 N/mm²

Combinazione	posizione	N_{Ed} [kN]	M_{Ed} [kNm]	M_{Rd} [kNm]	$\frac{M_{Rd}}{M_{Ed}}$
SLE.qp	incastro		19.47	184.31	**9.47**

Verifiche agli Stati Limite Esercizio - Fessurazione

Condizioni ambientali ordinarie armatura poco sensibile

α_e = 6.35 ϕ_{eq} = 16.00

k_1 = 0.8 k_2 = 0.5 k_3 = 3.4 k_4 = 0.425

Comb. Frequente k_t = 0.6 w_{lim} = 0.4 mm

Combinazione	posizione	N_{Ed} [kN]	M_{Ed} [kNm]	σ_s [MPa]	x [mm]	A_s [mm²]
SLE.f-Q7-f_0.2*S-2	incastro		27.00	52	118	603
SLE.f-Q20-f_0.2*Wx-2	incastro		9.50	18	118	603

Combinazione	$A_{c,eff}$ [mm²]	ρ_{eff}	ε_{sm}	Δ_{smax} [mm]	w_d [mm]	Verifica
SLE.f-Q7-f_0.2*S-2	250000	0.00	0.02%	1440.15	0.22	OK
SLE.f-Q20-f_0.2*Wx-2	250000	0.00	0.01%	1440.15	0.08	OK

Comb. Quasi perm. k_t = 0.4 w_{lim} = 0.3 mm

Combinazione	posizione	N_{Ed} [kN]	M_{Ed} [kNm]	σ_s [MPa]	x [mm]	A_s [mm²]
SLE.qp	incastro	0.00	19.47	38	118	603

Combinazione	$A_{c,eff}$ [mm²]	ρ_{eff}	ε_{sm}	Δ_{smax} [mm]	w_d [mm]	Verifica
SLE.qp	250000	0.00	0.01%	1440.15	0.16	OK

Verifica a punzonamento

Un eventuale rottura per punzonamento del plinto da parte del palo maggiormente caricato o del fusto della pila è tanto più probabile quanto più grande risulta la snellezza del plinto di fondazione.

Facendo riferimento all'allegato J.3 dell'EN 1992-1-1 si può definire un limite geometrico oltre al quale è plausibile che una rottura per punzonamento non possa avvenire.

In particolare se:

ac < 0.5 hc meccanismo a traliccio, non necessaria la verifica a punzonamento

ac > 0.5 hc gli effetti taglianti risultano significativi e quindi si considera la verifica a punzonamento

dove:

a_c = distanza fra in carico e la parete di contrasto max(L_m - d_y)

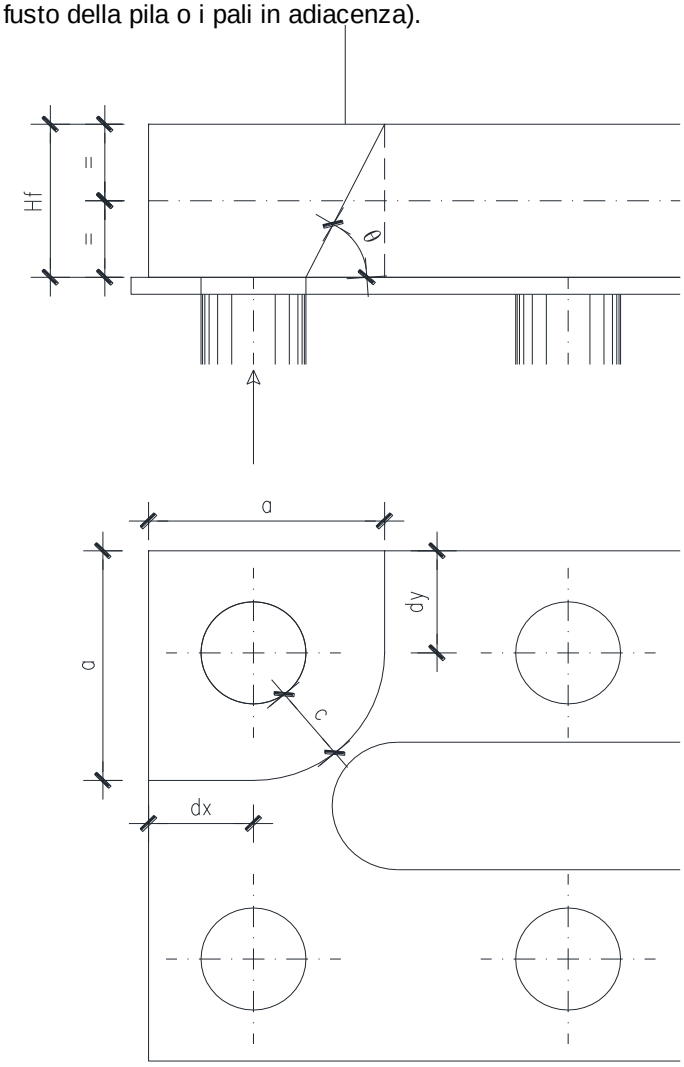
h_c = altezza dell'elemento (Hf)

Nel caso specifico:

a_c = 0.78 m > 0.5 h_c = 0.50 m

E' necessario considerare la verifica punzonamento.

Per la verifica a punzonamento si considera conservativamente la porzione di plinto al di sopra del palo più esterno, per il minore sviluppo del perimetro critico di verifica.
Si assume cautelativamente una distribuzione a 45° del carico nello spessore del plinto di fondazione. Così facendo la superficie di punzonamento non va ad interagire con altre zone di contrasto (quali il fusto della pila o i pali in adiacenza).



geometria schema di calcolo

ϕ_{palo} =	0.30	m	Hf =	1.00	m	
c =	1.00	m	d =	920	mm	altezza utile media
a =	1.45	m	θ =	45.00	°	angolo diffus. effettivo
u_0 = π ϕ =			0.94	m		perimetro palo
u_1 = dx + dy + 3.14 (f/2+c)/2 =			2.41	m		perimetro critico

azione esterna

V_{Ed} =	60.35	kN	v_{Ed1} = β V_{Ed} / (u_1 * d) =	0.04	MPa
β =	1.5	coeff. per l'eccentricità	v_{Ed0} = β V_{Ed} / (u_0 * d) =	0.10	MPa

armature nella sezione

	n° ferri	*ϕ ferri*		
	3	16		
	0	0		
$A_{slx,tesa}$ =	603	mm^2		

	n° ferri	*ϕ ferri*	
	3	16	
	0	0	
$A_{sly,tesa}$ =	603	mm^2	

Resistenza a punzonamento di piastre e fondazioni di pilastri prive di armature a taglio

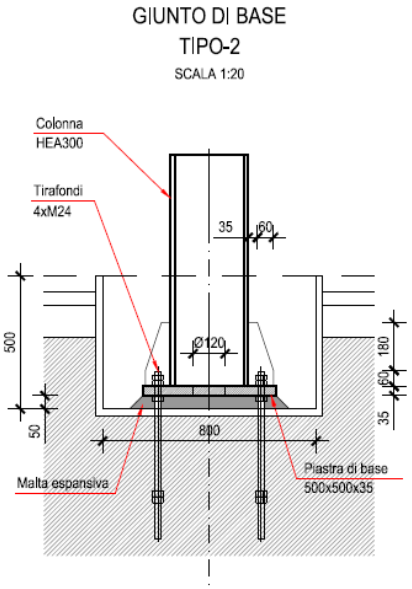
ν =	0.63		$C_{Rd,c}$ =	0.12		σ_{cp} =	0.00	MPa
f_{ck} =	24.90	MPa	v_{min} =	0.31		σ_{cy} =	0.00	MPa
k =	1.47		k_1 =	0.15		σ_{cx} =	0.00	MPa
ρ_{lx} =	0.0005		ρ_{ly} =	0.0005		ρ_l =	0.0005	$\leq 0{,}02$

$v_{Rd,c}$ = $C_{Rd,c}k(100\rho_1 f_{ck})^{1/3}+k_1\sigma_{cp} \geq (\nu_{min}+k_1\sigma_{cp})$	0.31	MPa	>	$v_{Ed,1}$
$v_{Rd,max}$ = 0.5 ν f_{cd} =	4.45	MPa	>	$v_{Ed,0}$

Non necessario armare a punzonamento

9.3 TIPO 2 – FONDAZIONI SUPERFICIALI SU PLINTO CENTRATO

La colonna ha piano di imposta a quota z = -0.5 m dalla quota di calpestio finita, ed entra con un dettaglio a bicchiere nel plinto per 30 cm come indicato nella figura seguente.



Il plinto ha dimensioni 1.40 x 1.40 m in pianta e 1.5 m in altezza (misurata da quota di imposta colonna a quota estradosso magrone). Considerando la porzione non strutturale attorno al giunto a bicchiere, il plinto ha una profondità lorda di 1.8 m.
Quota di imposta fondazione: almeno a z = -2 m dal p.c.:
Quota di imposta magrone: occorre scavare fino al raggiungimento del secondo strato di terreno indicato nella stratigrafia di progetto nel paragrafo precedente e riempire eventualmente con magrone fino a quota di imposta fondazione.

9.3.1 Sollecitazioni

Si riportano le azioni alla base del pilastro più sollecitato, alle quali va aggiunto il peso proprio del plinto di fondazione.

TABLE: Joint Reactions

Joint	OutputCase	StepType	F1	F2	F3	M1	M2	M3
10	SLV	Max	3.0	3.5	18.3	18.0	7.3	0.0
10	SLV	Min	-3.0	-3.5	-1.3	-18.0	-7.3	0.0
10	SLU-Q6_1*S-1+0.6*Wy-4		0.0	-6.6	83.2	91.7	0.0	0.0
10	SLU-Q26_0.5*S-2+1*Wy-5		0.0	-10.8	50.3	81.7	0.0	0.0
10	SLU-Q25_1*S-2+0.6*Wy-5		0.0	-6.5	71.3	87.9	0.0	0.0
10	SLU-Q10_1*S-2+0.6*Wy-2		0.0	-6.7	77.7	94.0	0.0	0.0

9.3.2 Verifiche geotecniche

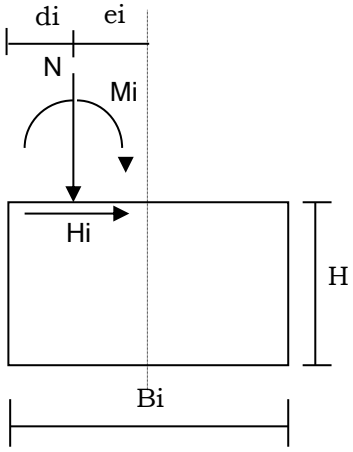
CARATTERISTICHE GEOMETRICHE DELLA FONDAZIONE

B_x =	1.65	1.65	1.65	1.65	1.65	1.65	m
B_y =	1.65	1.65	1.65	1.65	1.65	1.65	m
H =	1.50	1.50	1.50	1.50	1.50	1.50	m

p.p.fond =	102.09	102.09	102.09	102.09	102.09	102.09	kN
γ_{Gpp} =	1.00	1.00	1.00	1.00	1.00	1.00	

SOLLECITAZIONI

Comb	SLU-Q10_1*S-2+0.6*Wy-2	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLVMax	SLVMin	
Sollecitazioni e punto di applicazione ad estradosso fondazione							
N_G =	77.73	71.33	50.31	83.18	18.30	-1.30	kN
$H_{G;x}$ =	6.67	6.49	10.82	6.59	3.53	-3.53	kN
$M_{G;x}$ =	93.96	87.86	81.75	91.72	17.98	-17.98	kNm
$H_{G;y}$ =	0.00	0.00	0.00	0.00	3.04	-3.04	kN
$M_{G;y}$ =	0.00	0.00	0.00	0.00	7.34	-7.34	kNm
N_Q =							kN
$H_{Q;x}$ =							kN
$M_{Q;x}$ =							kNm
$H_{Q;y}$ =							kN
$M_{Q;y}$ =							kNm
d_x =	0.83	0.83	0.83	0.83	0.83	0.83	m
e_x =							m
d_y =	0.83	0.83	0.83	0.83	0.83	0.83	m
e_y =							m
Sollecitazioni nel baricentro della fondazione ad imposta plinto							
N_G =	179.83	173.42	152.40	185.28	120.39	100.79	kN
$H_{G;x}$ =	6.67	6.49	10.82	6.59	3.53	-3.53	kN
$M_{G;x}$ =	103.97	97.59	97.97	101.61	23.28	-23.28	kNm
$H_{G;y}$ =	0.00	0.00	0.00	0.00	3.04	-3.04	kN
$M_{G;y}$ =	0.00	0.00	0.00	0.00	11.91	-11.91	kNm
N_Q =							kN
$H_{Q;x}$ =							kN
$M_{Q;x}$ =							kNm
$H_{Q;y}$ =							kN
$M_{Q;y}$ =							kNm
Sollecitazioni di verifica:							
γ_G =	1.00	1.00	1.00	1.00	1.00	1.00	
γ_Q =	1.00	1.00	1.00	1.00	1.00	1.00	
N_{Ed} =	179.83	173.42	152.40	185.28	120.39	100.79	kN
$H_{Ed;x}$ =	6.67	6.49	10.82	6.59	3.53	3.53	kN
$M_{Ed;x}$ =	103.97	97.59	97.97	101.61	23.28	23.28	kNm
e_x =	0.58	0.56	0.64	0.55	0.19	0.23	m
B'x =	0.49	0.52	0.36	0.55	1.26	1.19	m
$H_{Ed;y}$ =	0.00	0.00	0.00	0.00	3.04	3.04	kN
$M_{Ed;y}$ =	0.00	0.00	0.00	0.00	11.91	11.91	kNm
e_y =	0.00	0.00	0.00	0.00	0.10	0.12	m
B'y =	1.65	1.65	1.65	1.65	1.45	1.41	m



= Bx-2ex = larghezza efficace di fondazione

= By-2ey = larghezza efficace di fondazione

CARATTERISTICHE GEOTECNICHE

Comb	SLU-Q10_1*S-2+0.6*Wy-2	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLVMax	SLVMin	
$\gamma_{c'}$ =	1.00	1.00	1.00	1.00	1.00	1.00	
$\gamma_{\phi'}$ =	1.00	1.00	1.00	1.00	1.00	1.00	
$\gamma_{R;v}$ =	2.30	2.30	2.30	2.30	2.30	2.30	
γ_{γ} =	1.00	1.00	1.00	1.00	1.00	1.00	
c'_k =							= coesione
φ_k =	30.00	30.00	30.00	30.00	30.00	30.00	= angolo di attrito del terreno
γ_{ak} =	10.00	10.00	10.00	10.00	10.00	10.00	= peso di volume effettivo dell'acqua di falda
γ_{1k}=	17.00	17.00	17.00	17.00	17.00	17.00	= peso di volume effettivo del terreno SOPRA il piano di posa
γ_{2k} =	20.00	20.00	20.00	20.00	20.00	20.00	= peso di volume effettivo del terreno SOTTO il piano di posa
c'_d =							
φ_d =	30°	30°	30°	30°	30°	30°	
γ_{ad} =	10.00	10.00	10.00	10.00	10.00	10.00	
γ_{1d}=	17.00	17.00	17.00	17.00	17.00	17.00	
γ_{2d} =	20.00	20.00	20.00	20.00	20.00	20.00	
z =	15.00	15.00	15.00	15.00	15.00	15.00	= dislivello tra piano campagna e quota falda
Df =	2.00	2.00	2.00	2.00	2.00	2.00	= dislivello tra piano campagna e piano di posa
q' =							
q_0=	34.00	34.00	34.00	34.00	34.00	34.00	= pressione permanente ai bordi della fondazione
B' =	0.49	0.52	0.36	0.55	1.26	1.19	m
L' =	1.65	1.65	1.65	1.65	1.45	1.41	m

VERIFICHE GEOTECNICHE

Verifica in direzione x

Comb	SLU-Q10_1*S-2+0.6*Wy-2	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLVMax	SLVMin		
N_{Ed} =	179.83	173.42	152.40	185.28	120.39	100.79	kN	carico verticale
V_{Ed} =	6.67	6.49	10.82	6.59	3.53	3.53	kN	carico orizzontale direzione x
N_q=	18.40	18.40	18.40	18.40	18.40	18.40		
N_γ=	22.40	22.40	22.40	22.40	22.40	22.40		
N_c=	30.14	30.14	30.14	30.14	30.14	30.14		
s_q=	1.17	1.18	1.13	1.19	1.50	1.49		coefficienti di forma
s_γ=	0.88	0.87	0.91	0.87	0.65	0.66		
s_c=s_c^0=	1.18	1.19	1.13	1.20	1.53	1.51		
m=m^0=	1.77	1.76	1.82	1.75	1.53	1.54		inclinazione del carico
i_q=	0.94	0.94	0.87	0.94	0.96	0.95		
i_γ=	0.90	0.90	0.81	0.91	0.93	0.91		
i_c=								
d_q=	1.38	1.38	1.40	1.38	1.29	1.30		profondità piano di posa
d_γ=	1.00	1.00	1.00	1.00	1.00	1.00		
d_c=d_c^0=	1.53	1.53	1.56	1.52	1.40	1.41		
ε =								inclinazione piano di posa rispetto l'orizzontale
b_q=	1.00	1.00	1.00	1.00	1.00	1.00		
b_γ=	1.00	1.00	1.00	1.00	1.00	1.00		

b_c=	1.00	1.00	1.00	1.00	1.00	1.00	
ω =							inclinazione piano campagna rispetto l'orizzontale
g_q=	1.00	1.00	1.00	1.00	1.00	1.00	
g_γ=	1.00	1.00	1.00	1.00	1.00	1.00	
g_c=	1.00	1.00	1.00	1.00	1.00	1.00	
Q_{lim}=	844.91	906.55	555.97	968.72	2439.96	2189.13	kN Carico limite
R_d=	367.35	394.15	241.73	421.18	1060.85	951.80	kN Resistenza di progetto
N_{Ed}=	179.83	173.42	152.40	185.28	120.39	100.79	kN carico verticale
Verifica	ok	ok	ok	ok	ok	ok	
CS =	2.04	2.27	1.59	2.27	8.81	9.44	

Verifica in direzione y

Comb	SLU-Q10_1*S-2+0.6*Wy-2	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLVMax	SLVMin	
NEd =	179.83	173.42	152.40	185.28	120.39	100.79	kN carico verticale
VEd =	0.00	0.00	0.00	0.00	3.04	3.04	kN carico orizzontale direzione y
N_q=	18.40	18.40	18.40	18.40	18.40	18.40	
N_γ=	22.40	22.40	22.40	22.40	22.40	22.40	
N_c=	30.14	30.14	30.14	30.14	30.14	30.14	
s_q=	1.17	1.18	1.13	1.19	1.50	1.49	coefficienti di forma
s_γ=	0.88	0.87	0.91	0.87	0.65	0.66	
s_c=s_c^0=	1.18	1.19	1.13	1.20	1.53	1.51	
m=m^0=	1.23	1.24	1.18	1.25	1.47	1.46	inclinazione del carico
i_q=	1.00	1.00	1.00	1.00	0.96	0.96	
i_γ=	1.00	1.00	1.00	1.00	0.94	0.93	
i_c=							
d_q=	1.25	1.25	1.25	1.25	1.27	1.28	profondità piano di posa
d_γ=	1.00	1.00	1.00	1.00	1.00	1.00	
d_c=d_c^0=	1.35	1.35	1.35	1.35	1.38	1.38	
ε =							inclinazione piano di posa rispetto l'orizzontale
b_q=	1.00	1.00	1.00	1.00	1.00	1.00	
b_γ=	1.00	1.00	1.00	1.00	1.00	1.00	
b_c=	1.00	1.00	1.00	1.00	1.00	1.00	
ω =							inclinazione piano campagna rispetto l'orizzontale
g_q=	1.00	1.00	1.00	1.00	1.00	1.00	
g_γ=	1.00	1.00	1.00	1.00	1.00	1.00	
g_c=	1.00	1.00	1.00	1.00	1.00	1.00	
Q_{lim}=	1014.78	1083.08	734.29	1147.11	2477.87	2231.50	kN Carico limite
R_d=	441.21	470.90	319.26	498.74	1077.34	970.22	kN Resistenza di progetto
N_{Ed}=	179.83	173.42	152.40	185.28	120.39	100.79	kN carico verticale
Verifica	ok	ok	ok	ok	ok	ok	
CS =	2.45	2.72	2.09	2.69	8.95	9.63	

Riepilogo generale verifiche

Comb	SLU-Q10_1*S-2+0.6*Wy-2	SLU-Q25_1*S-2+0.6*Wy-5	SLU-Q26_0.5*S-2+1*Wy-5	SLU-Q6_1*S-1+0.6*Wy-4	SLVMax	SLVMin

Verifica	ok	ok	ok	ok	ok	ok
CS =	2.04	2.27	1.59	2.27	8.81	9.44

q_{Rd} =	541.62	544.10	531.21	546.40	587.29	577.69	kN/m²	pressione resistente di progetto
$q_{t,Ed}$ =	220.75	200.38	253.58	202.98	65.63	60.01	kN/m²	pressioni sul terreno

q_{Rd} =	5.42	5.44	5.31	5.46	5.87	5.78	kg/cm²	pressione resistente di progetto
$q_{t,Ed}$ =	2.21	2.00	2.54	2.03	0.66	0.60	kg/cm²	pressioni sul terreno

Verifiche a scorrimento

		M1	
Angolo di attrito terreno	ϕ_k =	30.00	
Angolo di attrito terra-opera	δ_{fond}=	20.00	
Coesione efficace	c'_k =	0.00	kPa
Coesione non drenata	c_{uk} =	0.00	kPa
	$\gamma_{R;h}$ =	1.1	

Tipo	*Comb*	*Azione* ***N*** kN	B' m	L' m	*Resistenza allo scorrimento*	*Azioni sollecitanti* ***Vx*** kN	***Vy*** ***kN***	*Verifica* ***dir x***	***dir y***	*CS* ***dir x***
M1	SLU-Q10_1*S-2+0.6*Wy-2	-179.83	0.49	1.65	59.50	6.67	0.00	ok	ok	8.92
M1	SLU-Q25_1*S-2+0.6*Wy-5	-173.42	0.52	1.65	57.38	6.49	0.00	ok	ok	8.84
M1	SLU-Q26_0.5*S-2+1*Wy-5	-152.40	0.36	1.65	50.43	10.82	0.00	ok	ok	4.66
M1	SLU-Q6_1*S-1+0.6*Wy-4	-185.28	0.55	1.65	61.31	6.59	0.00	ok	ok	9.30
M1	SLVMax	-120.39	1.26	1.45	39.84	3.53	3.04	ok	ok	11.28
M1	SLVMin	-100.79	1.19	1.41	33.35	3.53	3.04	ok	ok	9.44

Verifiche a ribaltamento

Comb	*Azione* ***N***	*Mstab* ***MRdx***	***MRdy***	*Mrib* ***MEd,x***	***MEd,y***	*Verifica* ***dir x***	***dir y***	*CS* ***dir x***
SLU-Q10_1*S-2+0.6*Wy-2	-179.83	148.36	148.36	103.97	0.00	ok	ok	1.43
SLU-Q25_1*S-2+0.6*Wy-5	-173.42	143.08	143.08	97.59	0.00	ok	ok	1.47
SLU-Q26_0.5*S-2+1*Wy-5	-152.40	125.73	125.73	97.97	0.00	ok	ok	1.28
SLU-Q6_1*S-1+0.6*Wy-4	-185.28	152.85	152.85	101.61	0.00	ok	ok	1.50
SLVMax	-120.39	99.32	99.32	23.28	11.91	ok	ok	4.27
SLVMin	-100.79	83.15	83.15	23.28	11.91	ok	ok	3.57

9.3.3 *Verifiche strutturali*

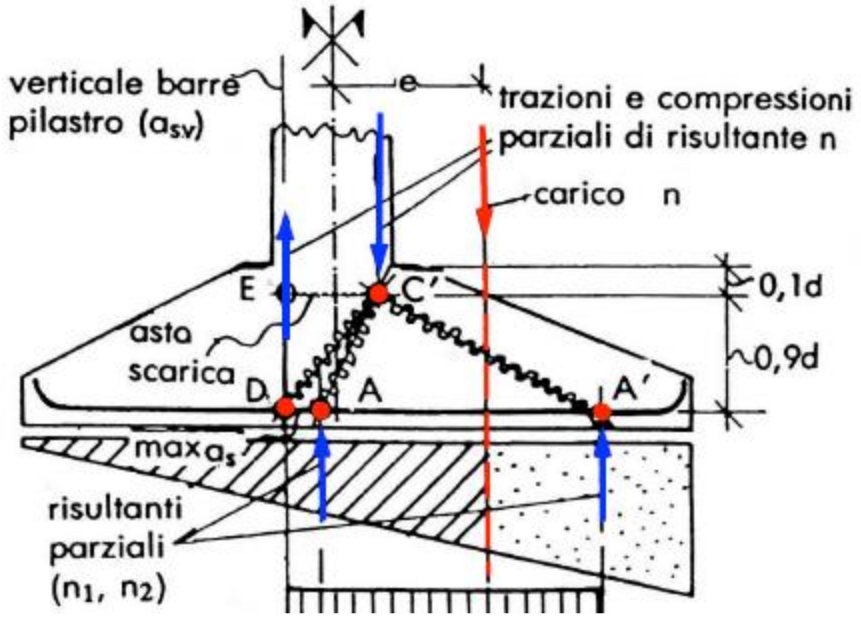
CARATTERISTICHE GEOMETRICHE E DEI MATERIALI

f_{ck} =	25	N/mmq	γc =	1.5	
α_{cc} =	0.85		f_{cd} =	14.17	N/mmq
ACCIAIO	B450C		f_{yk} =	450	N/mmq
γs =	1.15		f_{yd} =	391	N/mmq

DIMENSIONI PLINTO			DIMENSIONI COLONNA				
Bx =	1.65	m	bx =	0.5	m	Bx/6	0.275 m
By =	1.65	m	by =	0.5	m	By/6	0.275 m
H =	1.50	m	d.x =	0.443	m		
Dx =	1.452	m	dc.x =	0.113	m		
Dy =	1.436	m	d.y =	0.443	m		
Wx =	0.749	m³	dc.y =	0.113	m		
Wy =	0.749	m³	wx =	0.021	m³		
			wy =	0.021	m³		

ARMATURA - a	n°	ϕ1	n°	ϕ2	mm²	c [mm]
arm. superiore (compr.)	0	0	8	16	1608	40
arm. inferiore (tesa)	0	0	8	16	1608	40

ARMATURA - b	n°	ϕ1	n°	ϕ2	mm²	c [mm]
arm. superiore (compr.)	0	0	8	16	1608	56
arm. inferiore (tesa)	0	0	8	16	1608	56



SOLLECITAZIONI

	SLU-Q10_	SLU-Q25_	SLU-Q26_	SLU-Q6_1	SLVMax	SLVMin
N_{ed} [kN]	77.73	71.33	50.31	83.18	18.30	-1.30
$H_{Ed;x}$ [kN]	6.67	6.49	10.82	6.59	3.53	3.53
$M_{Ed;x}$ [kNm]	103.97	97.59	97.97	101.61	23.28	23.28
e_x [m]	0.57815	0.56273	0.64288	0.54840	0.19337	0.23098
B'x [m]	0.49	0.52	0.36	0.55	1.26	1.19
$H_{Ed;y}$ [kN]	0.00	0.00	0.00	0.00	3.04	3.04
$M_{Ed;y}$ [kNm]	0.00	0.00	0.00	0.00	11.91	11.91
e_y [m]	0.00	0.00	0.00	0.00	0.10	0.12
B'y [m]	1.65	1.65	1.65	1.65	1.45	1.41

VERIFICA LATO x

B [m]	1.65	1.65	1.65	1.65	1.65	1.65	Base fondazione
L [m]	1.65	1.65	1.65	1.65	1.65	1.65	Profondità fondazione
D [m]	1.45	1.45	1.45	1.45	1.45	1.45	Altezza utile fondazione
W [m³]	0.75	0.75	0.75	0.75	0.75	0.75	Modulo di resistenza fondazione
b [m]	0.50	0.50	0.50	0.50	0.50	0.50	Base pilastro
l [m]	0.50	0.50	0.50	0.50	0.50	0.50	Profondità pilastro
e [m]	0.58	0.56	0.64	0.55	0.19	0.23	eccentricità
d [m]	0.44	0.44	0.44	0.44	0.44	0.44	altezza utile trazioni pilastro
dc [m]	0.11	0.11	0.11	0.11	0.11	0.11	distanza centro compressioni pilastro da
ξ.C [m]	0.688	0.688	0.688	0.688	0.688	0.688	distanza dal lembo più sollecitato del no
σN [kN/m²]	28.55	26.20	18.48	30.55	6.72	-0.48	tensione sforzo assiale
σM [kN/m²]	138.86	130.35	130.86	135.71	31.10	31.10	tensione momento
σ+ [kN/m²]	167.42	156.55	149.34	166.27	37.82	30.62	tensione massima
σ- [kN/m²]	-110.31	-104.15	-112.38	-105.16	-24.37	-31.57	tensione minima
FOND. parzializz	1	1	1	1	1	1	fondazione a sezione parzializzata?
a.neg [m]	0.655	0.659	0.709	0.639	0.647	0.838	tratto di fondazione a tensioni negative
σ.1-2 [kN/m²]	125.9	115.1	120.5	120.8	14.0	8.2	tensione in corrispondenza della divisio
N1 [kN]	59.73	58.78	40.54	65.50	27.01	19.04	Risultante trapezio tensioni
ξ.N1 [m]	0.12	0.12	0.09	0.13	0.27	0.24	distanza dal lembo più sollecitato della r
αN1 [°]	66.4	66.7	65.3	66.9	72.2	71.1	inclinazione risultante 1
C1 [kN]	65.2	64.0	44.6	71.2	28.4	20.1	Puntone 1
T1 [kN]	26.1	25.3	18.6	27.9	8.7	6.5	Tirante 1
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	4%	4%	3%	4%	1%	1%	tasso di lavoro
N2 [kN]	77.65	69.19	75.46	73.14	4.30	1.48	Risultante trapezio tensioni
ξ.N2 [m]	0.4961	0.505	0.435	0.521	0.756	0.667	distanza dal lembo più sollecitato della r
αN2 [°]	81.6	82.0	79.1	82.7	-87.0	89.1	inclinazione risultante 2
C2 [kN]	78.5	69.9	76.9	73.7	4.3	1.5	Puntone 2
T2 [kN]	11.4	9.7	14.6	9.3	0.2	0.0	Tirante 2
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	2%	2%	2%	1%	0%	0%	tasso di lavoro

VERIFICA LATO y							
B [m]	1.65	1.65	1.65	1.65	1.65	1.65	Base fondazione
L [m]	1.65	1.65	1.65	1.65	1.65	1.65	Profondità fondazione
D [m]	1.44	1.44	1.44	1.44	1.44	1.44	Altezza utile fondazione
W [m³]	0.75	0.75	0.75	0.75	0.75	0.75	Modulo di resistenza fondazione
b [m]	0.50	0.50	0.50	0.50	0.50	0.50	Base pilastro
l [m]	0.50	0.50	0.50	0.50	0.50	0.50	Profondità pilastro
e [m]	0.00	0.00	0.00	0.00	0.10	0.12	eccentricità
d [m]	0.44	0.44	0.44	0.44	0.44	0.44	altezza utile trazioni pilastro
dc [m]	0.11	0.11	0.11	0.11	0.11	0.11	distanza centro compressioni pilastro da
ξ.C [m]	0.688	0.688	0.688	0.688	0.688	0.688	distanza dal lembo più sollecitato del no
σN [kN/m²]	28.55	26.20	18.48	30.55	6.72	-0.48	tensione sforzo assiale
σM [kN/m²]	0.00	0.00	0.00	0.00	15.91	15.91	tensione momento
σ+ [kN/m²]	28.55	26.20	18.48	30.55	22.63	15.43	tensione massima
σ- [kN/m²]	28.55	26.20	18.48	30.55	-9.19	-16.39	tensione minima
FOND. parzializz	0	0	0	0	1	1	fondazione a sezione parzializzata?
a.neg [m]	0.000	0.000	0.000	0.000	0.476	0.850	tratto di fondazione a tensioni negative
σ.1-2 [kN/m²]	28.6	26.2	18.5	30.6	8.6	1.8	tensione in corrispondenza della divisio
N1 [kN]	38.87	35.67	25.15	41.59	18.72	10.05	Risultante trapezio tensioni
ξ.N1 [m]	0.41	0.41	0.41	0.41	0.31	0.26	distanza dal lembo più sollecitato della r
αN1 [°]	78.0	78.0	78.0	78.0	73.6	71.7	inclinazione risultante 1
C1 [kN]	39.7	36.5	25.7	42.5	19.5	10.6	Puntone 1
T1 [kN]	8.3	7.6	5.4	8.9	5.5	3.3	Tirante 1
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	1%	1%	1%	1%	1%	1%	tasso di lavoro
N2 [kN]	38.87	35.67	25.15	41.59	3.19	0.14	Risultante trapezio tensioni
ξ.N2 [m]	1.2375	1.2375	1.2375	1.2375	0.8752	0.7379	distanza dal lembo più sollecitato della r
αN2 [°]	-67.0	-67.0	-67.0	-67.0	-81.8	-87.8	inclinazione risultante 2
C2 [kN]	42.2	38.8	27.3	45.2	3.2	0.1	Puntone 2
T2 [kN]	16.5	15.2	10.7	17.7	0.5	0.0	Tirante 2
Trd [kN]	629.4	629.4	629.4	629.4	629.4	629.4	Resistenza armatura tesa
w.r.	3%	2%	2%	3%	0%	0%	tasso di lavoro