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Associazione Nazionale Bonifiche, Irrigazioni e Miglioramenti Fondiari

CANALE S. NICOLO' - MEDELANA (OC92)



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MINISTERO
DELLE INFRASTRUTTURE
E DEI TRASPORTI

Ripristino delle condizioni di stabilità arginale del canale San Nicolò -Medelana CUP: J96G20000500001

PNRR-M2C4-I4.1-A2-1: Ripristino della piena funzionalità idraulica
del canale S. Nicolò Medelana

PROGETTO ESECUTIVO Relazione di calcolo palancole

Data: 25.02.2025				Rev.: RS-02
IL PROGETTISTA (Dott. Ing. Beatrice Bergamini)			IL RESPONSABILE DEL PROCEDIMENTO (Dott. Ing. Valeria Chierici)	
Rev.	Descrizione	Redatto	Data	Codice Intervento
00	Per emissione	N.G.-B.B.	25.02.2025	OC92

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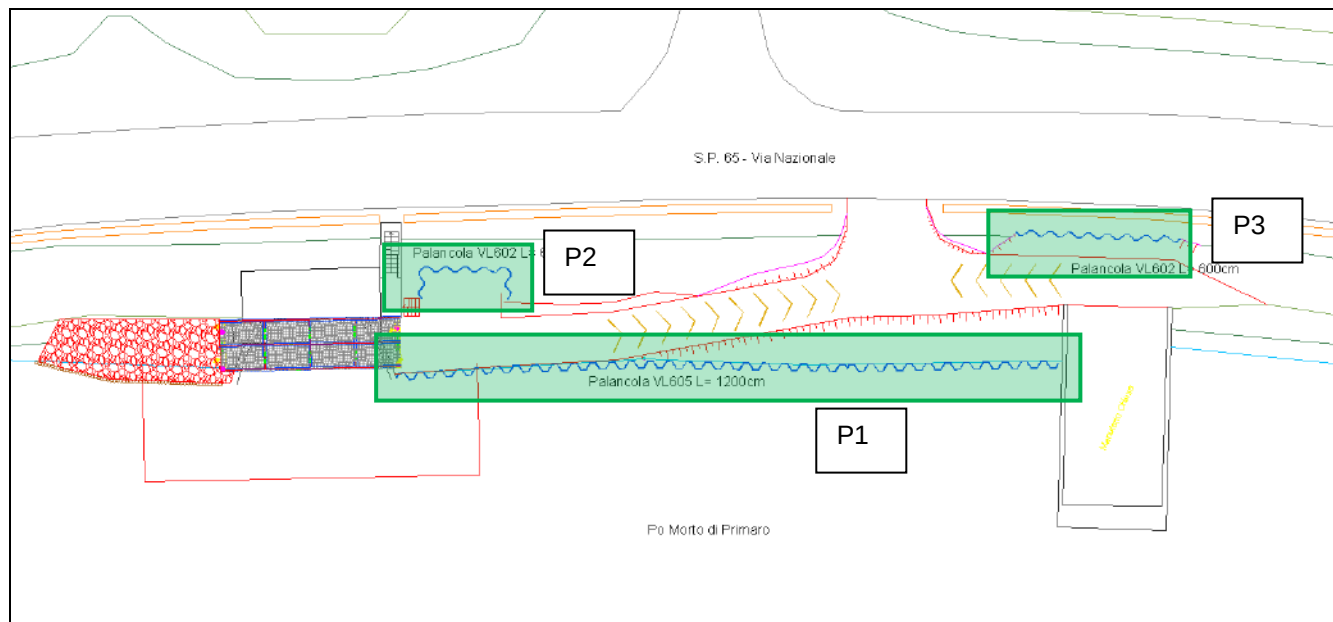
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PREMESSA

La presente relazione riguarda il dimensionamento del palancolato fisso necessario al sostegno dello stradello di accesso e delle rampe da realizzarsi a ridosso della struttura arginale e indicato nelle successive immagini esemplificative.



Foto aerea d'inquadramento



Si riportano di seguito le principali caratteristiche identificative del sito in cui sorge la struttura estrapolate dalla *Relazione Geologica* a firma del Dott. Geol. T. Veronese.

Falda

Nell'area è stata rilevata la quota della superficie di falda all'interno del foro di esecuzione della prova penetrometrica statica con punta elettrica e piezocono CPTU1 *rif. U80-24*. Tale quota è stata rilevata in data 28/11/2024 alla profondità di -1,00 m dal p.c., che rappresenta anche la quota dell'acqua del Po di Primaro.

Il livello freatico potrebbe oscillare rispetto ai valori riscontrati in tal giorno, solo un monitoraggio di un anno idrogeologico permetterebbe di valutare le oscillazioni stagionali di queste quote.

Categoria di Sottosuolo

Il valore di V_{S30} calcolato risulta: $V_{S30} = 188 \text{ m/s}$ e quindi la Categoria di suolo è C. Tale valore va assunto con uno scarto di $\pm 10\%$, come per tutti i metodi di acquisizione di tale parametro.

$$V_{S30} = 188 \text{ m/s} \quad \text{Categoria di suolo C}$$

Categoria Topografica

Il sito in esame è caratterizzato da superfici pianeggianti e ricade all'interno della **categoria topografica T1**.

Parametri Geotecnici

							MATERIALI COESIVI							MATERIALI GRANULARI								
DA	A	qcm	fsm	deltaU	litol.	Peso Vol.	Cu (qc)	OCR (qc)	OCR (U)	M ₉	Eu50	CR	Dr	F ₁₀₀	F ₂₀₀	F ₄₂₅ Schn.				E'25	M ₉	
m	m	MPa	MPa	MPa	(-)	kN/m3	KPa	(-)	(-)	MPa	MPa	(-)	(%)	(°)	(°)	(°)				MPa	MPa	
1,5	2,5	1,07	0,06	0,08	AI-La	18,00	61	19	8	4,12	10,31	0,10	-	-	*	-	-	-	-	*		
2,5	3,0	1,43	0,06	0,04	L-La	20,00	-	-	-	-	-	-	<20	32	26	31	34	36	39	4,12	6,60	
3,0	4,9	0,75	0,04	0,08	A	17,50	40	6	7	3,33	11,84	0,14	-	-	*	-	-	-	-	*		
4,9	5,7	4,45	0,05	0,01	S	20,00	-	-	-	-	-	-	45	35	31	34	37	39	42	11,32	16,11	
5,7	7,0	2,18	0,06	-0,02	SI	19,00	-	-	-	-	-	-	26	32	29	31	34	37	40	7,00	11,35	
7,0	9,5	0,94	0,05	0,19	A	17,50	46	4	5	3,79	19,05	0,18	-	-	*	-	-	-	-	*		
9,5	16,0	1,07	0,06	0,31	A	17,50	50	3	4	4,13	23,81	0,24	-	-	*	-	-	-	-	*		
16,0	18,5	1,96	0,11	0,06	AI-La	18,00	89	4	6	5,67	37,37	0,20	-	-	*	-	-	-	-	*		
18,5	19,1	5,53	0,08	-0,10	S	20,00	-	-	-	-	-	-	31	31	28	32	35	38	40	14,37	22,92	
19,1	19,9	1,34	0,06	-0,08	AI-La	18,00	65	2	10	4,73	34,61	0,28	-	-	*	-	-	-	-	*		
19,9	20,7	3,41	0,10	-0,14	SI	19,00	-	-	-	-	-	-	<20	26	25	29	33	36	39	8,66	13,88	
20,7	25,0	1,63	0,11	0,11	AI-La	18,00	76	2	7	5,26	39,7	0,28	-	-	*	-	-	-	-	*		
25,0	28,0	2,25	0,12	0,34	AI-La	18,00	97	3	6	6,37	47,49	0,29	-	-	*	-	-	-	-	*		

FONDAZIONE
SPONDE

Suscettibilità alla Liquefazione

I terreni in esame risultano **non liquefacibili** se sollecitati da un sisma di magnitudo 6,14 e accelerazione P.G.A. di 0,20g (Tabella 3.3 e 3.4).

Potenziale Liquefazione I_{PL}	Classificazione
$I_{PL} = 0$	<i>Non liquefacibile</i>
$0 < I_{PL} \leq 5$	<i>Basso</i>
$5 < I_{PL} \leq 15$	<i>Alto</i>
$I_{PL} \geq 15$	<i>Molto Alto</i>

Tabella 3.2 – Classificazione indice potenziale liquefazione

Prova	Potenziale Liquefazione I_{PL}
CPTU1	0,00

Tabella 3.3 – Indice potenziale liquefazione CPTU

Overall liquefaction potential: 0.00

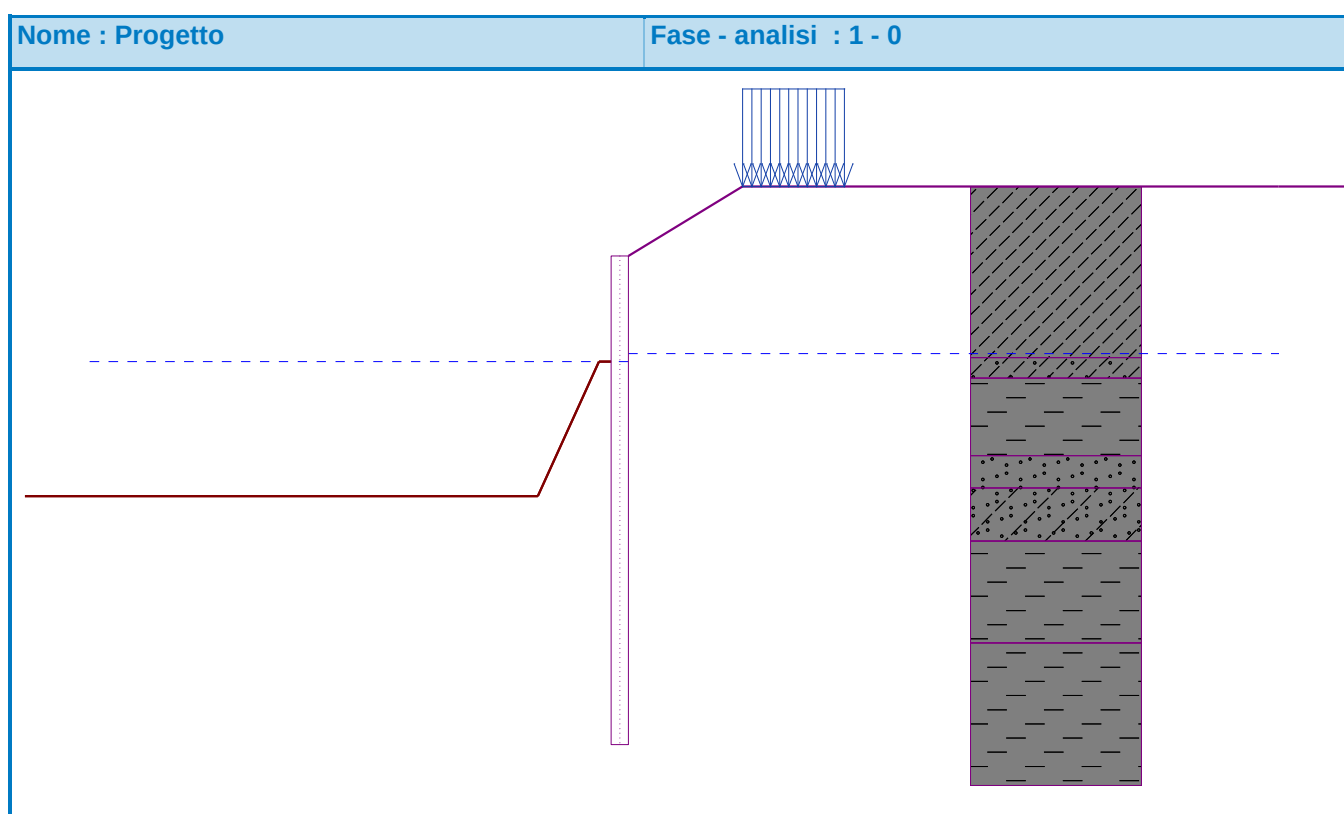
$LPI = 0.00$ - Liquefaction risk very low
 LPI between 0.00 and 5.00 - Liquefaction risk low
 LPI between 5.00 and 15.00 - Liquefaction risk high
 $LPI > 15.00$ - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
 F_L : $1 - FS$
 w_L : Function value of the extend of soil liquefaction according to depth
 d_L : Layer thickness (m)
 LPI: Liquefaction potential index value for test point

A. PALANCOLATO FISSO VL605 PER RAMPA ACCESSO – P1

Dati inseriti:



Impostazioni

Standard - fattori di sicurezza

Materiali e standard

Cemento armato :	EN 1992-1-1 (EC2)
Coefficienti EN 1992-1-1 :	standard
Palo tubolare :	metodo semplificato
Strutture in acciaio :	EN 1993-1-1 (EC3)
Coeff. parziale della capacità portante della sezione in acciaio :	$\gamma_{M0} = 1,00$
Strutture in legno :	EN 1995-1-1 (EC5)

Coefficiente parziale per le proprietà del legno : $\gamma_M = 1,30$
 Coeff. di correzione per durata del carico e umidità : $k_{mod} = 0,50$
 Coeff. cracking factor (influenza delle fessurazioni) : $k_{cr} = 0,67$

Analisi della pressione

Metodologia di verifica : Fattori di sicurezza (ASD)
 Calcolo spinta attiva terreno : Coulomb
 Calcolo spinta passiva terreno : Caquot-Kerisel
 Metodo di analisi : pressioni dipendenti
 Analisi sismica : Mononobe-Okabe
 Modulo di reazione del terreno : standard
 Considera riduzione del modulo di reazione del terreno per una paratia rinforzata

Fattori di sicurezza			
Situazione di progetto permanente			
Fattore di sicurezza per la stabilità interna degli ancoraggi :	$SF_a =$	1,50	[-]

Ancoraggi

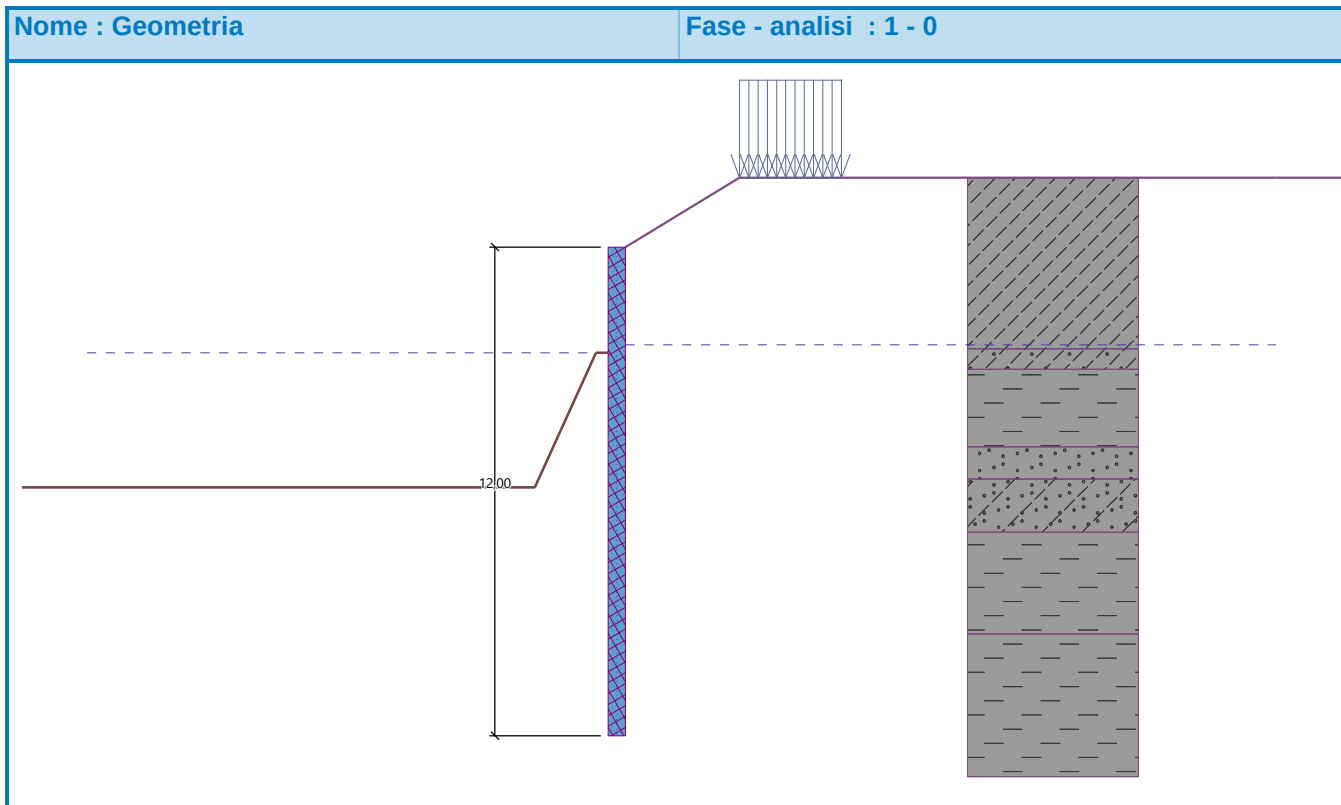
Metodologia di verifica : Fattori di sicurezza (ASD)

Fattori di sicurezza			
Fattore di sicurezza per resistenza dell'acciaio :	$SF_t =$	1,50	[-]
Fattore di sicurezza per resistenza pull-out (terreno) :	$SF_e =$	1,50	[-]
Fattore di sicurezza per resistenza pull-out (grouting) :	$SF_c =$	1,50	[-]

Geometria della struttura

Lunghezza della struttura = 12,00 m

Nome della sezione trasversale : Palancola : VL 605
 Area della sezione $A = 1,74E-02 \text{ m}^2/\text{m}$
 Momento d'inerzia $I = 4,24E-04 \text{ m}^4/\text{m}$
 Modulo di resistenza $W = 2,021E-03 \text{ m}^3/\text{m}$
 Modulo di resistenza plastico $W_{pl} = 2,342E-03 \text{ m}^3/\text{m}$



Materiale della struttura

Acciaio strutturale: S 275

Tensione caratteristica di snervamento $f_y = 275,00$ MPa

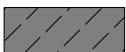
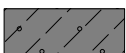
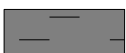
Modulo di elasticità $E = 210000,00$ MPa

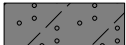
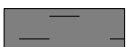
Modulo di taglio $G = 81000,00$ MPa

Modulo di reazione

Il modulo della reazione del sottosuolo è calcolato con il metodo Schmitt.

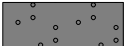
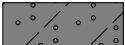
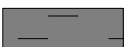
Parametri del terreno di base

N.	Nome	Retino	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]	γ_{su} [kN/m ³]	δ [°]
1	Strato - 1		17,00	61,00	18,00	9,00	0,00
2	Strato - 2		26,00	8,00	20,00	11,00	10,00
3	Strato - 3		17,00	40,00	17,50	8,50	10,00

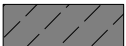
N.	Nome	Retino	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]	γ_{su} [kN/m ³]	δ [°]
4	Strato - 4		31,00	0,00	19,00	10,00	10,00
5	Strato - 5		29,00	5,00	18,00	9,00	10,00
6	Strato - 6		17,00	46,00	17,50	8,50	10,00
7	Strato - 7		13,00	50,00	17,50	8,50	10,00
8	Strato - 8		13,00	89,00	18,00	9,00	10,00
9	Strato - 9		28,00	0,00	19,00	10,00	10,00
10	Strato - 10		13,00	65,00	18,00	9,00	10,00
11	Strato - 11		25,00	5,00	18,00	9,00	10,00
12	Strato - 12		13,00	76,00	18,00	9,00	10,00
13	Strato - 13		13,00	97,00	18,00	9,00	10,00

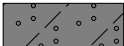
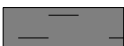
Parametri del terreno per calcolare la spinta a riposo

N.	Nome	Retino	Tipo calcolo	φ_{ef} [°]	ν [-]	OCR [-]	K_0 [-]
1	Strato - 1		coesivo	-	0,49	-	-
2	Strato - 2		non coesivo	26,00	-	-	-
3	Strato - 3		coesivo	-	0,49	-	-

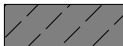
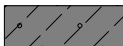
N.	Nome	Retino	Tipo calcolo	φ_{ef} [°]	ν [-]	OCR [-]	K_0 [-]
4	Strato - 4		non coesivo	31,00	-	-	-
5	Strato - 5		coesivo	-	0,28	-	-
6	Strato - 6		coesivo	-	0,40	-	-
7	Strato - 7		coesivo	-	0,42	-	-
8	Strato - 8		coesivo	-	0,42	-	-
9	Strato - 9		coesivo	-	0,28	-	-
10	Strato - 10		coesivo	-	0,42	-	-
11	Strato - 11		coesivo	-	0,30	-	-
12	Strato - 12		coesivo	-	0,42	-	-
13	Strato - 13		coesivo	-	0,42	-	-

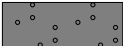
Parametri del terreno per calcolare il modulo della reazione del terreno

N.	Nome	Retino	Tipo inserimento	K_h [MN/m ³]	K_{h1} [MN/m ³]	K_{h2} [MN/m ³]	K_{h3} [MN/m ³]	A_1 [%]	A_2 [%]
1	Strato - 1		lineare		-	-	-	-	-
2	Strato - 2		lineare		-	-	-	-	-
3	Strato - 3		lineare		-	-	-	-	-

N.	Nome	Retino	Tipo inserimento	K_h [MN/m ³]	K_{h1} [MN/m ³]	K_{h2} [MN/m ³]	K_{h3} [MN/m ³]	A_1 [%]	A_2 [%]
4	Strato - 4		lineare		-	-	-	-	-
5	Strato - 5		lineare		-	-	-	-	-
6	Strato - 6		lineare		-	-	-	-	-
7	Strato - 7		lineare		-	-	-	-	-
8	Strato - 8		lineare		-	-	-	-	-
9	Strato - 9		lineare		-	-	-	-	-
10	Strato - 10		lineare		-	-	-	-	-
11	Strato - 11		lineare		-	-	-	-	-
12	Strato - 12		lineare		-	-	-	-	-
13	Strato - 13		lineare		-	-	-	-	-

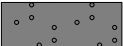
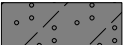
Parametri dei terreni per calcolare il modulo di reazione del terreno (Chadeisson)

N.	Nome	Retino	A_p [-]
1	Strato - 1		
2	Strato - 2		
3	Strato - 3		

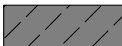
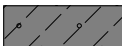
N.	Nome	Retino	A_p [-]
4	Strato - 4		
5	Strato - 5		
6	Strato - 6		
7	Strato - 7		
8	Strato - 8		
9	Strato - 9		
10	Strato - 10		
11	Strato - 11		
12	Strato - 12		
13	Strato - 13		

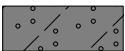
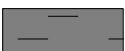
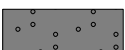
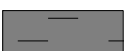
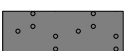
Parametri del terreno per calcolare il modulo della reazione del terreno(iterazione)

N.	Nome	Retino	ν [-]	E_{oed} [MPa]	E_{def} [MPa]	m [-]
1	Strato - 1		0,49	4,12	-	0,49
2	Strato - 2		0,40	6,60	-	0,40
3	Strato - 3		0,49	3,33	-	0,49

N.	Nome	Retino	ν [–]	E_{oed} [MPa]	E_{def} [MPa]	m [–]
4	Strato - 4		0,28	18,11	-	0,28
5	Strato - 5		0,28	11,35	-	0,28
6	Strato - 6		0,40	3,79	-	0,40
7	Strato - 7		0,42	4,13	-	0,42
8	Strato - 8		0,42	5,67	-	0,42
9	Strato - 9		0,28	22,92	-	0,28
10	Strato - 10		0,42	4,73	-	0,42
11	Strato - 11		0,30	13,88	-	0,30
12	Strato - 12		0,42	5,26	-	0,42
13	Strato - 13		0,42	6,37	-	0,42

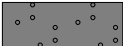
Parametri dei terreni per calcolare il modulo di reazione del terreno (CUR 166)

N.	Nome	Retino	k_1 [MN/m ³]	k_2 [MN/m ³]	k_3 [MN/m ³]
1	Strato - 1				
2	Strato - 2				
3	Strato - 3				

N.	Nome	Retino	k_1 [MN/m ³]	k_2 [MN/m ³]	k_3 [MN/m ³]
4	Strato - 4				
5	Strato - 5				
6	Strato - 6				
7	Strato - 7				
8	Strato - 8				
9	Strato - 9				
10	Strato - 10				
11	Strato - 11				
12	Strato - 12				
13	Strato - 13				

Parametri dei terreni per calcolare il modulo di reazione del terreno (Ménard)

N.	Nome	Retino	E_m [MPa]	α [–]
1	Strato - 1			
2	Strato - 2			
3	Strato - 3			

N.	Nome	Retino	E_m [MPa]	α [–]
4	Strato - 4			
5	Strato - 5			
6	Strato - 6			
7	Strato - 7			
8	Strato - 8			
9	Strato - 9			
10	Strato - 10			
11	Strato - 11			
12	Strato - 12			
13	Strato - 13			

Parametri terreno

Strato - 1

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 17,00 \text{ [}^\circ\text{]}$

Cohesion : $c_{ef} = 61,00 \text{ [kPa]}$

Friction angle structure-soil : $\delta = 0,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,49$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,49$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 4,12$ [MPa]

View

Retino terreno :



Strato - 2

Basic data

Unit weight : $\gamma = 20,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{\text{ef}} = 26,00$ [°]

Cohesion : $c_{\text{ef}} = 8,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesionless soil

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 21,00$ [kN/m³]

Analysis of modulus of subsoil reaction

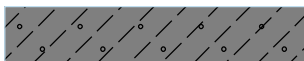
Poisson's ratio : $\nu = 0,40$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 6,60$ [MPa]

View

Retino terreno :



Strato - 3

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 17,00$ [°]
Cohesion : $c_{ef} = 40,00$ [kPa]
Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,49$ [-]

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,49$ [-]
Modulus type : input E_{oed}
Oedometric modulus : $E_{oed} = 3,33$ [MPa]

View

Retino terreno : 

Strato - 4

Basic data

Unit weight : $\gamma = 19,00$ [kN/m³]
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 31,00$ [°]
Cohesion : $c_{ef} = 0,00$ [kPa]
Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesionless soil

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 20,00$ [kN/m³]

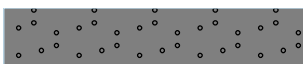
Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,28$ [-]
Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 18,11$ [MPa]

View

Retino terreno :



Strato - 5

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 29,00$ [°]

Cohesion : $c_{ef} = 5,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,28$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

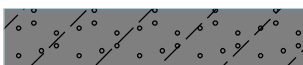
Poisson's ratio : $\nu = 0,28$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 11,35$ [MPa]

View

Retino terreno :



Strato - 6

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 17,00$ [°]

Cohesion : $c_{ef} = 46,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,40$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,40$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 3,79$ [MPa]

View

Retino terreno :



Strato - 7

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{\text{ef}} = 13,00$ [°]

Cohesion : $c_{\text{ef}} = 50,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

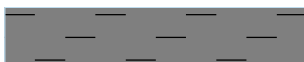
Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 4,13$ [MPa]

View

Retino terreno :



Strato - 8

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 13,00 \text{ [}^\circ\text{]}$
Cohesion : $c_{ef} = 89,00 \text{ [kPa]}$
Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Uplift pressure

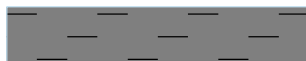
Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 19,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42 \text{ [-]}$
Modulus type : input E_{oed}
Oedometric modulus : $E_{oed} = 5,67 \text{ [MPa]}$

View

Retino terreno :



Strato - 9

Basic data

Unit weight : $\gamma = 19,00 \text{ [kN/m}^3\text{]}$
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 28,00 \text{ [}^\circ\text{]}$
Cohesion : $c_{ef} = 0,00 \text{ [kPa]}$
Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,28 \text{ [-]}$

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 20,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

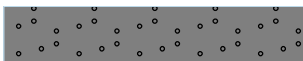
Poisson's ratio : $\nu = 0,28 \text{ [-]}$

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 22,92$ [MPa]

View

Retino terreno :



Strato - 10

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 13,00$ [°]

Cohesion : $c_{ef} = 65,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 4,73$ [MPa]

View

Retino terreno :



Strato - 11

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 25,00$ [°]

Cohesion : $c_{ef} = 5,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,30$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

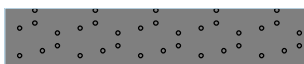
Poisson's ratio : $\nu = 0,30$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 13,88$ [MPa]

View

Retino terreno :



Strato - 12

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\phi_{\text{ef}} = 13,00$ [°]

Cohesion : $c_{\text{ef}} = 76,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 5,26$ [MPa]

View

Retino terreno :



Strato - 13

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 13,00 \text{ [}^\circ\text{]}$

Cohesion : $c_{ef} = 97,00 \text{ [kPa]}$

Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 6,37 \text{ [MPa]}$

View

Retino terreno :



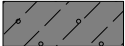
Profilo geologico e terreni assegnati

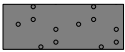
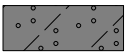
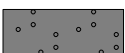
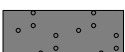
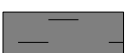
Informazioni sulla posizione

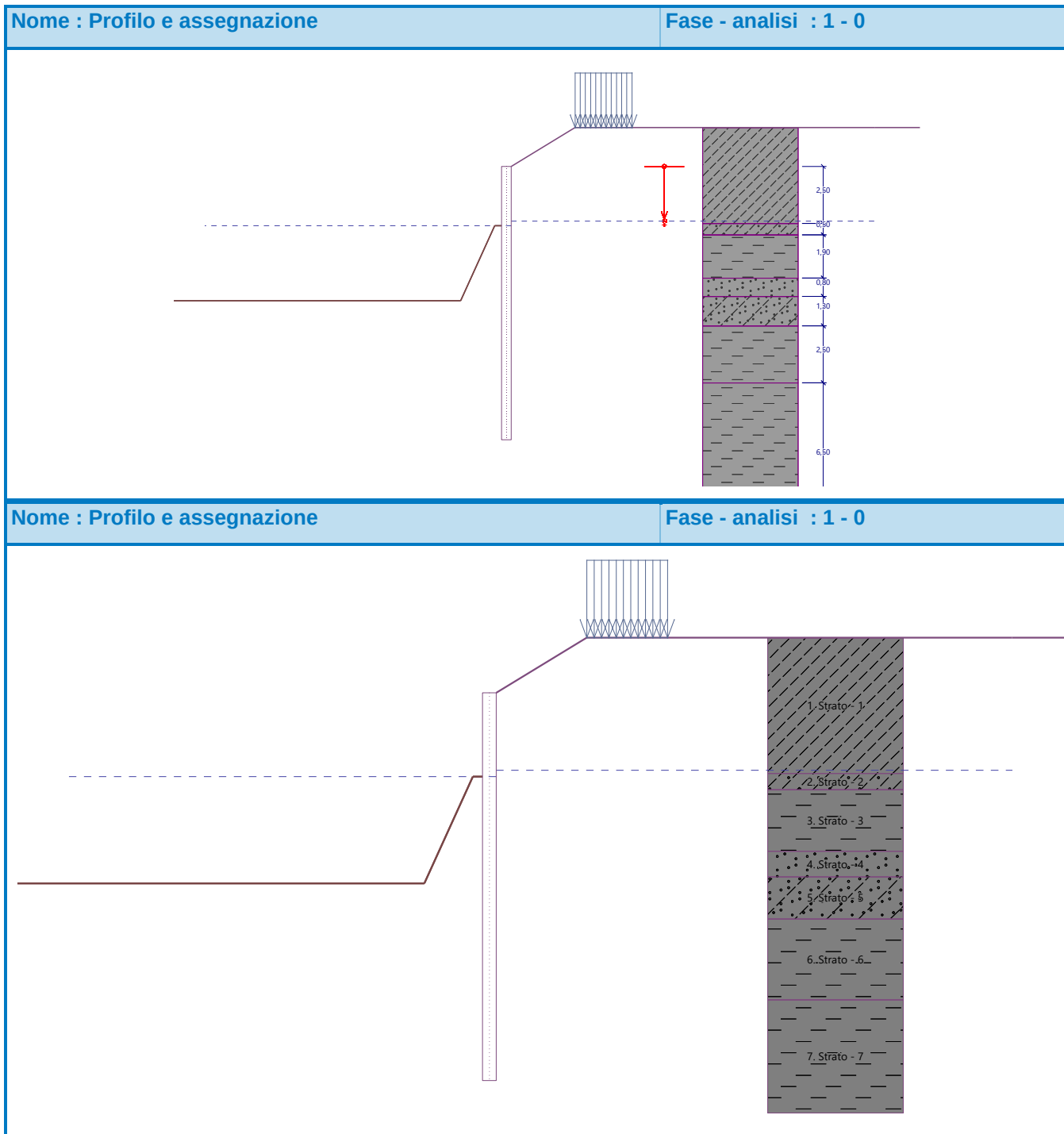
GPS : N 44,7149930; E 11,7089730

N 44°42'53,97"; E 11°42'32,30"

Profilo geologico e terreni assegnati

N.	Spessore dello strato $t \text{ [m]}$	Profondità $z \text{ [m]}$	Terreno assegnato	Retino
1	2,50	0,00 .. 2,50	Strato - 1	
2	0,50	2,50 .. 3,00	Strato - 2	
3	1,90	3,00 .. 4,90	Strato - 3	

N.	Spessore dello strato t [m]	Profondità z [m]	Terreno assegnato	Retino
4	0,80	4,90 .. 5,70	Strato - 4	
5	1,30	5,70 .. 7,00	Strato - 5	
6	2,50	7,00 .. 9,50	Strato - 6	
7	6,50	9,50 .. 16,00	Strato - 7	
8	2,50	16,00 .. 18,50	Strato - 8	
9	0,60	18,50 .. 19,10	Strato - 9	
10	0,80	19,10 .. 19,90	Strato - 10	
11	0,80	19,90 .. 20,70	Strato - 11	
12	4,30	20,70 .. 25,00	Strato - 12	
13	3,00	25,00 .. 28,00	Strato - 13	
14	-	28,00 .. ∞	Strato - 13	



Scavo

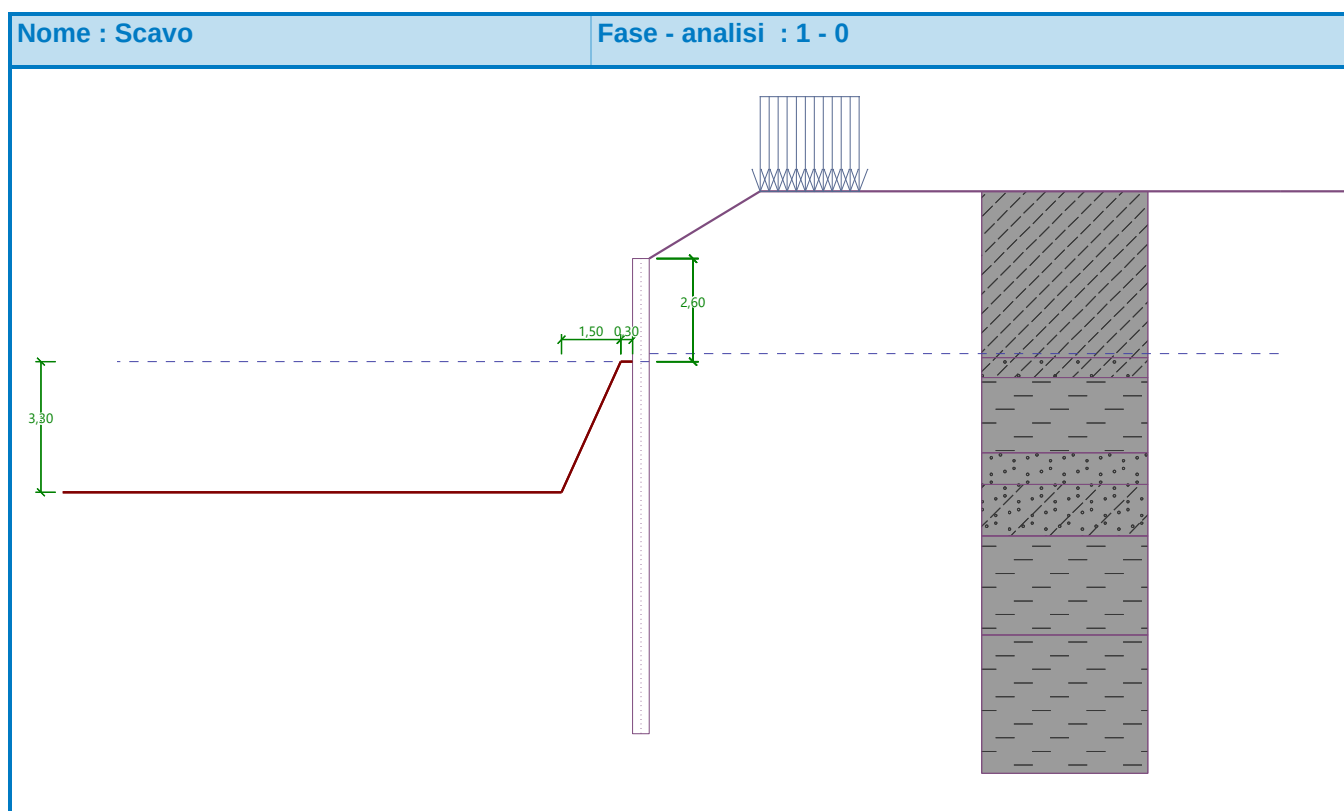
Il terreno antistante la parete è ad una profondità di 2,60 m.

Forma del fondo scavo

N.	Coordinate x [m]	Profondità z [m]
1	0,00	0,00
2	-0,30	0,00
3	-1,80	3,30
4	-2,80	3,30

Origine [0,0] collocata sul fondo scavo.

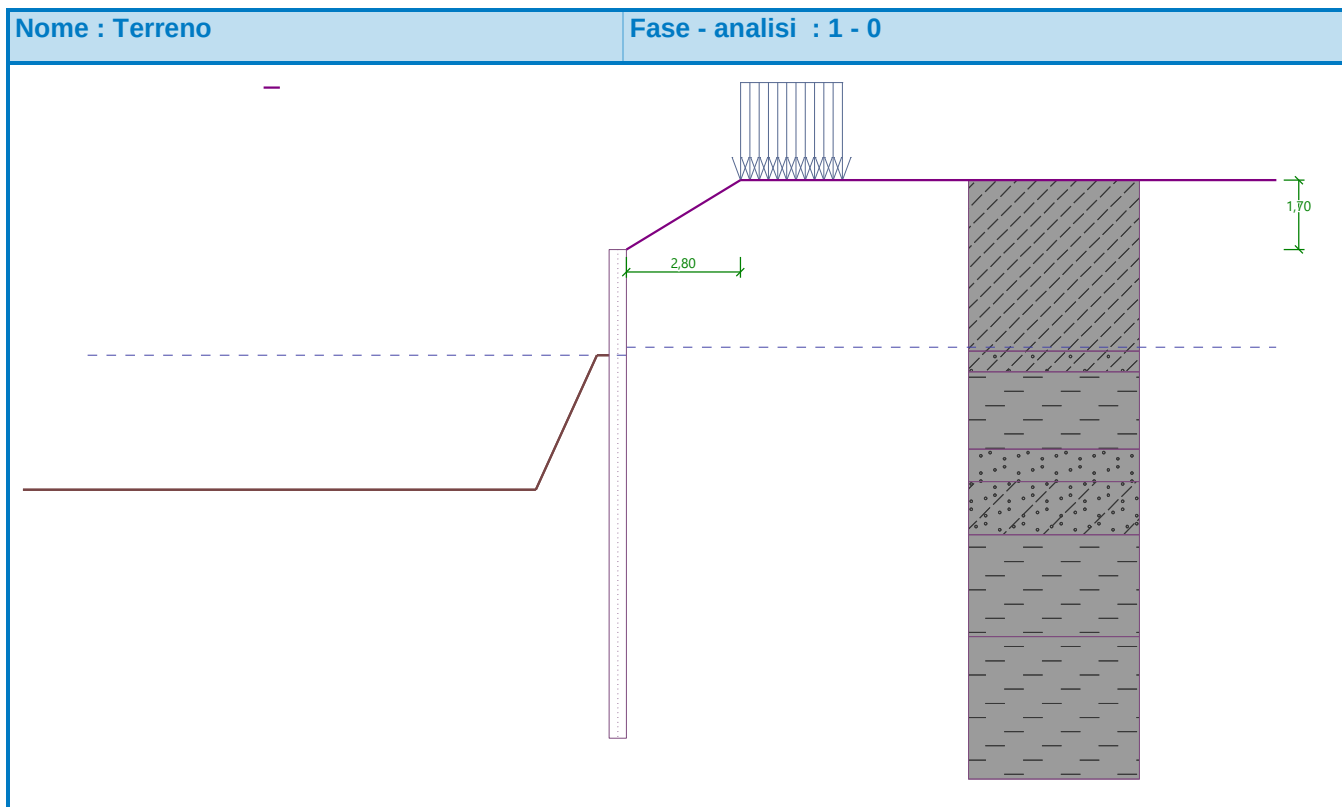
La coordinata positiva +z è diretta verso il basso.



Profilo del terreno

Il terreno dietro la costruzione ha la pendenza 1: 1,65 (l'angolo di inclinazione è 31,26 °).

L'altezza dell'argine è 1,70 m, la lunghezza dell'argine è 2,80 m.

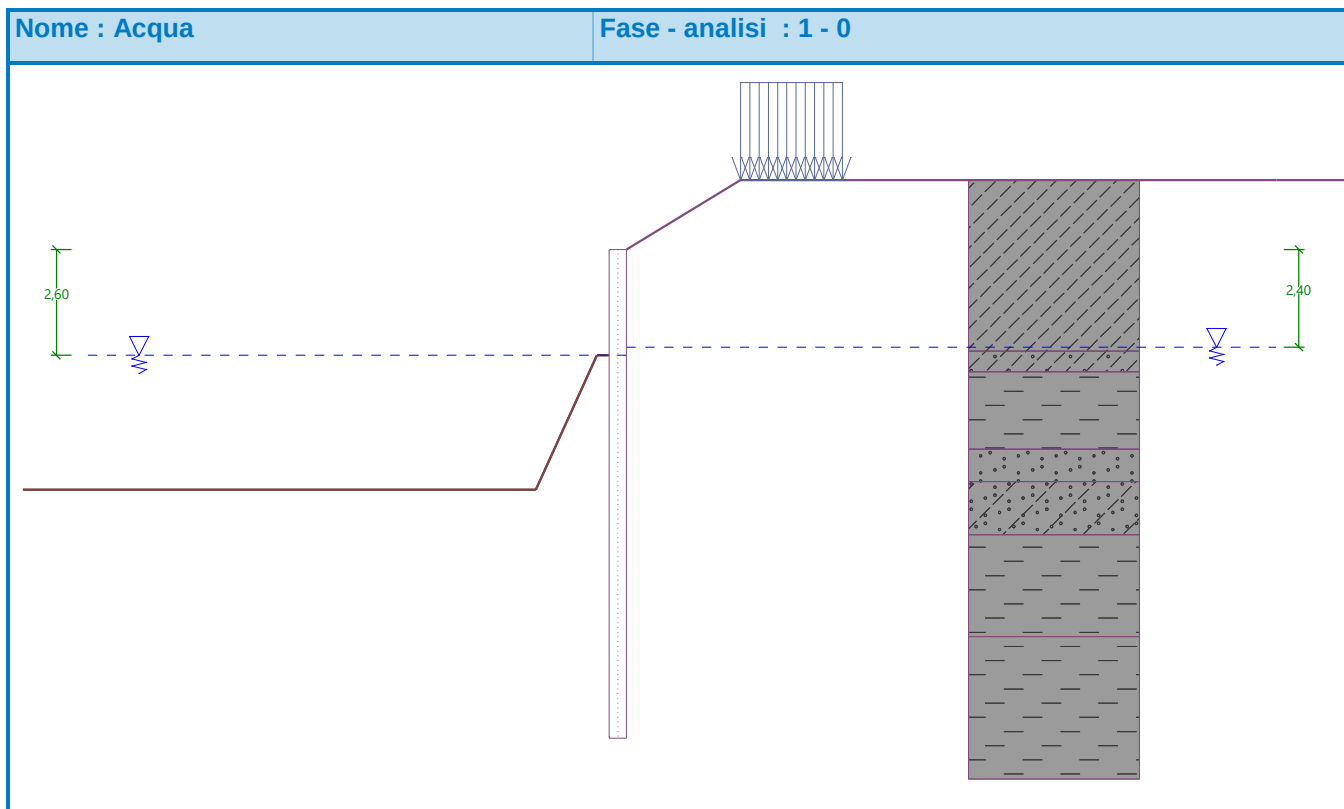


Influenza dell'acqua

L.F. a monte collocata ad una profondità di 2,40 m

L.F. a valle collocata alla profondità di 2,60 m

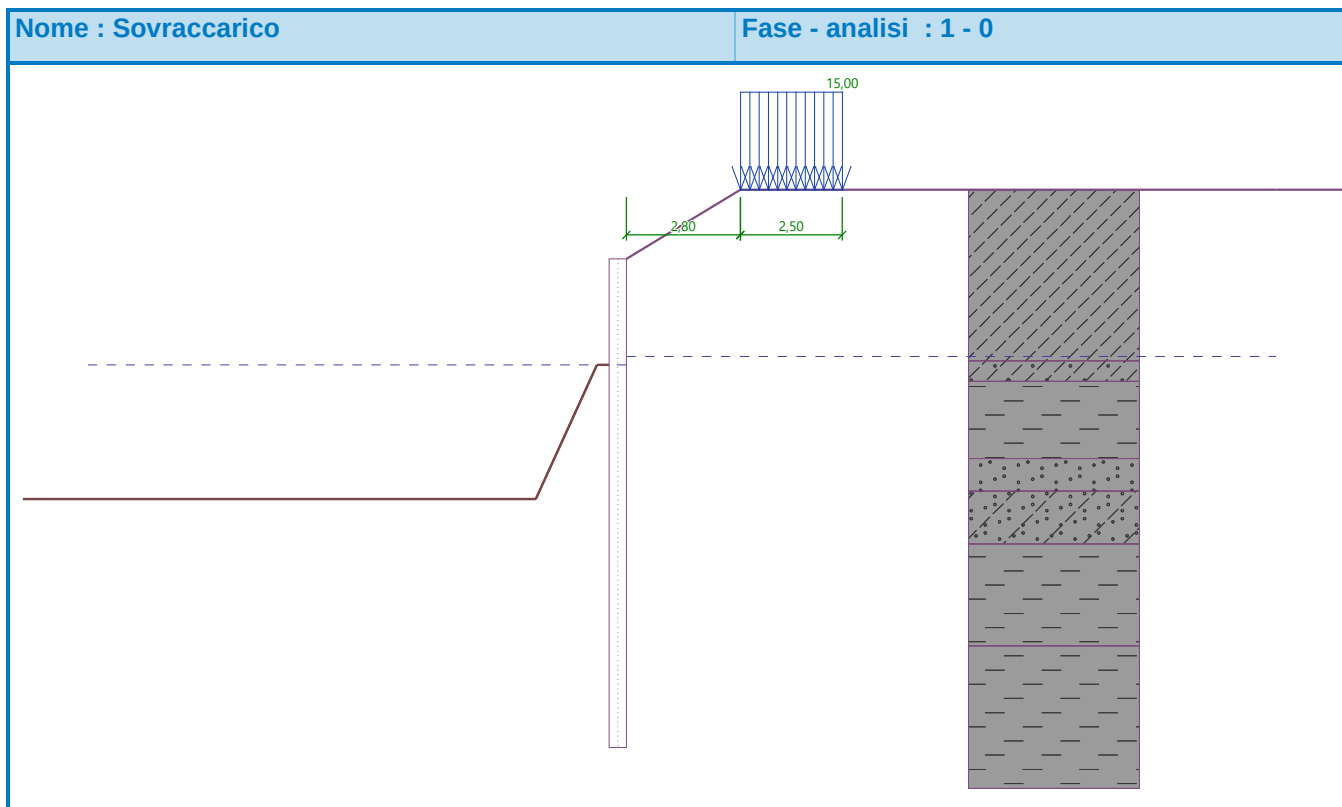
La struttura alla base non è permeabile



Sovraccarichi di superficie

N.	Sovraccarico		Azione	Grand.1 [kN/m ²]	Grand.2 [kN/m ²]	Ord.x x [m]	Lunghezza l [m]	Profondità z [m]
	nuovo	modifica						
1	Sì		variabile	15,00		2,80	2,50	sul terreno

N.	Nome
1	Automezzi



Impostazioni generali

Numero di Elem. Finiti per discretizzare la struttura = 100

La pressione minima è considerata come $\sigma_{a,min} = 0,20\sigma_z$

Impostazioni della fase di progetto

Situazione del progetto : permanente

Analisi risultati

Distribuzione delle pressioni agenti sulla struttura (davanti e dietro il muro)

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
0.00	0.00	0.00	0.00	0.00	3.71	176.84
0.00	0.00	0.00	0.00	0.00	3.71	176.85
0.22	0.00	0.00	0.00	0.80	14.09	185.27
0.22	0.00	0.00	0.00	0.81	14.14	185.30
0.30	0.00	0.00	0.00	1.08	17.74	188.23
0.30	0.00	0.00	0.00	1.09	17.79	188.26

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
0.41	0.00	0.00	0.00	1.46	22.68	192.23
0.41	0.00	0.00	0.00	1.47	22.72	192.26
0.63	0.00	0.00	0.00	2.27	33.16	200.73
1.01	0.00	0.00	0.00	3.63	50.59	215.03
1.26	0.00	0.00	0.00	4.55	54.85	224.61
1.67	0.00	0.00	0.00	6.03	61.69	240.18
1.89	0.00	0.00	0.00	6.82	65.35	248.50
2.40	0.00	0.00	0.00	8.64	73.72	267.61
2.50	0.00	0.00	0.00	8.82	75.52	270.50
2.50	0.00	0.00	0.00	21.89	45.70	286.05
2.53	0.00	0.00	0.00	22.24	46.11	287.30
2.60	0.00	0.00	0.00	23.22	47.25	290.81
2.60	0.00	-0.00	-29.38	23.22	47.25	290.82
2.85	0.00	-1.58	-29.38	24.08	48.65	300.41
3.00	0.00	-1.73	-29.38	24.56	49.44	305.87
3.00	0.00	-1.97	-119.72	9.92	81.45	257.32
3.16	0.00	-2.12	-119.72	10.19	82.64	260.78
3.30	0.00	-2.25	-119.72	10.43	83.72	263.89
3.30	0.00	-2.25	-119.72	10.43	83.73	263.91
3.79	0.00	-2.72	-119.72	11.26	87.42	274.61
4.42	0.00	-3.32	-119.72	12.34	92.26	288.45
4.90	0.00	-3.77	-119.72	13.15	95.97	298.95
4.90	-0.52	-0.52	-0.52	31.79	50.13	427.43
5.05	-0.55	-0.55	-0.55	32.17	50.81	434.17
5.68	-0.67	-0.67	-0.67	33.75	53.66	462.06
5.70	0.00	-3.18	-19.75	31.06	43.70	434.91
5.80	0.00	-3.24	-19.75	31.29	44.01	438.36
5.80	0.00	-3.24	-19.75	29.93	44.01	438.36
5.90	0.00	-3.31	-19.75	30.23	44.35	442.04

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
6.32	0.00	-3.60	-19.75	31.41	45.69	456.85
6.95	0.00	-4.03	-19.75	33.20	47.75	479.36
7.00	0.00	-4.07	-19.75	33.35	47.92	481.24
7.00	0.00	-4.14	-137.68	17.09	80.16	368.85
7.30	0.00	-4.34	-137.68	17.60	81.80	375.42
7.58	0.00	-4.52	-137.68	18.07	83.33	381.53
7.67	0.00	-4.59	-137.68	18.24	83.86	383.63
8.21	0.00	-4.94	-137.68	19.15	86.81	395.37
8.84	0.00	-5.35	-137.68	20.22	90.31	409.21
9.47	0.00	-5.77	-137.68	21.30	93.82	423.04
9.50	0.00	-5.79	-137.68	21.34	93.97	423.62
9.50	0.00	-4.90	-136.64	21.34	101.86	346.63
10.11	0.00	-5.24	-144.33	22.37	105.53	356.59
10.64	0.00	-5.54	-151.14	23.28	108.79	365.41
10.74	0.00	-6.00	-152.35	23.44	109.37	366.98
11.37	0.00	-9.07	-160.37	24.52	113.22	377.37
12.00	0.00	-12.13	-168.39	25.59	117.07	387.76

Distribuzioni del modulo della reazione del terreno e forze interne sulla struttura

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
0.00	0.00	0.00	-28.34	0.00	0.00	-0.00
0.60	0.00	0.00	-27.35	2.16	-0.65	0.13
1.20	0.00	0.00	-26.36	4.32	-2.59	1.04
1.80	0.00	0.00	-25.37	6.48	-5.83	3.50
2.40	0.00	0.00	-24.40	8.64	-10.37	8.29
2.60	0.00	0.00	-24.09	23.17	-13.94	10.63
2.60	0.00	0.00	-24.08	-6.14	-14.01	10.74
3.00	0.00	0.00	-23.47	-4.81	-11.84	15.84

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
3.60	2.34	2.34	-22.59	-22.19	2.38	18.64
4.20	2.34	2.34	-21.79	-14.44	13.35	13.69
4.80	2.34	2.34	-21.05	-6.89	19.75	3.53
5.40	0.00	0.00	-20.32	32.43	2.96	-3.76
6.00	0.00	0.00	-19.58	10.76	-10.14	-0.64
6.60	0.00	0.00	-18.83	12.47	-17.10	7.48
7.20	2.78	2.78	-18.12	-23.70	-18.14	19.28
7.80	2.78	2.78	-17.49	-17.27	-5.87	26.29
8.40	2.78	2.78	-16.95	-11.40	2.70	27.06
9.00	2.78	2.78	-16.53	-6.12	7.93	23.71
9.60	3.12	3.12	-16.20	-3.45	10.27	18.12
10.20	3.12	3.12	-15.95	1.43	10.86	11.63
10.80	3.12	3.12	-15.74	5.35	8.67	5.65
11.40	3.12	3.12	-15.56	7.23	4.89	1.52
12.00	3.12	3.12	-15.39	9.07	0.00	0.00

Distribuzioni del modulo della reazione del terreno e forze interne sulla struttura - nel dettaglio

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
0.00	0.00	0.00	-28.34	0.00	0.00	-0.00
0.12	0.00	0.00	-28.14	0.43	-0.03	0.00
0.24	0.00	0.00	-27.94	0.86	-0.10	0.01
0.36	0.00	0.00	-27.74	1.30	-0.23	0.03
0.48	0.00	0.00	-27.55	1.73	-0.41	0.07
0.60	0.00	0.00	-27.35	2.16	-0.65	0.13
0.72	0.00	0.00	-27.15	2.59	-0.93	0.22
0.84	0.00	0.00	-26.95	3.02	-1.27	0.36
0.96	0.00	0.00	-26.75	3.46	-1.66	0.53
1.08	0.00	0.00	-26.56	3.89	-2.10	0.76

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
1.20	0.00	0.00	-26.36	4.32	-2.59	1.04
1.32	0.00	0.00	-26.16	4.75	-3.14	1.38
1.44	0.00	0.00	-25.96	5.18	-3.73	1.79
1.56	0.00	0.00	-25.77	5.62	-4.38	2.28
1.68	0.00	0.00	-25.57	6.05	-5.08	2.84
1.80	0.00	0.00	-25.37	6.48	-5.83	3.50
1.92	0.00	0.00	-25.18	6.91	-6.64	4.25
2.04	0.00	0.00	-24.98	7.34	-7.49	5.09
2.16	0.00	0.00	-24.79	7.78	-8.40	6.05
2.28	0.00	0.00	-24.60	8.21	-9.36	7.11
2.40	0.00	0.00	-24.40	8.64	-10.37	8.29
2.52	0.00	0.00	-24.21	22.15	-12.22	9.63
2.60	0.00	0.00	-24.09	23.17	-13.94	10.63
2.60	0.00	0.00	-24.08	-6.14	-14.01	10.74
2.64	0.00	0.00	-24.02	-6.02	-13.79	11.24
2.76	0.00	0.00	-23.84	-5.62	-13.09	12.85
2.88	0.00	0.00	-23.65	-5.22	-12.44	14.38
3.00	0.00	0.00	-23.47	-4.81	-11.84	15.84
3.12	2.34	2.34	-23.29	-28.61	-9.81	16.98
3.24	2.34	2.34	-23.11	-26.99	-6.47	17.96
3.36	2.34	2.34	-22.94	-25.37	-3.33	18.54
3.48	2.34	2.34	-22.76	-23.78	-0.38	18.76
3.60	2.34	2.34	-22.59	-22.19	2.38	18.64
3.72	2.34	2.34	-22.43	-20.62	4.95	18.20
3.84	2.34	2.34	-22.27	-19.06	7.33	17.46
3.96	2.34	2.34	-22.11	-17.51	9.52	16.45
4.08	2.34	2.34	-21.95	-15.97	11.53	15.18
4.20	2.34	2.34	-21.79	-14.44	13.35	13.69
4.32	2.34	2.34	-21.64	-12.92	15.00	11.98

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
4.44	2.34	2.34	-21.49	-11.41	16.46	10.09
4.56	2.34	2.34	-21.34	-9.90	17.73	8.04
4.68	2.34	2.34	-21.20	-8.39	18.83	5.84
4.80	2.34	2.34	-21.05	-6.89	19.75	3.53
4.92	0.00	0.00	-20.90	31.32	18.26	1.35
5.04	0.00	0.00	-20.76	31.60	14.49	-0.61
5.16	0.00	0.00	-20.61	31.87	10.68	-2.12
5.28	0.00	0.00	-20.46	32.15	6.84	-3.17
5.40	0.00	0.00	-20.32	32.43	2.96	-3.76
5.52	0.00	0.00	-20.17	32.70	-0.94	-3.88
5.64	0.00	0.00	-20.02	32.98	-4.88	-3.53
5.76	0.00	0.00	-19.87	11.46	-7.55	-2.76
5.88	0.00	0.00	-19.73	10.42	-8.86	-1.78
6.00	0.00	0.00	-19.58	10.76	-10.14	-0.64
6.12	0.00	0.00	-19.43	11.10	-11.45	0.66
6.24	0.00	0.00	-19.28	11.45	-12.80	2.11
6.36	0.00	0.00	-19.13	11.79	-14.19	3.73
6.48	0.00	0.00	-18.98	12.13	-15.63	5.52
6.60	0.00	0.00	-18.83	12.47	-17.10	7.48
6.72	0.00	0.00	-18.69	12.81	-18.62	9.63
6.84	0.00	0.00	-18.54	13.15	-20.18	11.96
6.96	0.00	0.00	-18.40	13.49	-21.78	14.47
7.08	2.78	2.78	-18.26	-25.04	-21.06	16.93
7.20	2.78	2.78	-18.12	-23.70	-18.14	19.28
7.32	2.78	2.78	-17.99	-22.37	-15.37	21.29
7.44	2.78	2.78	-17.86	-21.07	-12.77	22.97
7.56	2.78	2.78	-17.73	-19.78	-10.32	24.36
7.68	2.78	2.78	-17.61	-18.51	-8.02	25.46
7.80	2.78	2.78	-17.49	-17.27	-5.87	26.29

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
7.92	2.78	2.78	-17.37	-16.05	-3.87	26.87
8.04	2.78	2.78	-17.26	-14.85	-2.02	27.22
8.16	2.78	2.78	-17.15	-13.68	-0.31	27.36
8.28	2.78	2.78	-17.05	-12.53	1.26	27.30
8.40	2.78	2.78	-16.95	-11.40	2.70	27.06
8.52	2.78	2.78	-16.86	-10.30	4.00	26.66
8.64	2.78	2.78	-16.77	-9.22	5.17	26.11
8.76	2.78	2.78	-16.69	-8.17	6.21	25.42
8.88	2.78	2.78	-16.61	-7.13	7.13	24.62
9.00	2.78	2.78	-16.53	-6.12	7.93	23.71
9.12	2.78	2.78	-16.46	-5.13	8.60	22.72
9.24	2.78	2.78	-16.39	-4.16	9.16	21.65
9.36	2.78	2.78	-16.33	-3.21	9.60	20.53
9.48	2.78	2.78	-16.26	-2.28	9.93	19.35
9.60	3.12	3.12	-16.20	-3.45	10.27	18.12
9.72	3.12	3.12	-16.15	-2.44	10.63	16.87
9.84	3.12	3.12	-16.10	-1.45	10.86	15.58
9.96	3.12	3.12	-16.05	-0.48	10.98	14.26
10.08	3.12	3.12	-16.00	0.48	10.98	12.95
10.20	3.12	3.12	-15.95	1.43	10.86	11.63
10.32	3.12	3.12	-15.91	2.37	10.63	10.34
10.44	3.12	3.12	-15.86	3.30	10.29	9.09
10.56	3.12	3.12	-15.82	4.22	9.84	7.88
10.68	3.12	3.12	-15.78	4.96	9.29	6.73
10.80	3.12	3.12	-15.74	5.35	8.67	5.65
10.92	3.12	3.12	-15.71	5.74	8.01	4.65
11.04	3.12	3.12	-15.67	6.12	7.29	3.73
11.16	3.12	3.12	-15.63	6.49	6.54	2.90
11.28	3.12	3.12	-15.60	6.86	5.74	2.16

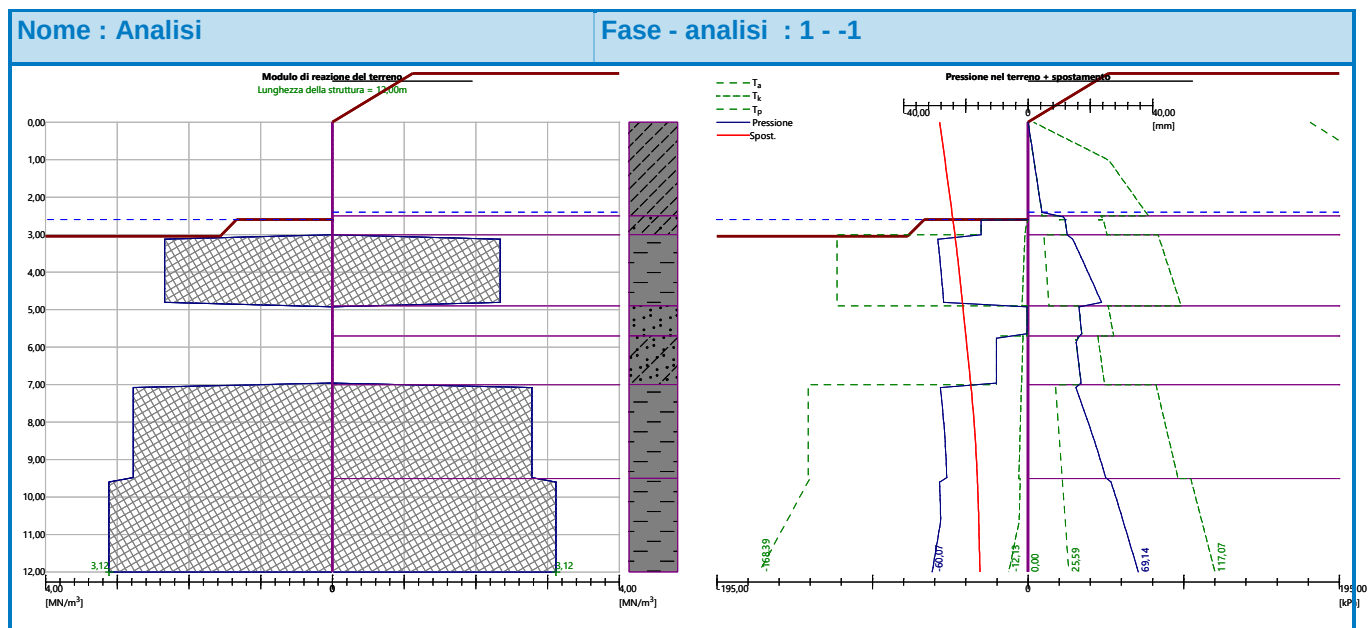
Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
11.40	3.12	3.12	-15.56	7.23	4.89	1.52
11.52	3.12	3.12	-15.53	7.60	4.00	0.99
11.64	3.12	3.12	-15.49	7.97	3.07	0.56
11.76	3.12	3.12	-15.46	8.34	2.09	0.25
11.88	3.12	3.12	-15.42	8.70	1.07	0.06
12.00	3.12	3.12	-15.39	9.07	0.00	0.00

Valori massimi delle forze interne agenti sulla struttura

Massima forza di taglio = 21,78 kN/m

Momento massimo = 27,36 kNm/m

Massimo spostamento = 28,3 mm





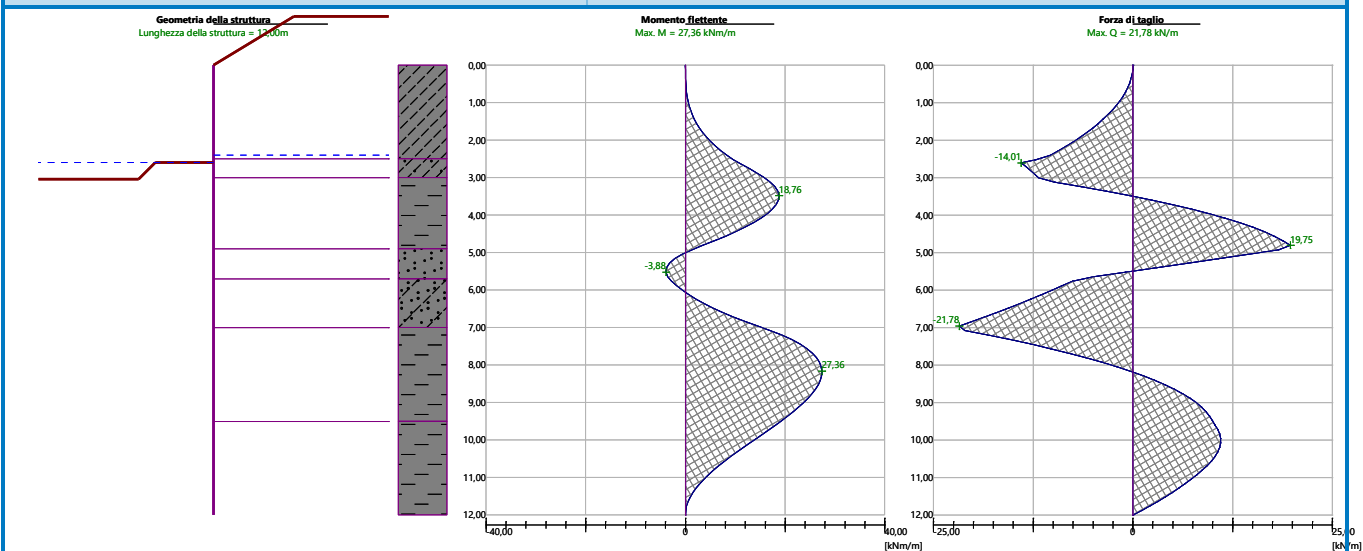
Finanziato
dall'Unione europea
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MINISTERO
DELLE INFRASTRUTTURE
E DEI TRASPORTI

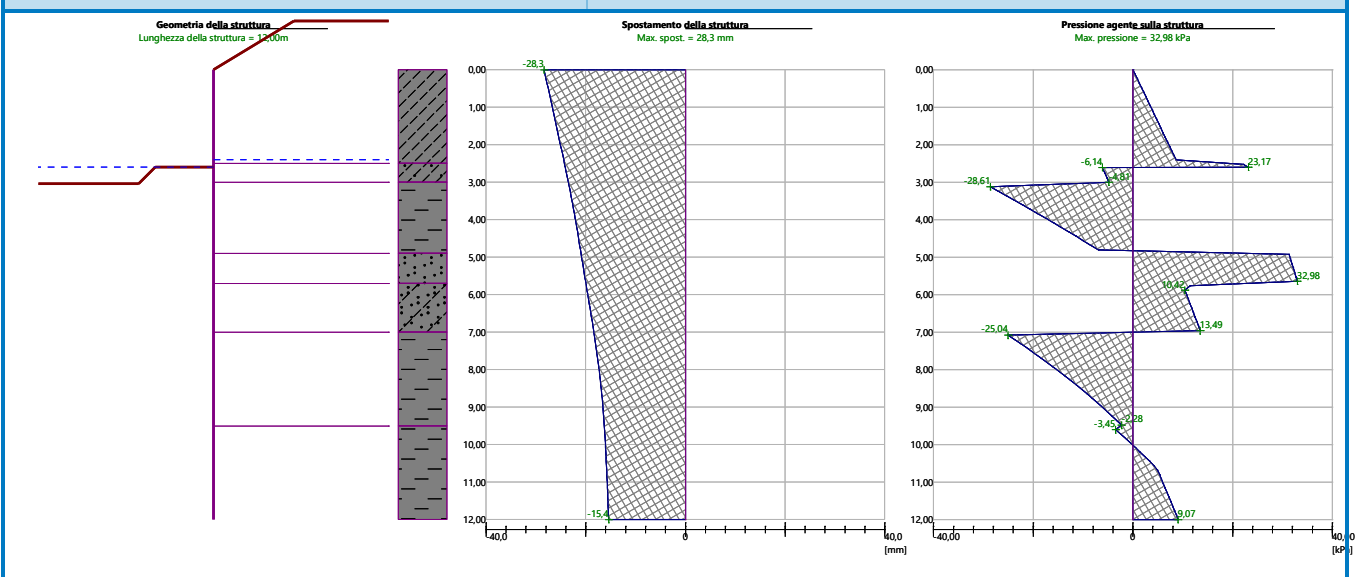
Nome : Analisi

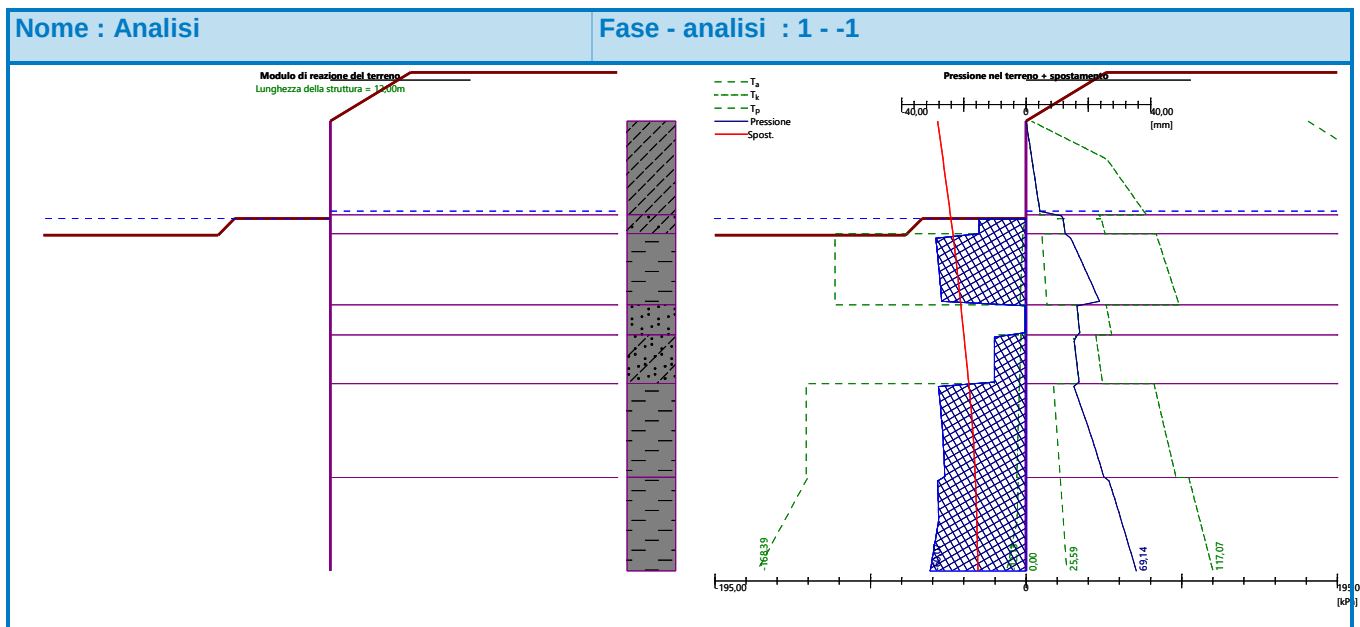
Fase - analisi : 1 - -1



Nome : Analisi

Fase - analisi : 1 - -1





Dimensionamento N. 1

Distribuzione delle forze in costruzione

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.00	-28.34	-28.34	0.00	0.00	-0.00	-0.00
0.60	-27.35	-27.35	-0.65	-0.65	0.13	0.13
1.20	-26.36	-26.36	-2.59	-2.59	1.04	1.04
1.80	-25.37	-25.37	-5.83	-5.83	3.50	3.50
2.40	-24.40	-24.40	-10.37	-10.37	8.29	8.29
2.60	-24.09	-24.09	-13.94	-13.94	10.63	10.63
2.60	-24.09	-24.09	-13.94	-13.94	10.63	10.63
2.60	-24.08	-24.08	-14.01	-14.01	10.74	10.74
2.60	-24.08	-24.08	-14.01	-14.01	10.74	10.74
3.00	-23.47	-23.47	-11.84	-11.84	15.84	15.84
3.60	-22.59	-22.59	2.38	2.38	18.64	18.64
4.20	-21.79	-21.79	13.35	13.35	13.69	13.69
4.80	-21.05	-21.05	19.75	19.75	3.53	3.53

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
5.40	-20.32	-20.32	2.96	2.96	-3.76	-3.76
6.00	-19.58	-19.58	-10.14	-10.14	-0.64	-0.64
6.60	-18.83	-18.83	-17.10	-17.10	7.48	7.48
7.20	-18.12	-18.12	-18.14	-18.14	19.28	19.28
7.80	-17.49	-17.49	-5.87	-5.87	26.29	26.29
8.40	-16.95	-16.95	2.70	2.70	27.06	27.06
9.00	-16.53	-16.53	7.93	7.93	23.71	23.71
9.60	-16.20	-16.20	10.27	10.27	18.12	18.12
10.20	-15.95	-15.95	10.86	10.86	11.63	11.63
10.80	-15.74	-15.74	8.67	8.67	5.65	5.65
11.40	-15.56	-15.56	4.89	4.89	1.52	1.52
12.00	-15.39	-15.39	0.00	0.00	0.00	0.00

Distribuzione delle forze in costruzione - nel dettaglio

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.00	-28.34	-28.34	0.00	0.00	-0.00	-0.00
0.12	-28.14	-28.14	-0.03	-0.03	0.00	0.00
0.24	-27.94	-27.94	-0.10	-0.10	0.01	0.01
0.36	-27.74	-27.74	-0.23	-0.23	0.03	0.03
0.48	-27.55	-27.55	-0.41	-0.41	0.07	0.07
0.60	-27.35	-27.35	-0.65	-0.65	0.13	0.13
0.72	-27.15	-27.15	-0.93	-0.93	0.22	0.22
0.84	-26.95	-26.95	-1.27	-1.27	0.36	0.36
0.96	-26.75	-26.75	-1.66	-1.66	0.53	0.53
1.08	-26.56	-26.56	-2.10	-2.10	0.76	0.76
1.20	-26.36	-26.36	-2.59	-2.59	1.04	1.04
1.32	-26.16	-26.16	-3.14	-3.14	1.38	1.38

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
1.44	-25.96	-25.96	-3.73	-3.73	1.79	1.79
1.56	-25.77	-25.77	-4.38	-4.38	2.28	2.28
1.68	-25.57	-25.57	-5.08	-5.08	2.84	2.84
1.80	-25.37	-25.37	-5.83	-5.83	3.50	3.50
1.92	-25.18	-25.18	-6.64	-6.64	4.25	4.25
2.04	-24.98	-24.98	-7.49	-7.49	5.09	5.09
2.16	-24.79	-24.79	-8.40	-8.40	6.05	6.05
2.28	-24.60	-24.60	-9.36	-9.36	7.11	7.11
2.40	-24.40	-24.40	-10.37	-10.37	8.29	8.29
2.52	-24.21	-24.21	-12.22	-12.22	9.63	9.63
2.60	-24.09	-24.09	-13.94	-13.94	10.63	10.63
2.60	-24.09	-24.09	-13.94	-13.94	10.63	10.63
2.60	-24.08	-24.08	-14.01	-14.01	10.74	10.74
2.60	-24.08	-24.08	-14.01	-14.01	10.74	10.74
2.64	-24.02	-24.02	-13.79	-13.79	11.24	11.24
2.76	-23.84	-23.84	-13.09	-13.09	12.85	12.85
2.88	-23.65	-23.65	-12.44	-12.44	14.38	14.38
3.00	-23.47	-23.47	-11.84	-11.84	15.84	15.84
3.12	-23.29	-23.29	-9.81	-9.81	16.98	16.98
3.24	-23.11	-23.11	-6.47	-6.47	17.96	17.96
3.36	-22.94	-22.94	-3.33	-3.33	18.54	18.54
3.48	-22.76	-22.76	-0.38	-0.38	18.76	18.76
3.60	-22.59	-22.59	2.38	2.38	18.64	18.64
3.72	-22.43	-22.43	4.95	4.95	18.20	18.20
3.84	-22.27	-22.27	7.33	7.33	17.46	17.46
3.96	-22.11	-22.11	9.52	9.52	16.45	16.45
4.08	-21.95	-21.95	11.53	11.53	15.18	15.18
4.20	-21.79	-21.79	13.35	13.35	13.69	13.69

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
4.32	-21.64	-21.64	15.00	15.00	11.98	11.98
4.44	-21.49	-21.49	16.46	16.46	10.09	10.09
4.56	-21.34	-21.34	17.73	17.73	8.04	8.04
4.68	-21.20	-21.20	18.83	18.83	5.84	5.84
4.80	-21.05	-21.05	19.75	19.75	3.53	3.53
4.92	-20.90	-20.90	18.26	18.26	1.35	1.35
5.04	-20.76	-20.76	14.49	14.49	-0.61	-0.61
5.16	-20.61	-20.61	10.68	10.68	-2.12	-2.12
5.28	-20.46	-20.46	6.84	6.84	-3.17	-3.17
5.40	-20.32	-20.32	2.96	2.96	-3.76	-3.76
5.52	-20.17	-20.17	-0.94	-0.94	-3.88	-3.88
5.64	-20.02	-20.02	-4.88	-4.88	-3.53	-3.53
5.76	-19.87	-19.87	-7.55	-7.55	-2.76	-2.76
5.88	-19.73	-19.73	-8.86	-8.86	-1.78	-1.78
6.00	-19.58	-19.58	-10.14	-10.14	-0.64	-0.64
6.12	-19.43	-19.43	-11.45	-11.45	0.66	0.66
6.24	-19.28	-19.28	-12.80	-12.80	2.11	2.11
6.36	-19.13	-19.13	-14.19	-14.19	3.73	3.73
6.48	-18.98	-18.98	-15.63	-15.63	5.52	5.52
6.60	-18.83	-18.83	-17.10	-17.10	7.48	7.48
6.72	-18.69	-18.69	-18.62	-18.62	9.63	9.63
6.84	-18.54	-18.54	-20.18	-20.18	11.96	11.96
6.96	-18.40	-18.40	-21.78	-21.78	14.47	14.47
7.08	-18.26	-18.26	-21.06	-21.06	16.93	16.93
7.20	-18.12	-18.12	-18.14	-18.14	19.28	19.28
7.32	-17.99	-17.99	-15.37	-15.37	21.29	21.29
7.44	-17.86	-17.86	-12.77	-12.77	22.97	22.97
7.56	-17.73	-17.73	-10.32	-10.32	24.36	24.36

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
7.68	-17.61	-17.61	-8.02	-8.02	25.46	25.46
7.80	-17.49	-17.49	-5.87	-5.87	26.29	26.29
7.92	-17.37	-17.37	-3.87	-3.87	26.87	26.87
8.04	-17.26	-17.26	-2.02	-2.02	27.22	27.22
8.16	-17.15	-17.15	-0.31	-0.31	27.36	27.36
8.28	-17.05	-17.05	1.26	1.26	27.30	27.30
8.40	-16.95	-16.95	2.70	2.70	27.06	27.06
8.52	-16.86	-16.86	4.00	4.00	26.66	26.66
8.64	-16.77	-16.77	5.17	5.17	26.11	26.11
8.76	-16.69	-16.69	6.21	6.21	25.42	25.42
8.88	-16.61	-16.61	7.13	7.13	24.62	24.62
9.00	-16.53	-16.53	7.93	7.93	23.71	23.71
9.12	-16.46	-16.46	8.60	8.60	22.72	22.72
9.24	-16.39	-16.39	9.16	9.16	21.65	21.65
9.36	-16.33	-16.33	9.60	9.60	20.53	20.53
9.48	-16.26	-16.26	9.93	9.93	19.35	19.35
9.60	-16.20	-16.20	10.27	10.27	18.12	18.12
9.72	-16.15	-16.15	10.63	10.63	16.87	16.87
9.84	-16.10	-16.10	10.86	10.86	15.58	15.58
9.96	-16.05	-16.05	10.98	10.98	14.26	14.26
10.08	-16.00	-16.00	10.98	10.98	12.95	12.95
10.20	-15.95	-15.95	10.86	10.86	11.63	11.63
10.32	-15.91	-15.91	10.63	10.63	10.34	10.34
10.44	-15.86	-15.86	10.29	10.29	9.09	9.09
10.56	-15.82	-15.82	9.84	9.84	7.88	7.88
10.68	-15.78	-15.78	9.29	9.29	6.73	6.73
10.80	-15.74	-15.74	8.67	8.67	5.65	5.65
10.92	-15.71	-15.71	8.01	8.01	4.65	4.65

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
11.04	-15.67	-15.67	7.29	7.29	3.73	3.73
11.16	-15.63	-15.63	6.54	6.54	2.90	2.90
11.28	-15.60	-15.60	5.74	5.74	2.16	2.16
11.40	-15.56	-15.56	4.89	4.89	1.52	1.52
11.52	-15.53	-15.53	4.00	4.00	0.99	0.99
11.64	-15.49	-15.49	3.07	3.07	0.56	0.56
11.76	-15.46	-15.46	2.09	2.09	0.25	0.25
11.88	-15.42	-15.42	1.07	1.07	0.06	0.06
12.00	-15.39	-15.39	0.00	0.00	0.00	0.00

Massimi valori delle forze interne

Massimo spostamento = -28,3 mm
 Spostamento minimo = -15,4 mm
 Momento flettente massimo = 27,36 kNm/m
 Momento flettente minimo = -3,88 kNm/m
 Massima forza di taglio = 21,78 kN/m

Verifica della sezione trasversale - risultati dettagliati

Caratteristiche della sezione trasversale per 1 m del muro:

Area della sezione trasversale $A = 1,742E-02 \text{ m}^2/\text{m}$
 Modulo di resistenza $W = 2,021E-03 \text{ m}^3/\text{m}$
 Modulo di resistenza plastico $W_{pl} = 2,342E-03 \text{ m}^3/\text{m}$
 Momento d'inerzia $I = 4,244E-04 \text{ m}^4/\text{m}$
 Momento statico della sezione trasversale $S = 1,171E-03 \text{ m}^3/\text{m}$
 Momento statico dell'area $S_1 = 8,239E-04 \text{ m}^3/\text{m}$
 Spessore del taglio del muro $t = 16,7 \text{ mm/m}$

Proprietà materiali:

Tensione di snervamento $f_y = 275,00 \text{ MPa}$

Fattori parziali:

Coefficiente di resistenza della sezione trasversale $\gamma_{M0} = 1,00$

Resistenza della sezione trasversale:

Resistenza a flessione $M_{c,Rd} = W \cdot f_y / \gamma_{M0} = 555,77 \text{ kNm/m}$

Resistenza al taglio $V_{c,Rd} = I^* t / S \cdot f_y / (\sqrt{3} \cdot \gamma_{M0}) = 962,17 \text{ kN/m}$

Verifica della sezione in acciaio secondo EN 1993-1-1

Tutte le fasi di costruzione sono considerate nell'analisi.

Fattore parziale sul carico = 1,00

Forze interne per 1 m del muro

$M_{max} = 27,36 \text{ kNm/m}; \quad Q = 0,31 \text{ kN/m}$

$Q_{max} = 21,78 \text{ kN/m}; \quad M = 14,47 \text{ kNm/m}$

Verifica del momento massimo $M_{max} + Q$:

Verifica della flessione:

$M_{max} / M_{c,Rd} = 0,049 \leq 1 \quad \text{Soddisfatta}$

Verifica del taglio:

$Q / V_{c,Rd} = 0,000 \leq 1 \quad \text{Soddisfatta}$

Verifica dello stato della tensione:

Tensione normale $\sigma_{x,Ed} = 12,74 \text{ MPa}$

Tensione tangenziale $\tau_{Ed} = 0,04 \text{ MPa}$

Verifica: $\sqrt{((\sigma_{x,Ed} / (f_y / \gamma_{M0}))^2 + 3 \cdot (\tau_{Ed} / (f_y / \gamma_{M0}))^2)} = 0,046 \leq 1 \quad \text{Soddisfatta}$

Verifica della massima forza di taglio $Q_{max} + M$:

Verifica della flessione:

$M / M_{c,Rd} = 0,026 \leq 1 \quad \text{Soddisfatta}$

Verifica del taglio:

$Q_{max} / V_{c,Rd} = 0,023 \leq 1 \quad \text{Soddisfatta}$

Verifica dello stato della tensione:

Tensione normale $\sigma_{x,Ed} = 6,74 \text{ MPa}$

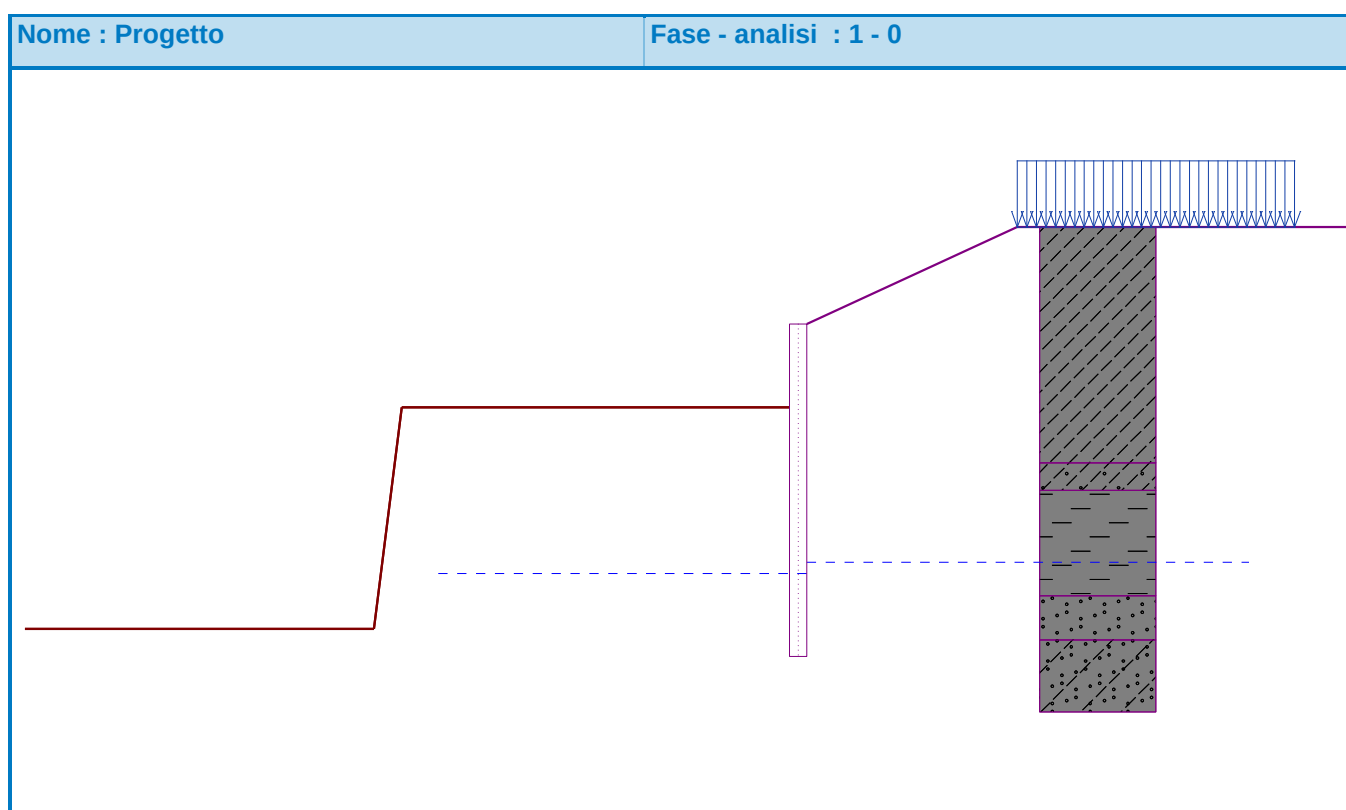
Tensione tangenziale $\tau_{Ed} = 2,53 \text{ MPa}$

Verifica: $\sqrt{((\sigma_{x,Ed} / (f_y / \gamma_{M0}))^2 + 3 \cdot (\tau_{Ed} / (f_y / \gamma_{M0}))^2)} = 0,029 \leq 1 \quad \text{Soddisfatta}$

La sezione trasversale è SODDISFATTA

B. PALANCOLATO FISSO VL602 PER AREA DEPOSITO – P2

Dati inseriti:



Impostazioni

Standard - fattori di sicurezza

Materiali e standard

Cemento armato :	EN 1992-1-1 (EC2)
Coefficienti EN 1992-1-1 :	standard
Palo tubolare :	metodo semplificato
Strutture in acciaio :	EN 1993-1-1 (EC3)
Coeff. parziale della capacità portante della sezione in acciaio :	$\gamma_{M0} = 1,00$
Strutture in legno :	EN 1995-1-1 (EC5)
Coefficiente parziale per le proprietà del legno :	$\gamma_M = 1,30$
Coeff. di correzione per durata del carico e umidità :	$k_{mod} = 0,50$

Coeff. cracking factor (influenza delle fessurazioni) : $k_{cr} = 0,67$

Analisi della pressione

Metodologia di verifica : Fattori di sicurezza (ASD)
 Calcolo spinta attiva terreno : Coulomb
 Calcolo spinta passiva terreno : Caquot-Kerisel
 Metodo di analisi : pressioni dipendenti
 Analisi sismica : Mononobe-Okabe
 Modulo di reazione del terreno : standard
 Considera riduzione del modulo di reazione del terreno per una paratia rinforzata

Fattori di sicurezza			
Situazione di progetto permanente			
Fattore di sicurezza per la stabilità interna degli ancoraggi :	$SF_a =$	1,50	[-]

Ancoraggi

Metodologia di verifica : Fattori di sicurezza (ASD)

Fattori di sicurezza			
Fattore di sicurezza per resistenza dell'acciaio :	$SF_t =$	1,50	[-]
Fattore di sicurezza per resistenza pull-out (terreno) :	$SF_e =$	1,50	[-]
Fattore di sicurezza per resistenza pull-out (grouting) :	$SF_c =$	1,50	[-]

Geometria della struttura

Lunghezza della struttura = 6,00 m

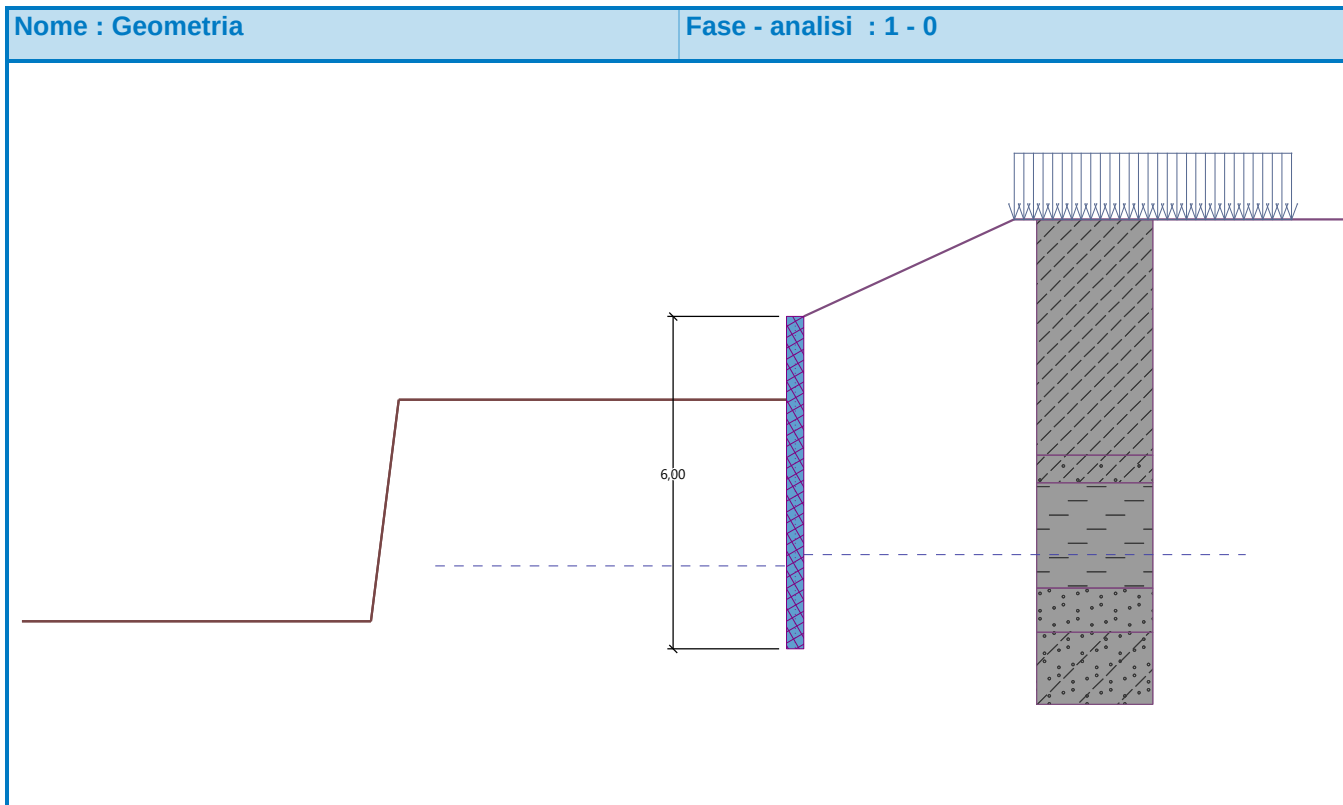
Nome della sezione trasversale : Palancola : VL 602

Area della sezione $A = 1,13E-02 \text{ m}^2/\text{m}$

Momento d'Inerzia $I = 1,30E-04 \text{ m}^4/\text{m}$

Modulo di resistenza $W = 8,420E-04 \text{ m}^3/\text{m}$

Modulo di resistenza plastico $W_{pl} = 1,022E-03 \text{ m}^3/\text{m}$



Materiale della struttura

Acciaio strutturale: S 275

Tensione caratteristica di snervamento $f_y = 275,00$ MPa

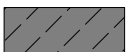
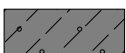
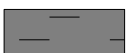
Modulo di elasticità $E = 210000,00$ MPa

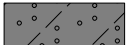
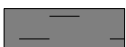
Modulo di taglio $G = 81000,00$ MPa

Modulo di reazione

Il modulo della reazione del sottosuolo è calcolato con il metodo Schmitt.

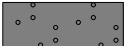
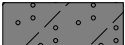
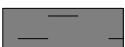
Parametri del terreno di base

N.	Nome	Retino	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]	γ_{su} [kN/m ³]	δ [°]
1	Strato - 1		17,00	61,00	18,00	9,00	0,00
2	Strato - 2		26,00	8,00	20,00	11,00	10,00
3	Strato - 3		17,00	40,00	17,50	8,50	10,00

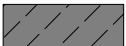
N.	Nome	Retino	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]	γ_{su} [kN/m ³]	δ [°]
4	Strato - 4		31,00	0,00	19,00	10,00	10,00
5	Strato - 5		29,00	5,00	18,00	9,00	10,00
6	Strato - 6		17,00	46,00	17,50	8,50	10,00
7	Strato - 7		13,00	50,00	17,50	8,50	10,00
8	Strato - 8		13,00	89,00	18,00	9,00	10,00
9	Strato - 9		28,00	0,00	19,00	10,00	10,00
10	Strato - 10		13,00	65,00	18,00	9,00	10,00
11	Strato - 11		25,00	5,00	18,00	9,00	10,00
12	Strato - 12		13,00	76,00	18,00	9,00	10,00
13	Strato - 13		13,00	97,00	18,00	9,00	10,00

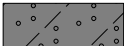
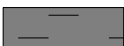
Parametri del terreno per calcolare la spinta a riposo

N.	Nome	Retino	Tipo calcolo	φ_{ef} [°]	ν [-]	OCR [-]	K_0 [-]
1	Strato - 1		coesivo	-	0,49	-	-
2	Strato - 2		non coesivo	26,00	-	-	-
3	Strato - 3		coesivo	-	0,49	-	-

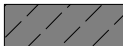
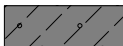
N.	Nome	Retino	Tipo calcolo	φ_{ef} [°]	ν [-]	OCR [-]	K_0 [-]
4	Strato - 4		non coesivo	31,00	-	-	-
5	Strato - 5		coesivo	-	0,28	-	-
6	Strato - 6		coesivo	-	0,40	-	-
7	Strato - 7		coesivo	-	0,42	-	-
8	Strato - 8		coesivo	-	0,42	-	-
9	Strato - 9		coesivo	-	0,28	-	-
10	Strato - 10		coesivo	-	0,42	-	-
11	Strato - 11		coesivo	-	0,30	-	-
12	Strato - 12		coesivo	-	0,42	-	-
13	Strato - 13		coesivo	-	0,42	-	-

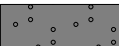
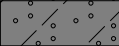
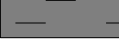
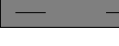
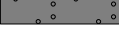
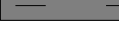
Parametri del terreno per calcolare il modulo della reazione del terreno

N.	Nome	Retino	Tipo inserimento	K_h [MN/m ³]	K_{h1} [MN/m ³]	K_{h2} [MN/m ³]	K_{h3} [MN/m ³]	A_1 [%]	A_2 [%]
1	Strato - 1		lineare		-	-	-	-	-
2	Strato - 2		lineare		-	-	-	-	-
3	Strato - 3		lineare		-	-	-	-	-

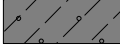
N.	Nome	Retino	Tipo inserimento	K_h [MN/m ³]	K_{h1} [MN/m ³]	K_{h2} [MN/m ³]	K_{h3} [MN/m ³]	A_1 [%]	A_2 [%]
4	Strato - 4		lineare		-	-	-	-	-
5	Strato - 5		lineare		-	-	-	-	-
6	Strato - 6		lineare		-	-	-	-	-
7	Strato - 7		lineare		-	-	-	-	-
8	Strato - 8		lineare		-	-	-	-	-
9	Strato - 9		lineare		-	-	-	-	-
10	Strato - 10		lineare		-	-	-	-	-
11	Strato - 11		lineare		-	-	-	-	-
12	Strato - 12		lineare		-	-	-	-	-
13	Strato - 13		lineare		-	-	-	-	-

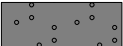
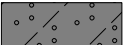
Parametri dei terreni per calcolare il modulo di reazione del terreno (Chadeisson)

N.	Nome	Retino	A_p [-]
1	Strato - 1		
2	Strato - 2		
3	Strato - 3		

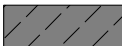
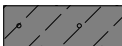
N.	Nome	Retino	A_p [-]
4	Strato - 4		
5	Strato - 5		
6	Strato - 6		
7	Strato - 7		
8	Strato - 8		
9	Strato - 9		
10	Strato - 10		
11	Strato - 11		
12	Strato - 12		
13	Strato - 13		

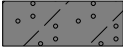
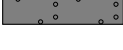
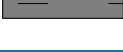
Parametri del terreno per calcolare il modulo della reazione del terreno(iterazione)

N.	Nome	Retino	ν [-]	E_{oed} [MPa]	E_{def} [MPa]	m [-]
1	Strato - 1		0,49	4,12	-	0,49
2	Strato - 2		0,40	6,60	-	0,40
3	Strato - 3		0,49	3,33	-	0,49

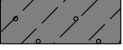
N.	Nome	Retino	ν [–]	E_{oed} [MPa]	E_{def} [MPa]	m [–]
4	Strato - 4		0,28	18,11	-	0,28
5	Strato - 5		0,28	11,35	-	0,28
6	Strato - 6		0,40	3,79	-	0,40
7	Strato - 7		0,42	4,13	-	0,42
8	Strato - 8		0,42	5,67	-	0,42
9	Strato - 9		0,28	22,92	-	0,28
10	Strato - 10		0,42	4,73	-	0,42
11	Strato - 11		0,30	13,88	-	0,30
12	Strato - 12		0,42	5,26	-	0,42
13	Strato - 13		0,42	6,37	-	0,42

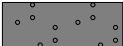
Parametri dei terreni per calcolare il modulo di reazione del terreno (CUR 166)

N.	Nome	Retino	k_1 [MN/m ³]	k_2 [MN/m ³]	k_3 [MN/m ³]
1	Strato - 1				
2	Strato - 2				
3	Strato - 3				

N.	Nome	Retino	k_1 [MN/m ³]	k_2 [MN/m ³]	k_3 [MN/m ³]
4	Strato - 4				
5	Strato - 5				
6	Strato - 6				
7	Strato - 7				
8	Strato - 8				
9	Strato - 9				
10	Strato - 10				
11	Strato - 11				
12	Strato - 12				
13	Strato - 13				

Parametri dei terreni per calcolare il modulo di reazione del terreno (Ménard)

N.	Nome	Retino	E_m [MPa]	α [–]
1	Strato - 1			
2	Strato - 2			
3	Strato - 3			

N.	Nome	Retino	E_m [MPa]	α [–]
4	Strato - 4			
5	Strato - 5			
6	Strato - 6			
7	Strato - 7			
8	Strato - 8			
9	Strato - 9			
10	Strato - 10			
11	Strato - 11			
12	Strato - 12			
13	Strato - 13			

Parametri terreno

Strato - 1

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 17,00 \text{ [}^\circ\text{]}$

Cohesion : $c_{ef} = 61,00 \text{ [kPa]}$

Friction angle structure-soil : $\delta = 0,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,49$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,49$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 4,12$ [MPa]

View

Retino terreno :



Strato - 2

Basic data

Unit weight : $\gamma = 20,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{\text{ef}} = 26,00$ [°]

Cohesion : $c_{\text{ef}} = 8,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesionless soil

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 21,00$ [kN/m³]

Analysis of modulus of subsoil reaction

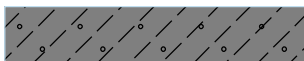
Poisson's ratio : $\nu = 0,40$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 6,60$ [MPa]

View

Retino terreno :



Strato - 3

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 17,00$ [°]
Cohesion : $c_{ef} = 40,00$ [kPa]
Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,49$ [-]

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,49$ [-]
Modulus type : input E_{oed}
Oedometric modulus : $E_{oed} = 3,33$ [MPa]

View

Retino terreno :



Strato - 4

Basic data

Unit weight : $\gamma = 19,00$ [kN/m³]
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 31,00$ [°]
Cohesion : $c_{ef} = 0,00$ [kPa]
Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesionless soil

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 20,00$ [kN/m³]

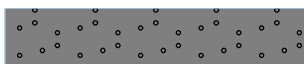
Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,28$ [-]
Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 18,11$ [MPa]

View

Retino terreno :



Strato - 5

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 29,00$ [°]

Cohesion : $c_{ef} = 5,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,28$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

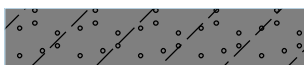
Poisson's ratio : $\nu = 0,28$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 11,35$ [MPa]

View

Retino terreno :



Strato - 6

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 17,00$ [°]

Cohesion : $c_{ef} = 46,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,40$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,40$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 3,79$ [MPa]

View

Retino terreno :



Strato - 7

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{\text{ef}} = 13,00$ [°]

Cohesion : $c_{\text{ef}} = 50,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

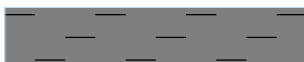
Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 4,13$ [MPa]

View

Retino terreno :



Strato - 8

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$
 Stress analysis : effective
 Internal friction angle : $\varphi_{ef} = 13,00 \text{ [}^\circ\text{]}$
 Cohesion : $c_{ef} = 89,00 \text{ [kPa]}$
 Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil
 Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Uplift pressure

Uplift calculation : standard
 Unit weight of saturated soil : $\gamma_{sat} = 19,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42 \text{ [-]}$
 Modulus type : input E_{oed}
 Oedometric modulus : $E_{oed} = 5,67 \text{ [MPa]}$

View

Retino terreno :



Strato - 9

Basic data

Unit weight : $\gamma = 19,00 \text{ [kN/m}^3\text{]}$
 Stress analysis : effective
 Internal friction angle : $\varphi_{ef} = 28,00 \text{ [}^\circ\text{]}$
 Cohesion : $c_{ef} = 0,00 \text{ [kPa]}$
 Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil
 Poisson's ratio : $\nu = 0,28 \text{ [-]}$

Uplift pressure

Uplift calculation : standard
 Unit weight of saturated soil : $\gamma_{sat} = 20,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

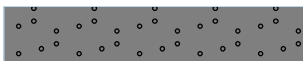
Poisson's ratio : $\nu = 0,28 \text{ [-]}$

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 22,92$ [MPa]

View

Retino terreno :



Strato - 10

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 13,00$ [°]

Cohesion : $c_{ef} = 65,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 4,73$ [MPa]

View

Retino terreno :



Strato - 11

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 25,00$ [°]

Cohesion : $c_{ef} = 5,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,30$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

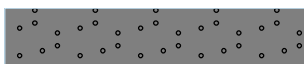
Poisson's ratio : $\nu = 0,30$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 13,88$ [MPa]

View

Retino terreno :



Strato - 12

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\phi_{\text{ef}} = 13,00$ [°]

Cohesion : $c_{\text{ef}} = 76,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 5,26$ [MPa]

View

Retino terreno :



Strato - 13

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 13,00 \text{ [}^\circ\text{]}$

Cohesion : $c_{ef} = 97,00 \text{ [kPa]}$

Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 6,37 \text{ [MPa]}$

View

Retino terreno :



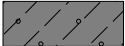
Profilo geologico e terreni assegnati

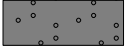
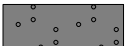
Informazioni sulla posizione

GPS : N 44,7149930; E 11,7089730

N 44°42'53,97"; E 11°42'32,30"

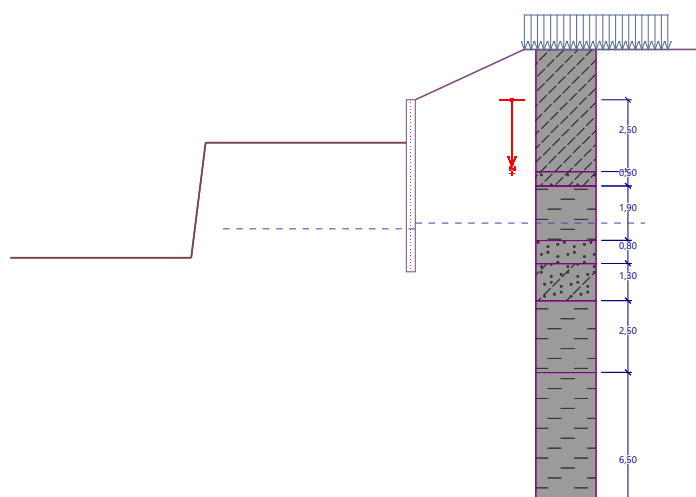
Profilo geologico e terreni assegnati

N.	Spessore dello strato $t \text{ [m]}$	Profondità $z \text{ [m]}$	Terreno assegnato	Retino
1	2,50	0,00 .. 2,50	Strato - 1	
2	0,50	2,50 .. 3,00	Strato - 2	
3	1,90	3,00 .. 4,90	Strato - 3	

N.	Spessore dello strato t [m]	Profondità z [m]	Terreno assegnato	Retino
4	0,80	4,90 .. 5,70	Strato - 4	
5	1,30	5,70 .. 7,00	Strato - 5	
6	2,50	7,00 .. 9,50	Strato - 6	
7	6,50	9,50 .. 16,00	Strato - 7	
8	2,50	16,00 .. 18,50	Strato - 8	
9	0,60	18,50 .. 19,10	Strato - 9	
10	0,80	19,10 .. 19,90	Strato - 10	
11	0,80	19,90 .. 20,70	Strato - 11	
12	4,30	20,70 .. 25,00	Strato - 12	
13	3,00	25,00 .. 28,00	Strato - 13	
14	-	28,00 .. ∞	Strato - 13	

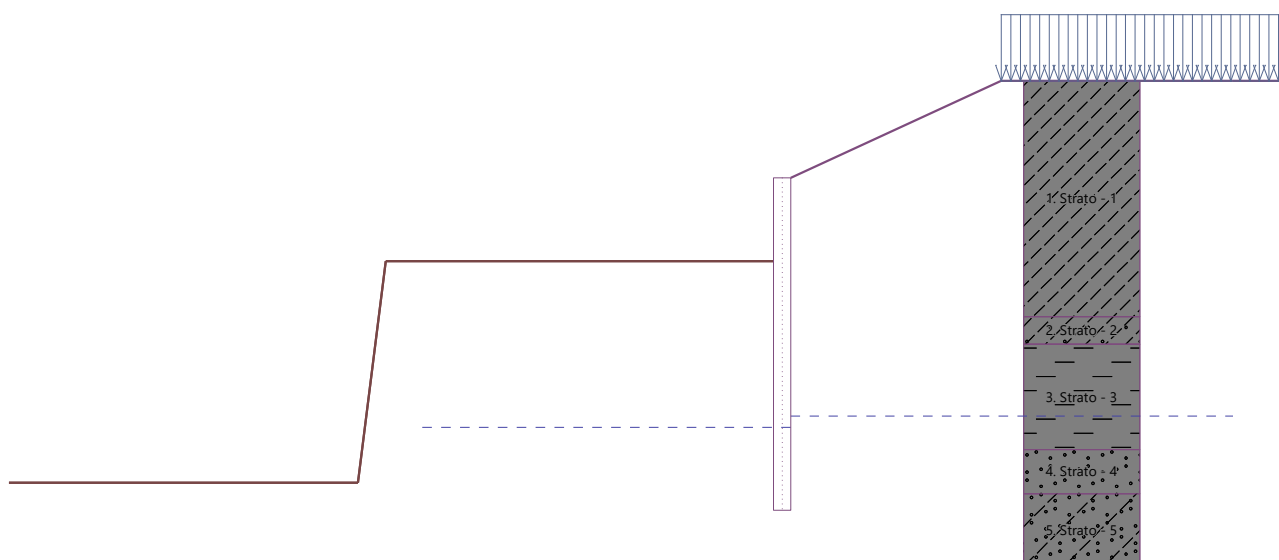
Nome : Profilo e assegnazione

Fase - analisi : 1 - 0



Nome : Profilo e assegnazione

Fase - analisi : 1 - 0



Scavo

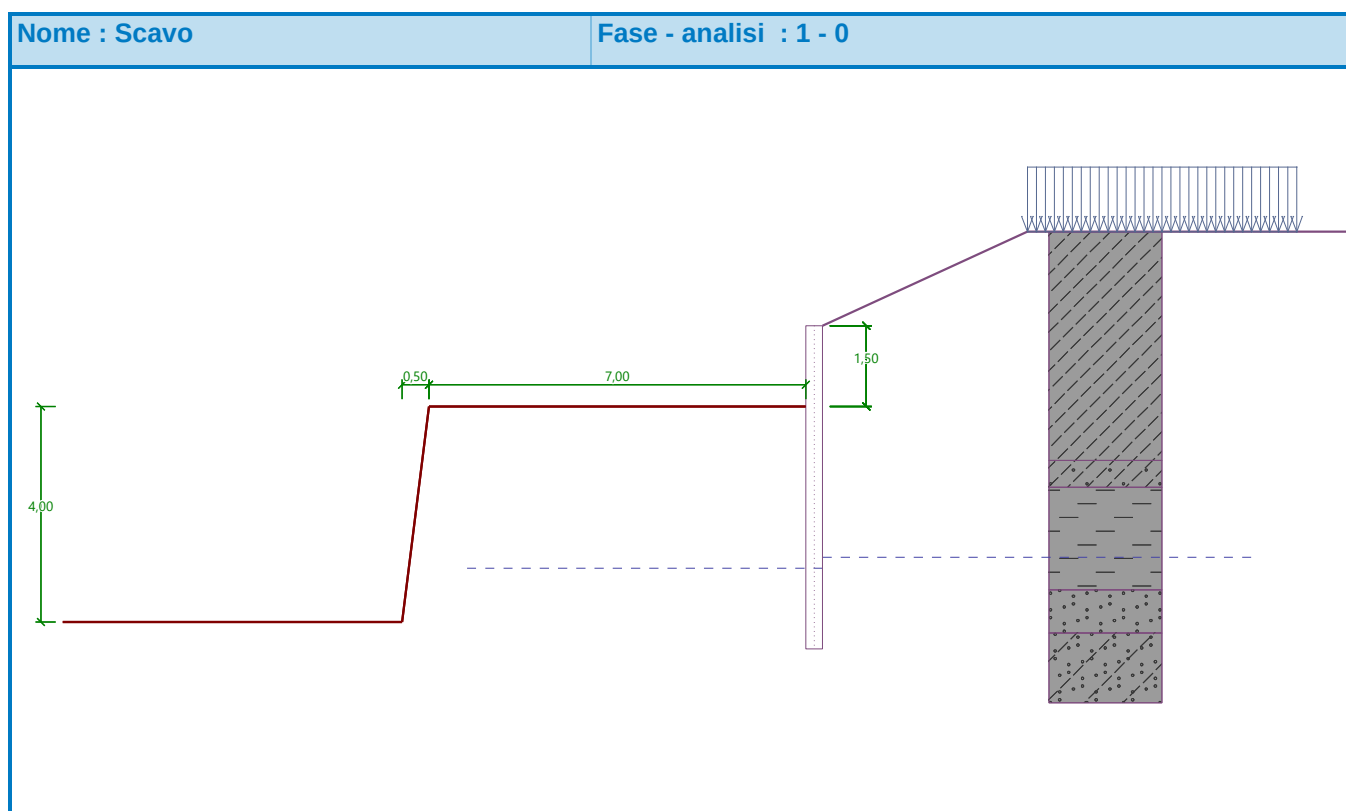
Il terreno antistante la parete è ad una profondità di 1,50 m.

Forma del fondo scavo

N.	Coordinate x [m]	Profondità z [m]
1	0,00	0,00
2	-7,00	0,00
3	-7,50	4,00
4	-8,50	4,00

Origine [0,0] collocata sul fondo scavo.

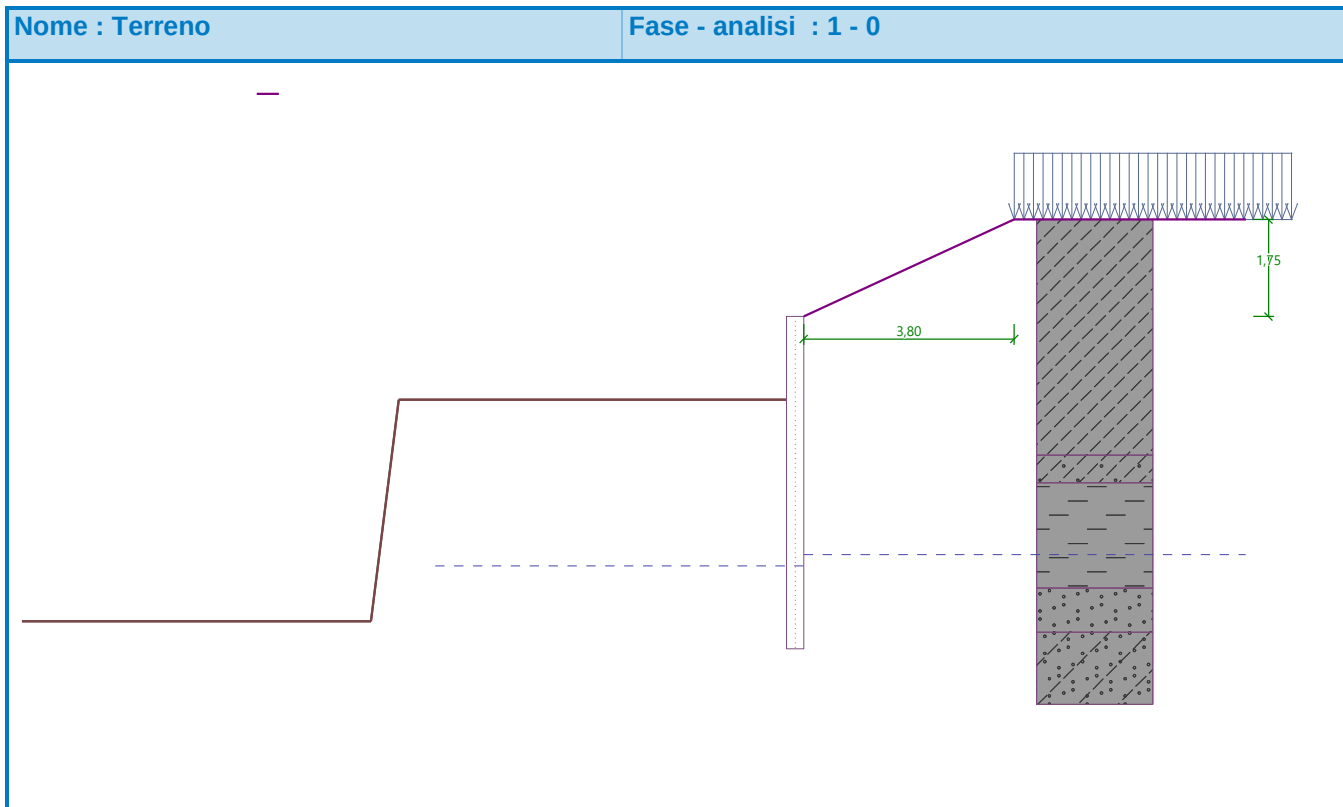
La coordinata positiva +z è diretta verso il basso.



Profilo del terreno

Il terreno dietro la costruzione ha la pendenza 1: 2,17 (l'angolo di inclinazione è 24,73 °).

L'altezza dell'argine è 1,75 m, la lunghezza dell'argine è 3,80 m.

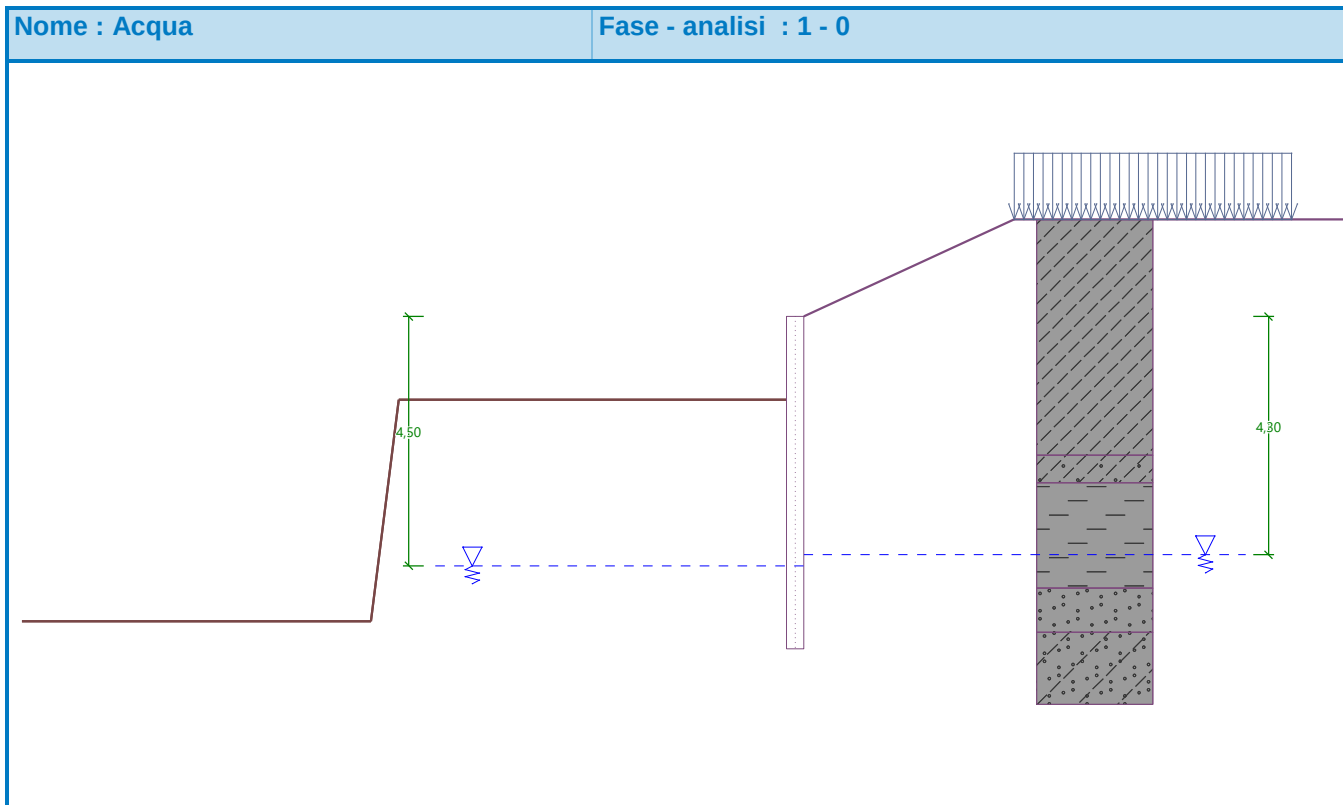


Influenza dell'acqua

L.F. a monte collocata ad una profondità di 4,30 m

L.F. a valle collocata alla profondità di 4,50 m

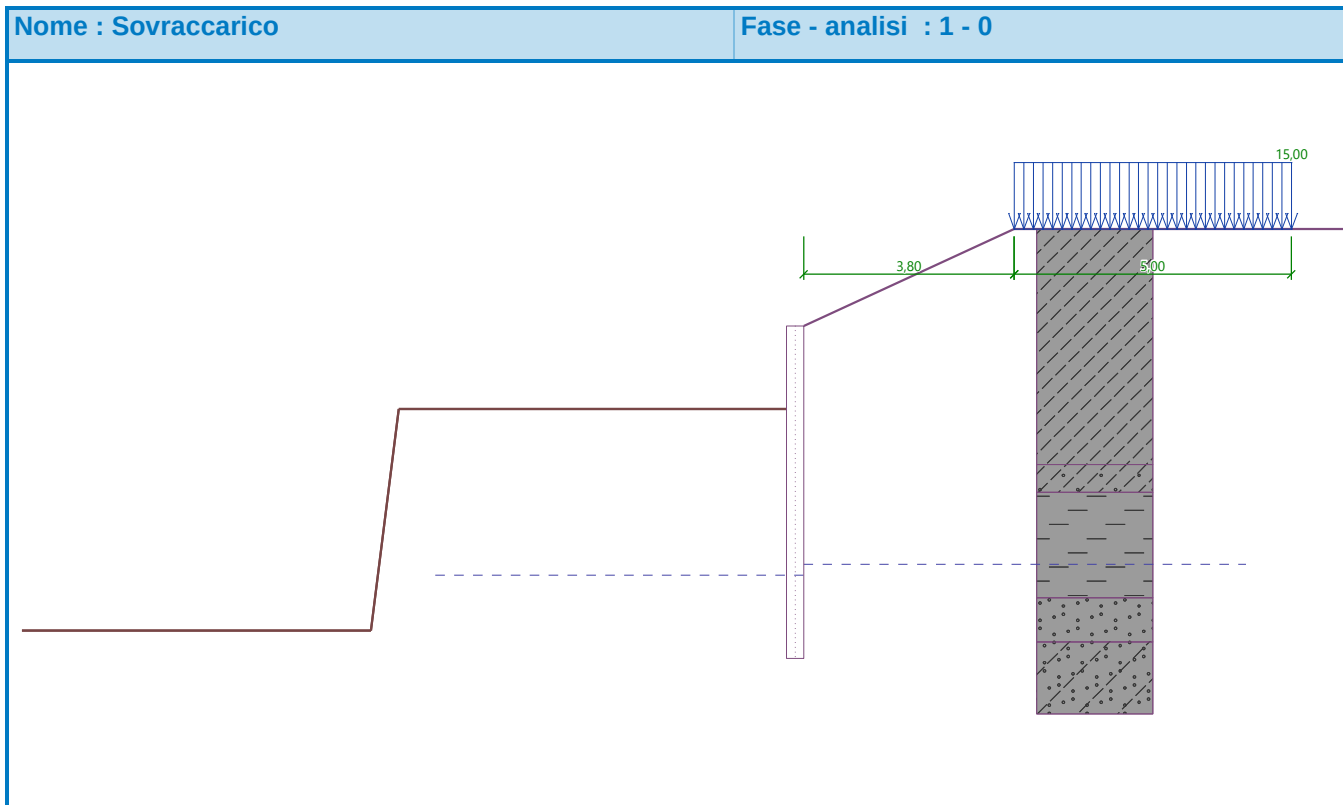
La struttura alla base non è permeabile



Sovraccarichi di superficie

N.	Sovraccarico		Azione	Grand.1 [kN/m ²]	Grand.2 [kN/m ²]	Ord.x x [m]	Lunghezza l [m]	Profondità z [m]
	nuovo	modifica						
1	Sì		variabile	15,00		3,80	5,00	sul terreno

N.	Nome
1	Automezzi



Impostazioni generali

Numero di Elem. Finiti per discretizzare la struttura = 100

La pressione minima è considerata come $\sigma_{a,min} = 0,20\sigma_z$

Impostazioni della fase di progetto

Situazione del progetto : permanente

Analisi risultati

Distribuzione delle pressioni agenti sulla struttura (davanti e dietro il muro)

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
0.00	0.00	0.00	0.00	0.00	4.05	176.84
0.00	0.00	0.00	0.00	0.00	4.05	176.85
0.30	0.00	0.00	0.00	1.08	14.98	188.19
0.60	0.00	0.00	0.00	2.16	25.81	199.53
0.90	0.00	0.00	0.00	3.24	36.55	210.88
1.20	0.00	0.00	0.00	4.32	47.21	222.23

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
1.50	0.00	0.00	0.00	5.40	57.80	233.57
1.50	0.00	-0.00	-166.11	5.40	52.81	233.58
1.69	0.00	-3.28	-172.44	6.08	64.47	240.75
1.80	0.00	-5.19	-176.12	6.48	66.36	244.92
2.10	0.00	-10.38	-186.13	7.56	71.47	256.26
2.40	0.00	-15.56	-196.14	8.64	76.55	267.61
2.50	0.00	-17.29	-199.47	9.00	78.24	271.39
2.50	0.00	-10.11	-90.98	19.01	39.82	291.21
2.70	0.00	-12.36	-104.67	21.21	42.85	304.90
2.86	0.00	-14.17	-115.71	22.98	45.28	315.94
3.00	-0.98	-15.73	-125.21	24.50	47.37	325.44
3.00	0.00	-26.90	-183.40	11.00	87.60	269.24
3.30	0.00	-31.95	-195.34	12.05	92.48	282.77
3.46	0.00	-34.71	-201.89	12.63	95.15	290.19
3.60	0.00	-36.99	-207.28	13.10	97.35	296.30
3.75	0.00	-39.51	-213.25	13.63	99.78	303.07
3.90	0.00	-42.03	-219.22	14.15	102.22	309.83
4.00	0.00	-43.72	-223.20	14.50	103.84	314.34
4.00	0.00	-43.73	-223.24	14.50	103.85	314.39
4.11	0.00	-45.54	-227.52	14.88	105.60	319.25
4.20	0.00	-47.08	-231.16	15.20	107.08	323.37
4.30	0.00	-48.76	-235.14	15.55	108.70	327.88
4.50	0.00	-52.12	-243.10	15.89	112.22	334.26
4.80	0.00	-54.57	-248.90	16.40	114.49	340.83
4.90	0.00	-55.39	-250.83	16.57	115.25	343.02
4.90	-16.84	-27.96	-254.55	38.40	58.79	506.91
5.10	-17.43	-28.93	-263.38	38.94	59.97	515.74
5.18	-17.66	-29.32	-266.94	39.16	60.44	519.30
5.18	-0.05	-0.05	-0.05	39.16	60.45	519.34

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
5.40	-0.10	-0.10	-0.10	39.76	61.74	528.99
5.50	-0.11	-0.11	-0.11	40.03	62.33	533.40
5.70	-0.15	-0.15	-0.15	40.57	63.51	542.24
5.70	-15.44	-19.75	-19.75	38.39	52.52	506.18
6.00	-16.29	-19.75	-19.75	39.17	53.42	516.87

Distribuzioni del modulo della reazione del terreno e forze interne sulla struttura

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
0.00	0.00	0.00	-8.70	0.00	-0.00	-0.00
0.30	0.00	0.00	-8.41	1.08	-0.16	0.02
0.60	0.00	0.00	-8.13	2.16	-0.65	0.13
0.90	0.00	0.00	-7.84	3.24	-1.46	0.44
1.20	0.00	4.60	-7.56	12.42	-3.41	1.07
1.50	0.00	4.60	-7.28	24.14	-8.82	2.80
1.50	4.60	4.60	-7.28	-13.98	-8.88	2.87
1.80	4.60	4.60	-7.01	-3.35	-6.76	5.10
2.10	4.60	4.60	-6.76	-1.09	-6.09	7.01
2.40	4.60	4.60	-6.53	0.91	-6.07	8.82
2.70	8.62	0.00	-6.33	-45.72	3.54	9.64
3.00	3.46	3.46	-6.16	-11.01	16.04	6.57
3.30	3.46	3.46	-6.01	18.91	11.36	2.33
3.60	3.46	3.46	-5.87	19.71	5.57	-0.21
3.90	3.46	3.46	-5.73	20.51	-0.46	-0.99
4.20	3.46	3.46	-5.58	21.32	-6.74	0.09
4.50	3.46	3.46	-5.44	22.40	-13.28	3.08
4.80	3.46	3.46	-5.31	23.14	-20.12	8.09
5.10	33.13	0.00	-5.20	-162.34	12.07	10.99
5.40	0.00	0.00	-5.13	39.66	18.38	4.59

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
5.70	0.00	0.00	-5.07	40.42	6.36	0.88
6.00	0.00	0.00	-5.02	19.43	-0.00	-0.00

Distribuzioni del modulo della reazione del terreno e forze interne sulla struttura - nel dettaglio

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
0.00	0.00	0.00	-8.70	0.00	-0.00	-0.00
0.06	0.00	0.00	-8.64	0.22	-0.01	0.00
0.12	0.00	0.00	-8.58	0.43	-0.03	0.00
0.18	0.00	0.00	-8.53	0.65	-0.06	0.00
0.24	0.00	0.00	-8.47	0.86	-0.10	0.01
0.30	0.00	0.00	-8.41	1.08	-0.16	0.02
0.36	0.00	0.00	-8.36	1.30	-0.23	0.03
0.42	0.00	0.00	-8.30	1.51	-0.32	0.04
0.48	0.00	0.00	-8.24	1.73	-0.41	0.07
0.54	0.00	0.00	-8.18	1.94	-0.52	0.09
0.60	0.00	0.00	-8.13	2.16	-0.65	0.13
0.66	0.00	0.00	-8.07	2.38	-0.78	0.17
0.72	0.00	0.00	-8.01	2.59	-0.93	0.22
0.78	0.00	0.00	-7.96	2.81	-1.10	0.28
0.84	0.00	0.00	-7.90	3.02	-1.27	0.36
0.90	0.00	0.00	-7.84	3.24	-1.46	0.44
0.96	0.00	0.00	-7.79	3.46	-1.66	0.53
1.02	0.00	0.00	-7.73	3.67	-1.87	0.64
1.08	0.00	4.60	-7.67	7.64	-2.21	0.74
1.14	0.00	4.60	-7.62	10.03	-2.74	0.89
1.20	0.00	4.60	-7.56	12.42	-3.41	1.07
1.26	0.00	4.60	-7.50	14.80	-4.23	1.30
1.32	0.00	4.60	-7.45	17.18	-5.19	1.58

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
1.38	0.00	4.60	-7.39	19.55	-6.29	1.93
1.44	0.00	4.60	-7.34	21.93	-7.53	2.34
1.50	0.00	4.60	-7.28	24.14	-8.82	2.80
1.50	4.60	4.60	-7.28	-13.98	-8.88	2.87
1.56	4.60	4.60	-7.23	-11.04	-8.17	3.34
1.62	4.60	4.60	-7.17	-7.89	-7.61	3.82
1.68	4.60	4.60	-7.12	-4.74	-7.23	4.26
1.74	4.60	4.60	-7.06	-3.82	-6.97	4.68
1.80	4.60	4.60	-7.01	-3.35	-6.76	5.10
1.86	4.60	4.60	-6.96	-2.88	-6.57	5.50
1.92	4.60	4.60	-6.91	-2.42	-6.41	5.89
1.98	4.60	4.60	-6.86	-1.97	-6.28	6.27
2.04	4.60	4.60	-6.81	-1.53	-6.17	6.64
2.10	4.60	4.60	-6.76	-1.09	-6.09	7.01
2.16	4.60	4.60	-6.71	-0.67	-6.04	7.37
2.22	4.60	4.60	-6.66	-0.26	-6.01	7.73
2.28	4.60	4.60	-6.62	0.14	-6.01	8.09
2.34	4.60	4.60	-6.57	0.53	-6.03	8.45
2.40	4.60	4.60	-6.53	0.91	-6.07	8.82
2.46	4.60	4.60	-6.49	1.28	-6.14	9.18
2.52	8.62	0.00	-6.44	-46.68	-4.78	9.53
2.58	8.62	0.00	-6.40	-46.35	-1.99	9.74
2.64	8.62	0.00	-6.37	-46.03	0.78	9.77
2.70	8.62	0.00	-6.33	-45.72	3.54	9.64
2.76	8.62	0.00	-6.29	-45.42	6.27	9.35
2.82	8.62	0.00	-6.26	-45.13	8.99	8.89
2.88	8.62	0.00	-6.22	-44.85	11.69	8.27
2.94	8.62	0.00	-6.19	-44.58	14.37	7.49
3.00	3.46	3.46	-6.16	-11.01	16.04	6.57

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
3.06	3.46	3.46	-6.13	18.23	15.82	5.60
3.12	3.46	3.46	-6.10	18.40	14.72	4.68
3.18	3.46	3.46	-6.07	18.57	13.61	3.83
3.24	3.46	3.46	-6.04	18.74	12.49	3.05
3.30	3.46	3.46	-6.01	18.91	11.36	2.33
3.36	3.46	3.46	-5.98	19.07	10.22	1.68
3.42	3.46	3.46	-5.95	19.23	9.08	1.11
3.48	3.46	3.46	-5.92	19.39	7.92	0.60
3.54	3.46	3.46	-5.90	19.55	6.75	0.16
3.60	3.46	3.46	-5.87	19.71	5.57	-0.21
3.66	3.46	3.46	-5.84	19.87	4.38	-0.51
3.72	3.46	3.46	-5.81	20.03	3.19	-0.74
3.78	3.46	3.46	-5.78	20.19	1.98	-0.89
3.84	3.46	3.46	-5.75	20.35	0.76	-0.98
3.90	3.46	3.46	-5.73	20.51	-0.46	-0.99
3.96	3.46	3.46	-5.70	20.67	-1.70	-0.92
4.02	3.46	3.46	-5.67	20.83	-2.94	-0.78
4.08	3.46	3.46	-5.64	21.00	-4.20	-0.57
4.14	3.46	3.46	-5.61	21.16	-5.46	-0.28
4.20	3.46	3.46	-5.58	21.32	-6.74	0.09
4.26	3.46	3.46	-5.55	21.49	-8.02	0.53
4.32	3.46	3.46	-5.53	21.68	-9.32	1.05
4.38	3.46	3.46	-5.50	21.92	-10.62	1.65
4.44	3.46	3.46	-5.47	22.16	-11.95	2.33
4.50	3.46	3.46	-5.44	22.40	-13.28	3.08
4.56	3.46	3.46	-5.41	22.56	-14.63	3.92
4.62	3.46	3.46	-5.39	22.71	-15.99	4.84
4.68	3.46	3.46	-5.36	22.86	-17.36	5.84
4.74	3.46	3.46	-5.33	23.01	-18.73	6.92

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
4.80	3.46	3.46	-5.31	23.14	-20.12	8.09
4.86	3.46	3.46	-5.28	23.27	-21.51	9.34
4.92	33.13	0.00	-5.26	-163.92	-17.28	10.52
4.98	33.13	0.00	-5.24	-163.34	-7.47	11.26
5.04	33.13	0.00	-5.22	-162.82	2.32	11.42
5.10	33.13	0.00	-5.20	-162.34	12.07	10.99
5.16	33.13	0.00	-5.19	-161.91	21.80	9.97
5.22	0.00	0.00	-5.17	39.21	25.47	8.54
5.28	0.00	0.00	-5.16	39.36	23.12	7.08
5.34	0.00	0.00	-5.14	39.51	20.75	5.77
5.40	0.00	0.00	-5.13	39.66	18.38	4.59
5.46	0.00	0.00	-5.12	39.81	15.99	3.56
5.52	0.00	0.00	-5.11	39.96	13.60	2.67
5.58	0.00	0.00	-5.09	40.11	11.20	1.93
5.64	0.00	0.00	-5.08	40.27	8.78	1.33
5.70	0.00	0.00	-5.07	40.42	6.36	0.88
5.76	0.00	0.00	-5.06	18.80	4.59	0.55
5.82	0.00	0.00	-5.05	18.96	3.45	0.31
5.88	0.00	0.00	-5.04	19.11	2.31	0.14
5.94	0.00	0.00	-5.03	19.27	1.16	0.03
6.00	0.00	0.00	-5.02	19.43	-0.00	-0.00

Valori massimi delle forze interne agenti sulla struttura

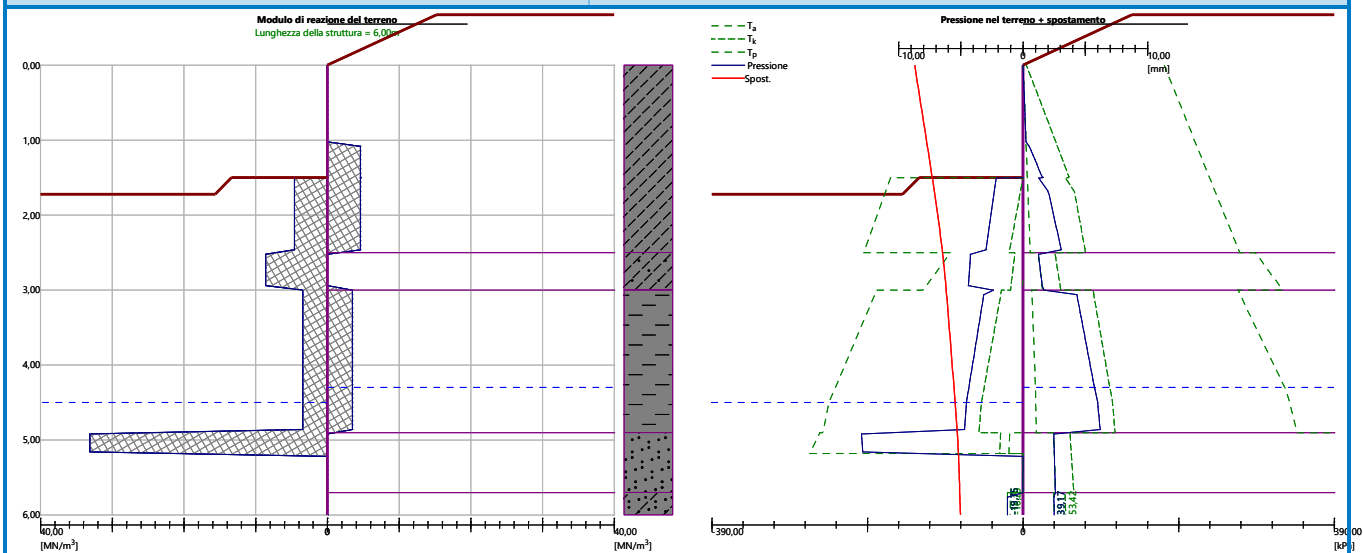
Massima forza di taglio = 25,47 kN/m

Momento massimo = 11,42 kNm/m

Massimo spostamento = 8,7 mm

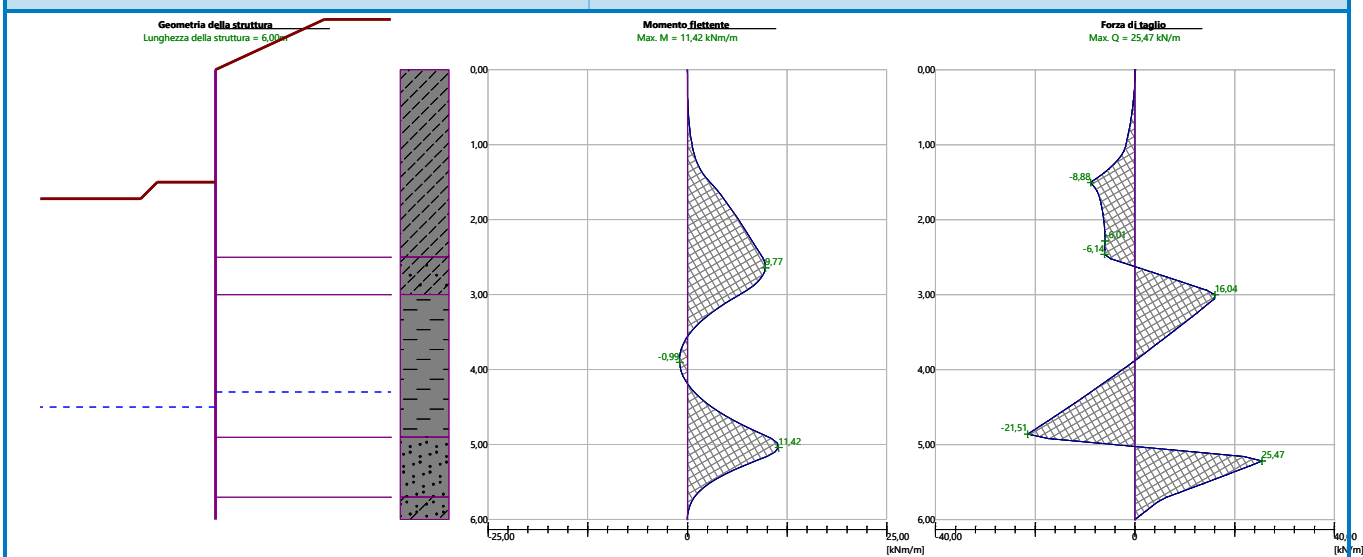
Nome : Analisi

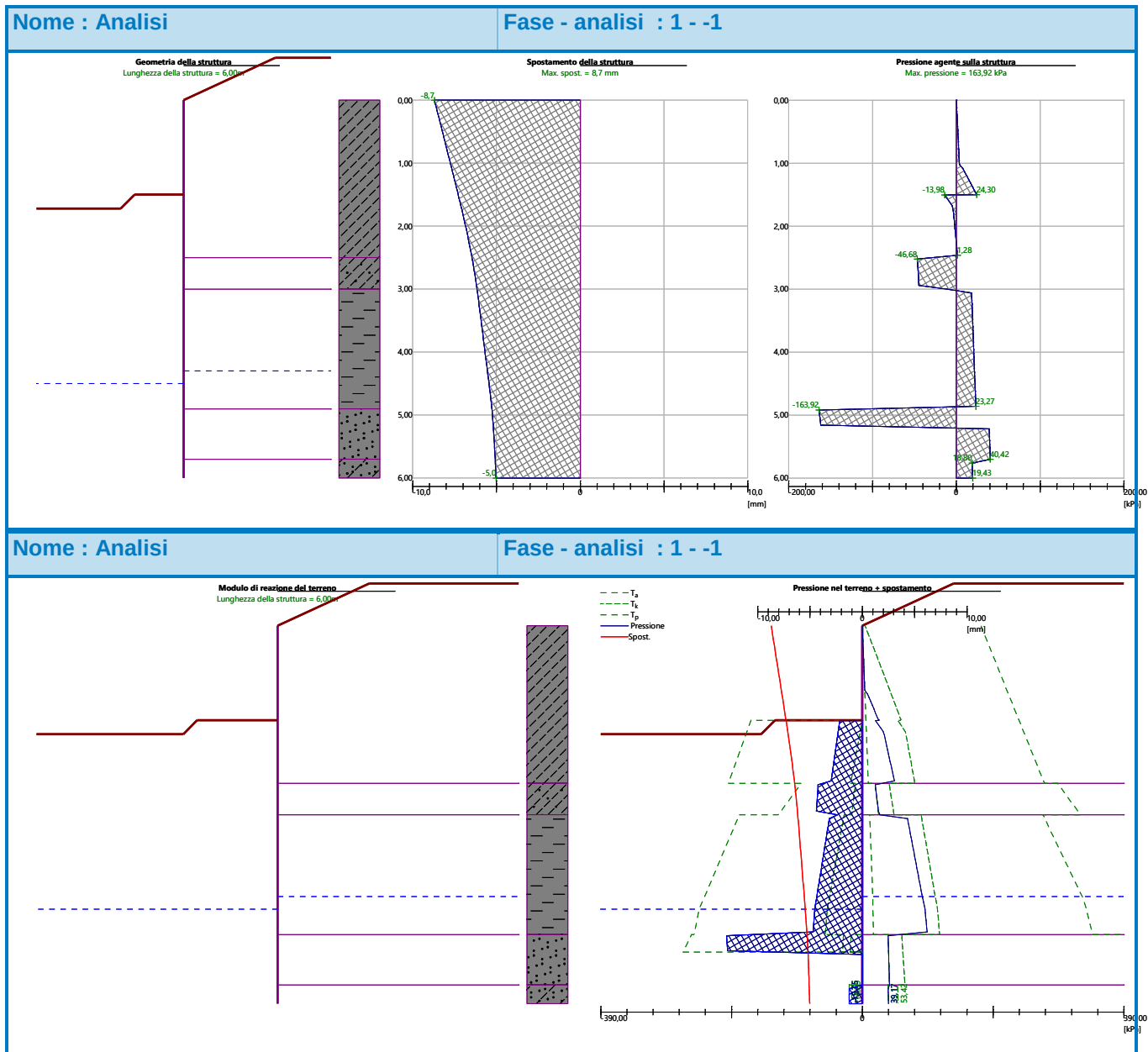
Fase - analisi : 1 - -1



Nome : Analisi

Fase - analisi : 1 - -1





Dimensionamento N. 1

Distribuzione delle forze in costruzione

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.00	-8.70	-8.70	-0.00	-0.00	-0.00	-0.00
0.30	-8.41	-8.41	-0.16	-0.16	0.02	0.02

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.60	-8.13	-8.13	-0.65	-0.65	0.13	0.13
0.90	-7.84	-7.84	-1.46	-1.46	0.44	0.44
1.20	-7.56	-7.56	-3.41	-3.41	1.07	1.07
1.50	-7.28	-7.28	-8.82	-8.82	2.80	2.80
1.50	-7.28	-7.28	-8.82	-8.82	2.80	2.80
1.50	-7.28	-7.28	-8.88	-8.88	2.87	2.87
1.80	-7.01	-7.01	-6.76	-6.76	5.10	5.10
2.10	-6.76	-6.76	-6.09	-6.09	7.01	7.01
2.40	-6.53	-6.53	-6.07	-6.07	8.82	8.82
2.70	-6.33	-6.33	3.54	3.54	9.64	9.64
3.00	-6.16	-6.16	16.04	16.04	6.57	6.57
3.30	-6.01	-6.01	11.36	11.36	2.33	2.33
3.60	-5.87	-5.87	5.57	5.57	-0.21	-0.21
3.90	-5.73	-5.73	-0.46	-0.46	-0.99	-0.99
4.20	-5.58	-5.58	-6.74	-6.74	0.09	0.09
4.50	-5.44	-5.44	-13.28	-13.28	3.08	3.08
4.80	-5.31	-5.31	-20.12	-20.12	8.09	8.09
5.10	-5.20	-5.20	12.07	12.07	10.99	10.99
5.40	-5.13	-5.13	18.38	18.38	4.59	4.59
5.70	-5.07	-5.07	6.36	6.36	0.88	0.88
6.00	-5.02	-5.02	-0.00	-0.00	-0.00	-0.00

Distribuzione delle forze in costruzione - nel dettaglio

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.00	-8.70	-8.70	-0.00	-0.00	-0.00	-0.00
0.06	-8.64	-8.64	-0.01	-0.01	0.00	0.00
0.12	-8.58	-8.58	-0.03	-0.03	0.00	0.00

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.18	-8.53	-8.53	-0.06	-0.06	0.00	0.00
0.24	-8.47	-8.47	-0.10	-0.10	0.01	0.01
0.30	-8.41	-8.41	-0.16	-0.16	0.02	0.02
0.36	-8.36	-8.36	-0.23	-0.23	0.03	0.03
0.42	-8.30	-8.30	-0.32	-0.32	0.04	0.04
0.48	-8.24	-8.24	-0.41	-0.41	0.07	0.07
0.54	-8.18	-8.18	-0.52	-0.52	0.09	0.09
0.60	-8.13	-8.13	-0.65	-0.65	0.13	0.13
0.66	-8.07	-8.07	-0.78	-0.78	0.17	0.17
0.72	-8.01	-8.01	-0.93	-0.93	0.22	0.22
0.78	-7.96	-7.96	-1.10	-1.10	0.28	0.28
0.84	-7.90	-7.90	-1.27	-1.27	0.36	0.36
0.90	-7.84	-7.84	-1.46	-1.46	0.44	0.44
0.96	-7.79	-7.79	-1.66	-1.66	0.53	0.53
1.02	-7.73	-7.73	-1.87	-1.87	0.64	0.64
1.08	-7.67	-7.67	-2.21	-2.21	0.74	0.74
1.14	-7.62	-7.62	-2.74	-2.74	0.89	0.89
1.20	-7.56	-7.56	-3.41	-3.41	1.07	1.07
1.26	-7.50	-7.50	-4.23	-4.23	1.30	1.30
1.32	-7.45	-7.45	-5.19	-5.19	1.58	1.58
1.38	-7.39	-7.39	-6.29	-6.29	1.93	1.93
1.44	-7.34	-7.34	-7.53	-7.53	2.34	2.34
1.50	-7.28	-7.28	-8.82	-8.82	2.80	2.80
1.50	-7.28	-7.28	-8.82	-8.82	2.80	2.80
1.50	-7.28	-7.28	-8.88	-8.88	2.87	2.87
1.56	-7.23	-7.23	-8.17	-8.17	3.34	3.34
1.62	-7.17	-7.17	-7.61	-7.61	3.82	3.82
1.68	-7.12	-7.12	-7.23	-7.23	4.26	4.26

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
1.74	-7.06	-7.06	-6.97	-6.97	4.68	4.68
1.80	-7.01	-7.01	-6.76	-6.76	5.10	5.10
1.86	-6.96	-6.96	-6.57	-6.57	5.50	5.50
1.92	-6.91	-6.91	-6.41	-6.41	5.89	5.89
1.98	-6.86	-6.86	-6.28	-6.28	6.27	6.27
2.04	-6.81	-6.81	-6.17	-6.17	6.64	6.64
2.10	-6.76	-6.76	-6.09	-6.09	7.01	7.01
2.16	-6.71	-6.71	-6.04	-6.04	7.37	7.37
2.22	-6.66	-6.66	-6.01	-6.01	7.73	7.73
2.28	-6.62	-6.62	-6.01	-6.01	8.09	8.09
2.34	-6.57	-6.57	-6.03	-6.03	8.45	8.45
2.40	-6.53	-6.53	-6.07	-6.07	8.82	8.82
2.46	-6.49	-6.49	-6.14	-6.14	9.18	9.18
2.52	-6.44	-6.44	-4.78	-4.78	9.53	9.53
2.58	-6.40	-6.40	-1.99	-1.99	9.74	9.74
2.64	-6.37	-6.37	0.78	0.78	9.77	9.77
2.70	-6.33	-6.33	3.54	3.54	9.64	9.64
2.76	-6.29	-6.29	6.27	6.27	9.35	9.35
2.82	-6.26	-6.26	8.99	8.99	8.89	8.89
2.88	-6.22	-6.22	11.69	11.69	8.27	8.27
2.94	-6.19	-6.19	14.37	14.37	7.49	7.49
3.00	-6.16	-6.16	16.04	16.04	6.57	6.57
3.06	-6.13	-6.13	15.82	15.82	5.60	5.60
3.12	-6.10	-6.10	14.72	14.72	4.68	4.68
3.18	-6.07	-6.07	13.61	13.61	3.83	3.83
3.24	-6.04	-6.04	12.49	12.49	3.05	3.05
3.30	-6.01	-6.01	11.36	11.36	2.33	2.33
3.36	-5.98	-5.98	10.22	10.22	1.68	1.68

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
3.42	-5.95	-5.95	9.08	9.08	1.11	1.11
3.48	-5.92	-5.92	7.92	7.92	0.60	0.60
3.54	-5.90	-5.90	6.75	6.75	0.16	0.16
3.60	-5.87	-5.87	5.57	5.57	-0.21	-0.21
3.66	-5.84	-5.84	4.38	4.38	-0.51	-0.51
3.72	-5.81	-5.81	3.19	3.19	-0.74	-0.74
3.78	-5.78	-5.78	1.98	1.98	-0.89	-0.89
3.84	-5.75	-5.75	0.76	0.76	-0.98	-0.98
3.90	-5.73	-5.73	-0.46	-0.46	-0.99	-0.99
3.96	-5.70	-5.70	-1.70	-1.70	-0.92	-0.92
4.02	-5.67	-5.67	-2.94	-2.94	-0.78	-0.78
4.08	-5.64	-5.64	-4.20	-4.20	-0.57	-0.57
4.14	-5.61	-5.61	-5.46	-5.46	-0.28	-0.28
4.20	-5.58	-5.58	-6.74	-6.74	0.09	0.09
4.26	-5.55	-5.55	-8.02	-8.02	0.53	0.53
4.32	-5.53	-5.53	-9.32	-9.32	1.05	1.05
4.38	-5.50	-5.50	-10.62	-10.62	1.65	1.65
4.44	-5.47	-5.47	-11.95	-11.95	2.33	2.33
4.50	-5.44	-5.44	-13.28	-13.28	3.08	3.08
4.56	-5.41	-5.41	-14.63	-14.63	3.92	3.92
4.62	-5.39	-5.39	-15.99	-15.99	4.84	4.84
4.68	-5.36	-5.36	-17.36	-17.36	5.84	5.84
4.74	-5.33	-5.33	-18.73	-18.73	6.92	6.92
4.80	-5.31	-5.31	-20.12	-20.12	8.09	8.09
4.86	-5.28	-5.28	-21.51	-21.51	9.34	9.34
4.92	-5.26	-5.26	-17.28	-17.28	10.52	10.52
4.98	-5.24	-5.24	-7.47	-7.47	11.26	11.26
5.04	-5.22	-5.22	2.32	2.32	11.42	11.42

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
5.10	-5.20	-5.20	12.07	12.07	10.99	10.99
5.16	-5.19	-5.19	21.80	21.80	9.97	9.97
5.22	-5.17	-5.17	25.47	25.47	8.54	8.54
5.28	-5.16	-5.16	23.12	23.12	7.08	7.08
5.34	-5.14	-5.14	20.75	20.75	5.77	5.77
5.40	-5.13	-5.13	18.38	18.38	4.59	4.59
5.46	-5.12	-5.12	15.99	15.99	3.56	3.56
5.52	-5.11	-5.11	13.60	13.60	2.67	2.67
5.58	-5.09	-5.09	11.20	11.20	1.93	1.93
5.64	-5.08	-5.08	8.78	8.78	1.33	1.33
5.70	-5.07	-5.07	6.36	6.36	0.88	0.88
5.76	-5.06	-5.06	4.59	4.59	0.55	0.55
5.82	-5.05	-5.05	3.45	3.45	0.31	0.31
5.88	-5.04	-5.04	2.31	2.31	0.14	0.14
5.94	-5.03	-5.03	1.16	1.16	0.03	0.03
6.00	-5.02	-5.02	-0.00	-0.00	-0.00	-0.00

Massimi valori delle forze interne

Massimo spostamento = -8,7 mm
 Spostamento minimo = -5,0 mm
 Momento flettente massimo = 11,42 kNm/m
 Momento flettente minimo = -0,99 kNm/m
 Massima forza di taglio = 25,47 kN/m

Verifica della sezione trasversale - risultati dettagliati

Caratteristiche della sezione trasversale per 1 m del muro:

Area della sezione trasversale $A = 1,133\text{E-}02 \text{ m}^2/\text{m}$
 Modulo di resistenza $W = 8,420\text{E-}04 \text{ m}^3/\text{m}$
 Modulo di resistenza plastico $W_{pl} = 1,022\text{E-}03 \text{ m}^3/\text{m}$
 Momento d'Inerzia $I = 1,305\text{E-}04 \text{ m}^4/\text{m}$

Momento statico della sezione trasversale $S = 5,110E-04 \text{ m}^3/\text{m}$
Momento statico dell'area $S_1 = 3,019E-04 \text{ m}^3/\text{m}$
Spessore del taglio del muro $t = 18,4 \text{ mm/m}$

Proprietà materiali:

Tensione di snervamento $f_y = 275,00 \text{ MPa}$

Fattori parziali:

Coefficiente di resistenza della sezione trasversale $\gamma_{M0} = 1,00$

Resistenza della sezione trasversale:

Resistenza a flessione $M_{c,Rd} = W \cdot f_y / \gamma_{M0} = 231,55 \text{ kNm/m}$

Resistenza al taglio $V_{c,Rd} = I \cdot t / S \cdot f_y / (\sqrt{3} \cdot \gamma_{M0}) = 745,90 \text{ kN/m}$

Verifica della sezione in acciaio secondo EN 1993-1-1

Tutte le fasi di costruzione sono considerate nell'analisi.

Fattore parziale sul carico = 1,00

Forze interne per 1 m del muro

$M_{\max} = 11,42 \text{ kNm/m}; \quad Q = 2,32 \text{ kN/m}$

$Q_{\max} = 25,47 \text{ kN/m}; \quad M = 8,54 \text{ kNm/m}$

Verifica del momento massimo $M_{\max} + Q$:

Verifica della flessione:

$M_{\max} / M_{c,Rd} = 0,049 \leq 1$ **Soddisfatta**

Verifica del taglio:

$Q / V_{c,Rd} = 0,003 \leq 1$ **Soddisfatta**

Verifica dello stato della tensione:

Tensione normale $\sigma_{x,Ed} = 12,83 \text{ MPa}$

Tensione tangenziale $\tau_{Ed} = 0,29 \text{ MPa}$

Verifica: $\sqrt{((\sigma_{x,Ed} / (f_y / \gamma_{M0}))^2 + 3 \cdot (\tau_{Ed} / (f_y / \gamma_{M0}))^2)} = 0,047 \leq 1$ **Soddisfatta**

Verifica della massima forza di taglio $Q_{\max} + M$:

Verifica della flessione:

$M / M_{c,Rd} = 0,037 \leq 1$ **Soddisfatta**

Verifica del taglio:

$Q_{\max} / V_{c,Rd} = 0,034 \leq 1$ **Soddisfatta**

Verifica dello stato della tensione:

Tensione normale $\sigma_{x,Ed} = 9,60 \text{ MPa}$

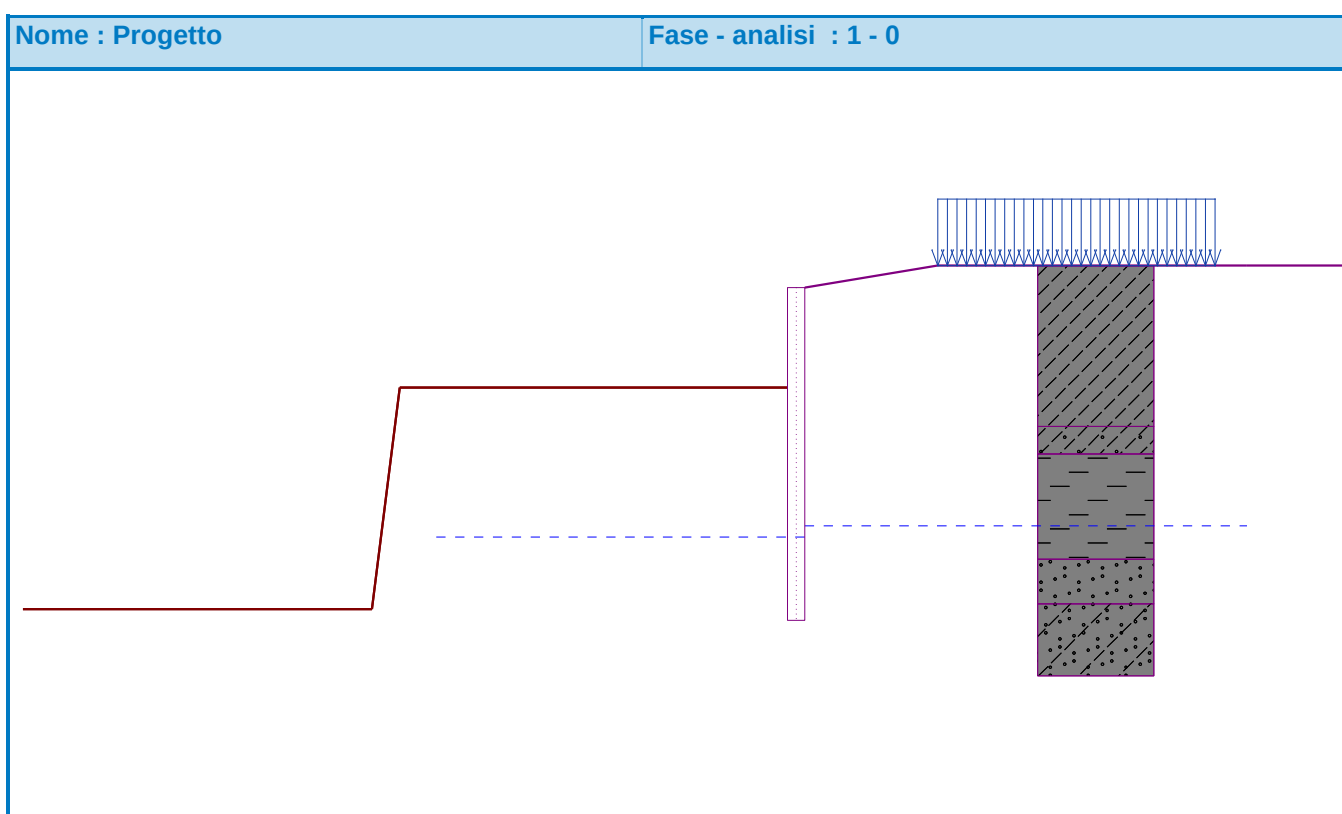
Tensione tangenziale $\tau_{Ed} = 3,20 \text{ MPa}$

Verifica: $\sqrt{((\sigma_{x,Ed}/(f_y/Y_{M0}))^2 + 3*(\tau_{Ed}/(f_y/Y_{M0}))^2)} = 0,040 \leq 1$ **Soddisfatta**

La sezione trasversale è SODDISFATTA

C. PALANCOLATO FISSO VL602 PER AREA CHIUSA – P3

Dati inseriti:



Impostazioni

Standard - fattori di sicurezza

Materiali e standard

Cemento armato :	EN 1992-1-1 (EC2)
Coefficienti EN 1992-1-1 :	standard
Palo tubolare :	metodo semplificato
Strutture in acciaio :	EN 1993-1-1 (EC3)
Coeff. parziale della capacità portante della sezione in acciaio :	$\gamma_{M0} = 1,00$
Strutture in legno :	EN 1995-1-1 (EC5)

Coefficiente parziale per le proprietà del legno : $\gamma_M = 1,30$
 Coeff. di correzione per durata del carico e umidità : $k_{mod} = 0,50$
 Coeff. cracking factor (influenza delle fessurazioni) : $k_{cr} = 0,67$

Analisi della pressione

Metodologia di verifica : Fattori di sicurezza (ASD)
 Calcolo spinta attiva terreno : Coulomb
 Calcolo spinta passiva terreno : Caquot-Kerisel
 Metodo di analisi : pressioni dipendenti
 Analisi sismica : Mononobe-Okabe
 Modulo di reazione del terreno : standard
 Considera riduzione del modulo di reazione del terreno per una paratia rinforzata

Fattori di sicurezza			
Situazione di progetto permanente			
Fattore di sicurezza per la stabilità interna degli ancoraggi :	$SF_a =$	1,50	[-]

Ancoraggi

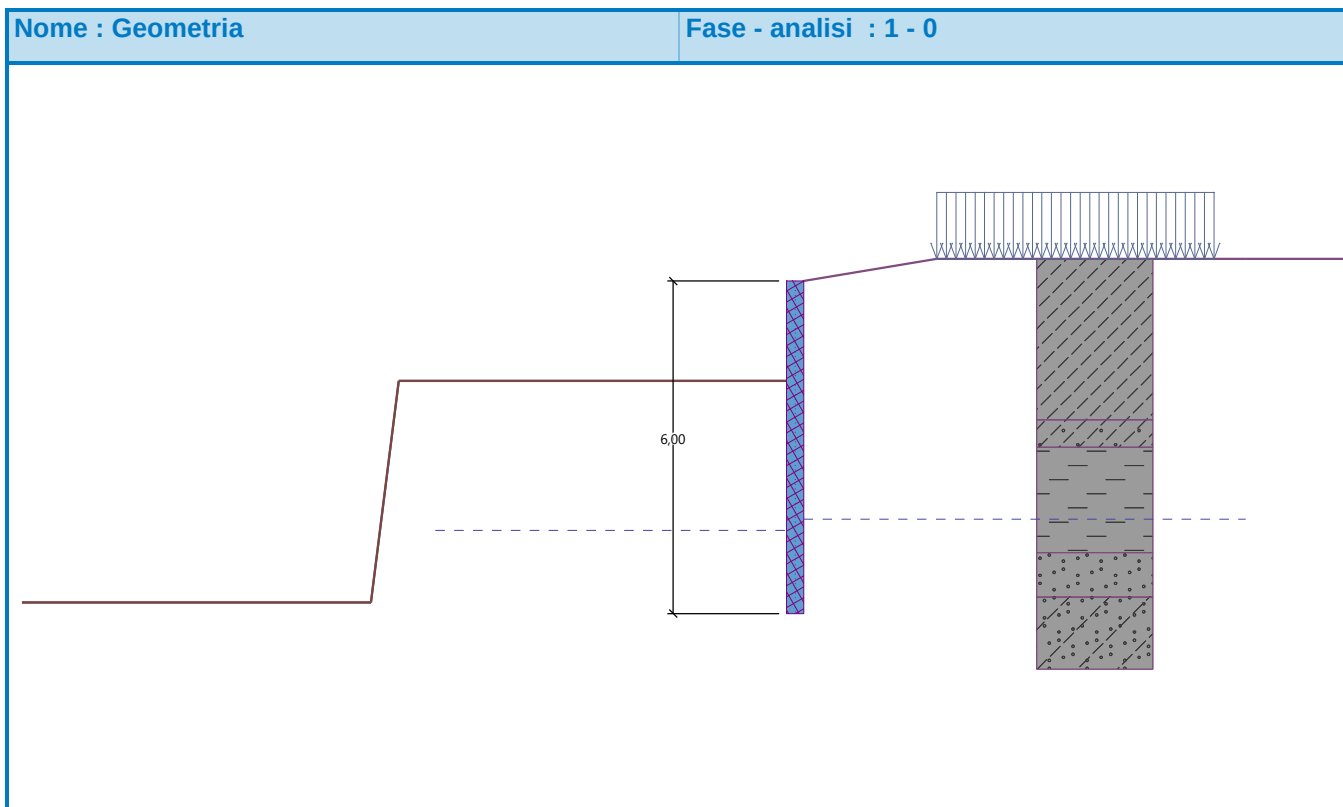
Metodologia di verifica : Fattori di sicurezza (ASD)

Fattori di sicurezza			
Fattore di sicurezza per resistenza dell'acciaio :	$SF_t =$	1,50	[-]
Fattore di sicurezza per resistenza pull-out (terreno) :	$SF_e =$	1,50	[-]
Fattore di sicurezza per resistenza pull-out (grouting) :	$SF_c =$	1,50	[-]

Geometria della struttura

Lunghezza della struttura = 6,00 m

Nome della sezione trasversale : Palancola : VL 602
 Area della sezione $A = 1,13E-02 \text{ m}^2/\text{m}$
 Momento d'inerzia $I = 1,30E-04 \text{ m}^4/\text{m}$
 Modulo di resistenza $W = 8,420E-04 \text{ m}^3/\text{m}$
 Modulo di resistenza plastico $W_{pl} = 1,022E-03 \text{ m}^3/\text{m}$



Materiale della struttura

Acciaio strutturale: S 275

Tensione caratteristica di snervamento $f_y = 275,00$ MPa

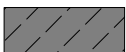
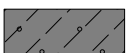
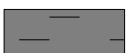
Modulo di elasticità $E = 210000,00$ MPa

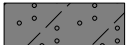
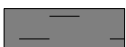
Modulo di taglio $G = 81000,00$ MPa

Modulo di reazione

Il modulo della reazione del sottosuolo è calcolato con il metodo Schmitt.

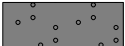
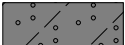
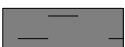
Parametri del terreno di base

N.	Nome	Retino	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]	γ_{su} [kN/m ³]	δ [°]
1	Strato - 1		17,00	61,00	18,00	9,00	0,00
2	Strato - 2		26,00	8,00	20,00	11,00	10,00
3	Strato - 3		17,00	40,00	17,50	8,50	10,00

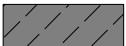
N.	Nome	Retino	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m ³]	γ_{su} [kN/m ³]	δ [°]
4	Strato - 4		31,00	0,00	19,00	10,00	10,00
5	Strato - 5		29,00	5,00	18,00	9,00	10,00
6	Strato - 6		17,00	46,00	17,50	8,50	10,00
7	Strato - 7		13,00	50,00	17,50	8,50	10,00
8	Strato - 8		13,00	89,00	18,00	9,00	10,00
9	Strato - 9		28,00	0,00	19,00	10,00	10,00
10	Strato - 10		13,00	65,00	18,00	9,00	10,00
11	Strato - 11		25,00	5,00	18,00	9,00	10,00
12	Strato - 12		13,00	76,00	18,00	9,00	10,00
13	Strato - 13		13,00	97,00	18,00	9,00	10,00

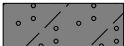
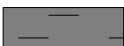
Parametri del terreno per calcolare la spinta a riposo

N.	Nome	Retino	Tipo calcolo	φ_{ef} [°]	ν [-]	OCR [-]	K_0 [-]
1	Strato - 1		coesivo	-	0,49	-	-
2	Strato - 2		non coesivo	26,00	-	-	-
3	Strato - 3		coesivo	-	0,49	-	-

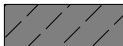
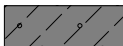
N.	Nome	Retino	Tipo calcolo	φ_{ef} [°]	ν [-]	OCR [-]	K_0 [-]
4	Strato - 4		non coesivo	31,00	-	-	-
5	Strato - 5		coesivo	-	0,28	-	-
6	Strato - 6		coesivo	-	0,40	-	-
7	Strato - 7		coesivo	-	0,42	-	-
8	Strato - 8		coesivo	-	0,42	-	-
9	Strato - 9		coesivo	-	0,28	-	-
10	Strato - 10		coesivo	-	0,42	-	-
11	Strato - 11		coesivo	-	0,30	-	-
12	Strato - 12		coesivo	-	0,42	-	-
13	Strato - 13		coesivo	-	0,42	-	-

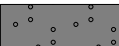
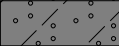
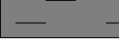
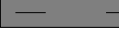
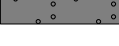
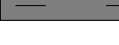
Parametri del terreno per calcolare il modulo della reazione del terreno

N.	Nome	Retino	Tipo inserimento	K_h [MN/m ³]	K_{h1} [MN/m ³]	K_{h2} [MN/m ³]	K_{h3} [MN/m ³]	A_1 [%]	A_2 [%]
1	Strato - 1		lineare		-	-	-	-	-
2	Strato - 2		lineare		-	-	-	-	-
3	Strato - 3		lineare		-	-	-	-	-

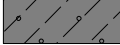
N.	Nome	Retino	Tipo inserimento	K_h [MN/m ³]	K_{h1} [MN/m ³]	K_{h2} [MN/m ³]	K_{h3} [MN/m ³]	A_1 [%]	A_2 [%]
4	Strato - 4		lineare		-	-	-	-	-
5	Strato - 5		lineare		-	-	-	-	-
6	Strato - 6		lineare		-	-	-	-	-
7	Strato - 7		lineare		-	-	-	-	-
8	Strato - 8		lineare		-	-	-	-	-
9	Strato - 9		lineare		-	-	-	-	-
10	Strato - 10		lineare		-	-	-	-	-
11	Strato - 11		lineare		-	-	-	-	-
12	Strato - 12		lineare		-	-	-	-	-
13	Strato - 13		lineare		-	-	-	-	-

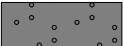
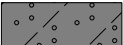
Parametri dei terreni per calcolare il modulo di reazione del terreno (Chadeisson)

N.	Nome	Retino	A_p [-]
1	Strato - 1		
2	Strato - 2		
3	Strato - 3		

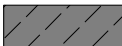
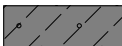
N.	Nome	Retino	A _p [-]
4	Strato - 4		
5	Strato - 5		
6	Strato - 6		
7	Strato - 7		
8	Strato - 8		
9	Strato - 9		
10	Strato - 10		
11	Strato - 11		
12	Strato - 12		
13	Strato - 13		

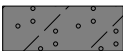
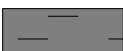
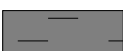
Parametri del terreno per calcolare il modulo della reazione del terreno(iterazione)

N.	Nome	Retino	ν [-]	E _{oed} [MPa]	E _{def} [MPa]	m [-]
1	Strato - 1		0,49	4,12	-	0,49
2	Strato - 2		0,40	6,60	-	0,40
3	Strato - 3		0,49	3,33	-	0,49

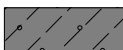
N.	Nome	Retino	ν [-]	E_{oed} [MPa]	E_{def} [MPa]	m [-]
4	Strato - 4		0,28	18,11	-	0,28
5	Strato - 5		0,28	11,35	-	0,28
6	Strato - 6		0,40	3,79	-	0,40
7	Strato - 7		0,42	4,13	-	0,42
8	Strato - 8		0,42	5,67	-	0,42
9	Strato - 9		0,28	22,92	-	0,28
10	Strato - 10		0,42	4,73	-	0,42
11	Strato - 11		0,30	13,88	-	0,30
12	Strato - 12		0,42	5,26	-	0,42
13	Strato - 13		0,42	6,37	-	0,42

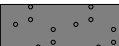
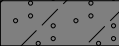
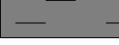
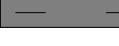
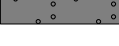
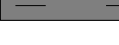
Parametri dei terreni per calcolare il modulo di reazione del terreno (CUR 166)

N.	Nome	Retino	k_1 [MN/m ³]	k_2 [MN/m ³]	k_3 [MN/m ³]
1	Strato - 1				
2	Strato - 2				
3	Strato - 3				

N.	Nome	Retino	k_1 [MN/m ³]	k_2 [MN/m ³]	k_3 [MN/m ³]
4	Strato - 4				
5	Strato - 5				
6	Strato - 6				
7	Strato - 7				
8	Strato - 8				
9	Strato - 9				
10	Strato - 10				
11	Strato - 11				
12	Strato - 12				
13	Strato - 13				

Parametri dei terreni per calcolare il modulo di reazione del terreno (Ménard)

N.	Nome	Retino	E_m [MPa]	α [–]
1	Strato - 1			
2	Strato - 2			
3	Strato - 3			

N.	Nome	Retino	E_m [MPa]	α [–]
4	Strato - 4			
5	Strato - 5			
6	Strato - 6			
7	Strato - 7			
8	Strato - 8			
9	Strato - 9			
10	Strato - 10			
11	Strato - 11			
12	Strato - 12			
13	Strato - 13			

Parametri terreno

Strato - 1

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 17,00 \text{ [}^\circ\text{]}$

Cohesion : $c_{ef} = 61,00 \text{ [kPa]}$

Friction angle structure-soil : $\delta = 0,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,49$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,49$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 4,12$ [MPa]

View

Retino terreno :



Strato - 2

Basic data

Unit weight : $\gamma = 20,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{\text{ef}} = 26,00$ [°]

Cohesion : $c_{\text{ef}} = 8,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesionless soil

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 21,00$ [kN/m³]

Analysis of modulus of subsoil reaction

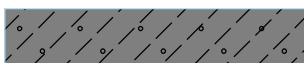
Poisson's ratio : $\nu = 0,40$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 6,60$ [MPa]

View

Retino terreno :



Strato - 3

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 17,00$ [°]
Cohesion : $c_{ef} = 40,00$ [kPa]
Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,49$ [-]

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,49$ [-]
Modulus type : input E_{oed}
Oedometric modulus : $E_{oed} = 3,33$ [MPa]

View

Retino terreno : 

Strato - 4

Basic data

Unit weight : $\gamma = 19,00$ [kN/m³]
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 31,00$ [°]
Cohesion : $c_{ef} = 0,00$ [kPa]
Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesionless soil

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 20,00$ [kN/m³]

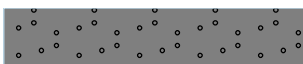
Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,28$ [-]
Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 18,11$ [MPa]

View

Retino terreno :



Strato - 5

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 29,00$ [°]

Cohesion : $c_{ef} = 5,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,28$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

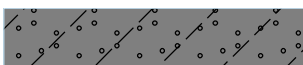
Poisson's ratio : $\nu = 0,28$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 11,35$ [MPa]

View

Retino terreno :



Strato - 6

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 17,00$ [°]

Cohesion : $c_{ef} = 46,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,40$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,40$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 3,79$ [MPa]

View

Retino terreno :



Strato - 7

Basic data

Unit weight : $\gamma = 17,50$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{\text{ef}} = 13,00$ [°]

Cohesion : $c_{\text{ef}} = 50,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 18,50$ [kN/m³]

Analysis of modulus of subsoil reaction

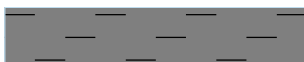
Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 4,13$ [MPa]

View

Retino terreno :



Strato - 8

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 13,00 \text{ [}^\circ\text{]}$
Cohesion : $c_{ef} = 89,00 \text{ [kPa]}$
Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Uplift pressure

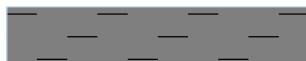
Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 19,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42 \text{ [-]}$
Modulus type : input E_{oed}
Oedometric modulus : $E_{oed} = 5,67 \text{ [MPa]}$

View

Retino terreno :



Strato - 9

Basic data

Unit weight : $\gamma = 19,00 \text{ [kN/m}^3\text{]}$
Stress analysis : effective
Internal friction angle : $\varphi_{ef} = 28,00 \text{ [}^\circ\text{]}$
Cohesion : $c_{ef} = 0,00 \text{ [kPa]}$
Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil
Poisson's ratio : $\nu = 0,28 \text{ [-]}$

Uplift pressure

Uplift calculation : standard
Unit weight of saturated soil : $\gamma_{sat} = 20,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

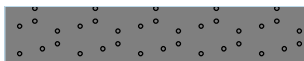
Poisson's ratio : $\nu = 0,28 \text{ [-]}$

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 22,92$ [MPa]

View

Retino terreno :



Strato - 10

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 13,00$ [°]

Cohesion : $c_{ef} = 65,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 4,73$ [MPa]

View

Retino terreno :



Strato - 11

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 25,00$ [°]

Cohesion : $c_{ef} = 5,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,30$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

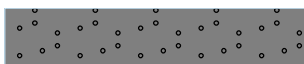
Poisson's ratio : $\nu = 0,30$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 13,88$ [MPa]

View

Retino terreno :



Strato - 12

Basic data

Unit weight : $\gamma = 18,00$ [kN/m³]

Stress analysis : effective

Internal friction angle : $\phi_{\text{ef}} = 13,00$ [°]

Cohesion : $c_{\text{ef}} = 76,00$ [kPa]

Friction angle structure-soil : $\delta = 10,00$ [°]

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42$ [-]

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{\text{sat}} = 19,00$ [kN/m³]

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42$ [-]

Modulus type : input E_{oed}

Oedometric modulus : $E_{\text{oed}} = 5,26$ [MPa]

View

Retino terreno :



Strato - 13

Basic data

Unit weight : $\gamma = 18,00 \text{ [kN/m}^3\text{]}$

Stress analysis : effective

Internal friction angle : $\varphi_{ef} = 13,00 \text{ [}^\circ\text{]}$

Cohesion : $c_{ef} = 97,00 \text{ [kPa]}$

Friction angle structure-soil : $\delta = 10,00 \text{ [}^\circ\text{]}$

Pressure at rest

Pressure at rest : cohesive soil

Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Uplift pressure

Uplift calculation : standard

Unit weight of saturated soil : $\gamma_{sat} = 19,00 \text{ [kN/m}^3\text{]}$

Analysis of modulus of subsoil reaction

Poisson's ratio : $\nu = 0,42 \text{ [-]}$

Modulus type : input E_{oed}

Oedometric modulus : $E_{oed} = 6,37 \text{ [MPa]}$

View

Retino terreno :



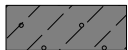
Profilo geologico e terreni assegnati

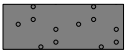
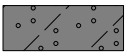
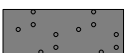
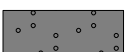
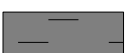
Informazioni sulla posizione

GPS : N 44,7149930; E 11,7089730

N 44°42'53,97"; E 11°42'32,30"

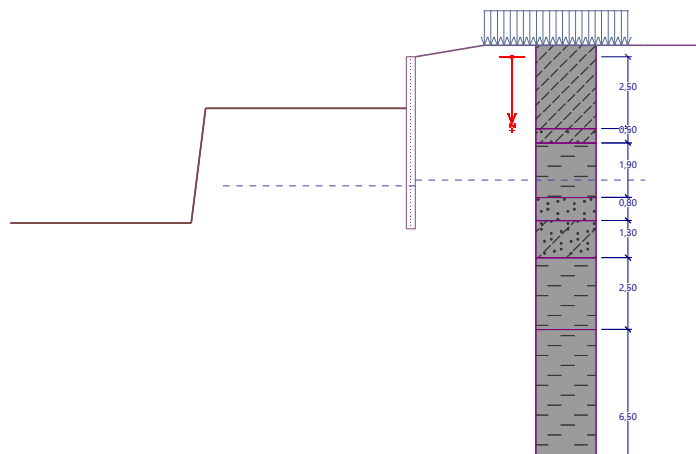
Profilo geologico e terreni assegnati

N.	Spessore dello strato $t \text{ [m]}$	Profondità $z \text{ [m]}$	Terreno assegnato	Retino
1	2,50	0,00 .. 2,50	Strato - 1	
2	0,50	2,50 .. 3,00	Strato - 2	
3	1,90	3,00 .. 4,90	Strato - 3	

N.	Spessore dello strato t [m]	Profondità z [m]	Terreno assegnato	Retino
4	0,80	4,90 .. 5,70	Strato - 4	
5	1,30	5,70 .. 7,00	Strato - 5	
6	2,50	7,00 .. 9,50	Strato - 6	
7	6,50	9,50 .. 16,00	Strato - 7	
8	2,50	16,00 .. 18,50	Strato - 8	
9	0,60	18,50 .. 19,10	Strato - 9	
10	0,80	19,10 .. 19,90	Strato - 10	
11	0,80	19,90 .. 20,70	Strato - 11	
12	4,30	20,70 .. 25,00	Strato - 12	
13	3,00	25,00 .. 28,00	Strato - 13	
14	-	28,00 .. ∞	Strato - 13	

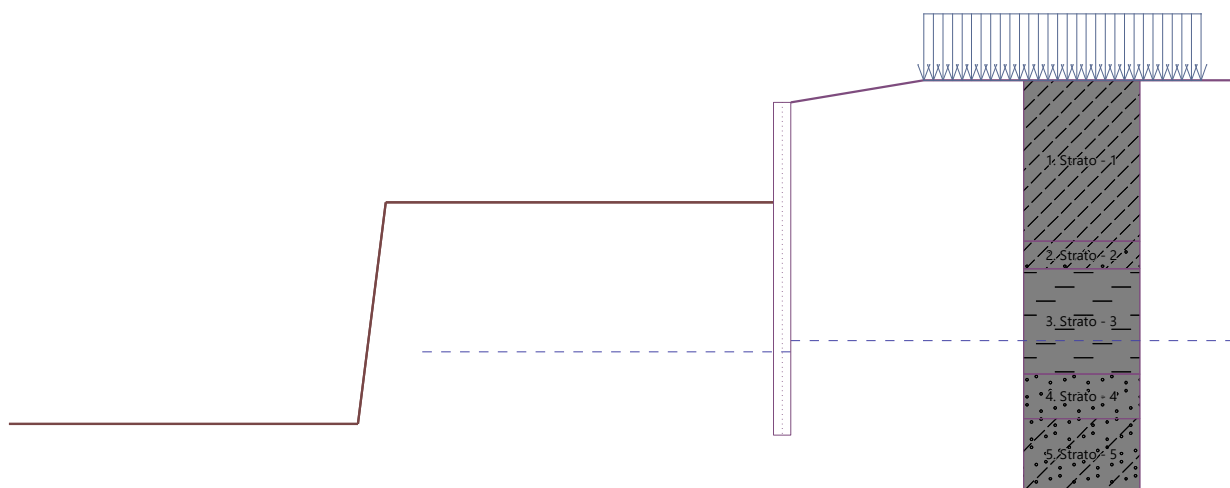
Nome : Profilo e assegnazione

Fase - analisi : 1 - 0



Nome : Profilo e assegnazione

Fase - analisi : 1 - 0



Scavo

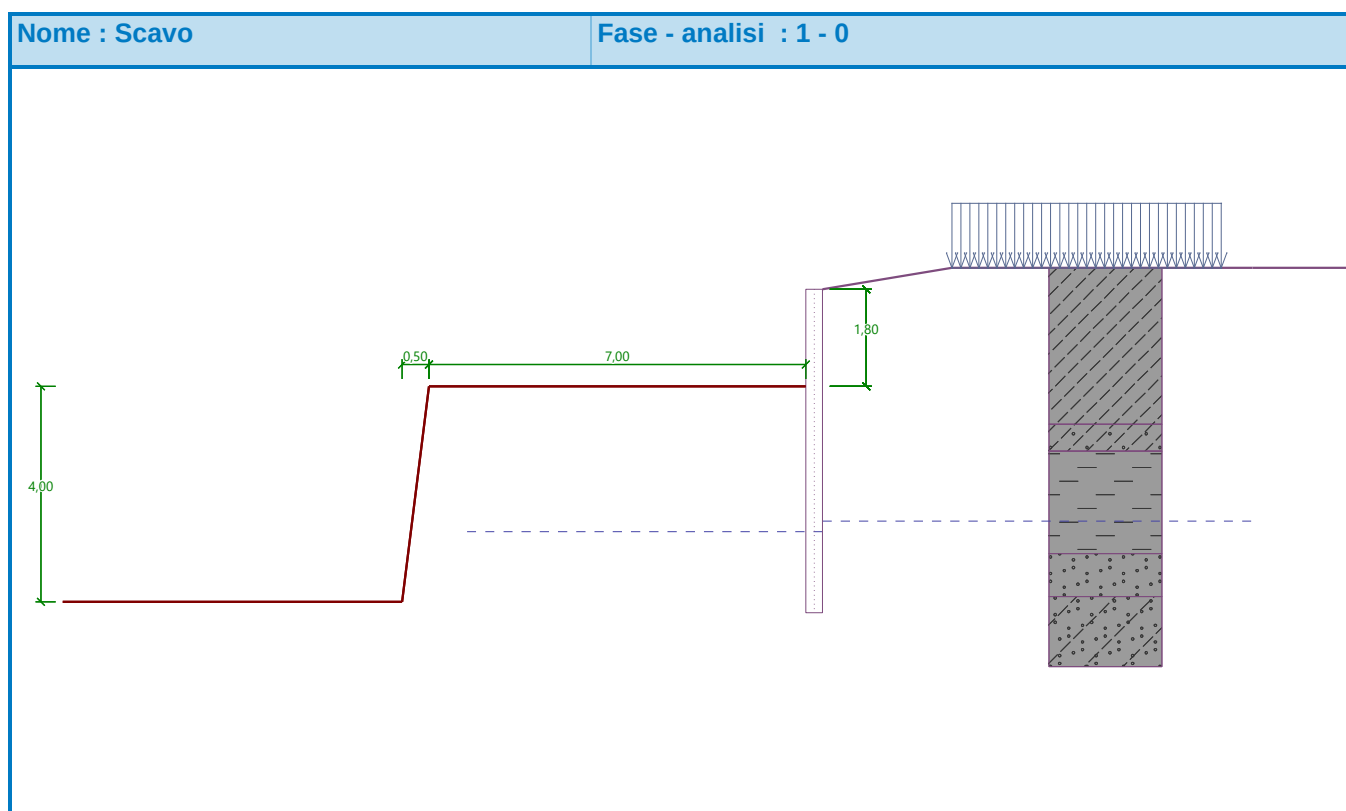
Il terreno antistante la parete è ad una profondità di 1,80 m.

Forma del fondo scavo

N.	Coordinate x [m]	Profondità z [m]
1	0,00	0,00
2	-7,00	0,00
3	-7,50	4,00
4	-8,50	4,00

Origine [0,0] collocata sul fondo scavo.

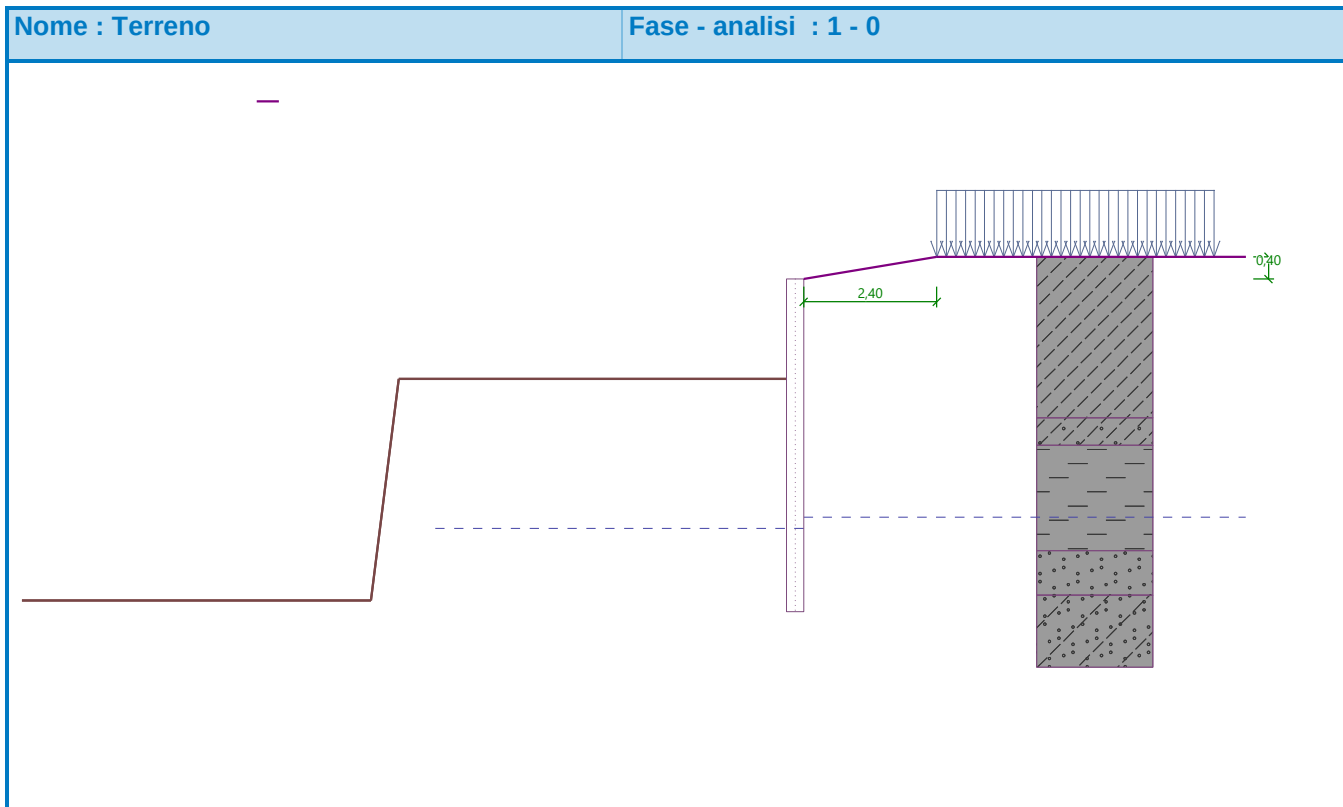
La coordinata positiva +z è diretta verso il basso.



Profilo del terreno

Il terreno dietro la costruzione ha la pendenza 1: 6,00 (l'angolo di inclinazione è 9,46 °).

L'altezza dell'argine è 0,40 m, la lunghezza dell'argine è 2,40 m.

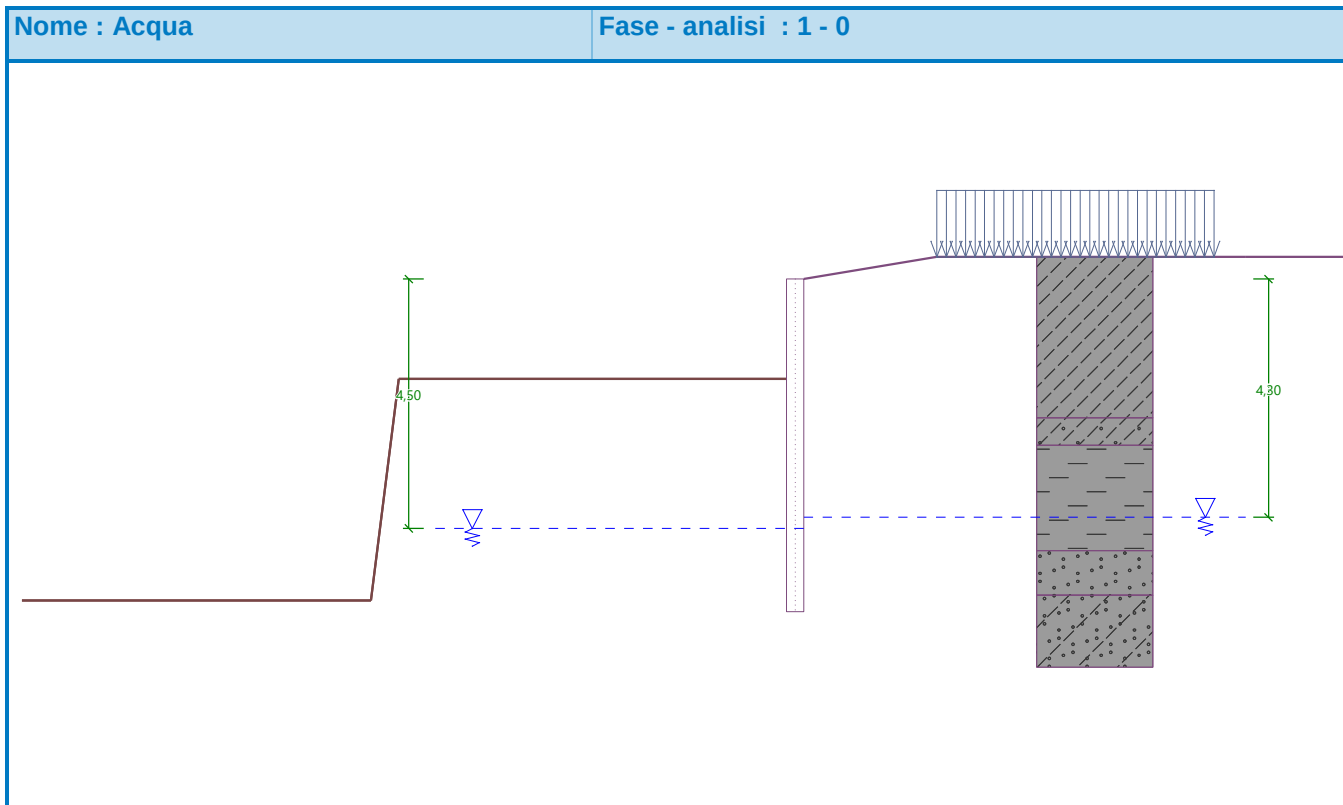


Influenza dell'acqua

L.F. a monte collocata ad una profondità di 4,30 m

L.F. a valle collocata alla profondità di 4,50 m

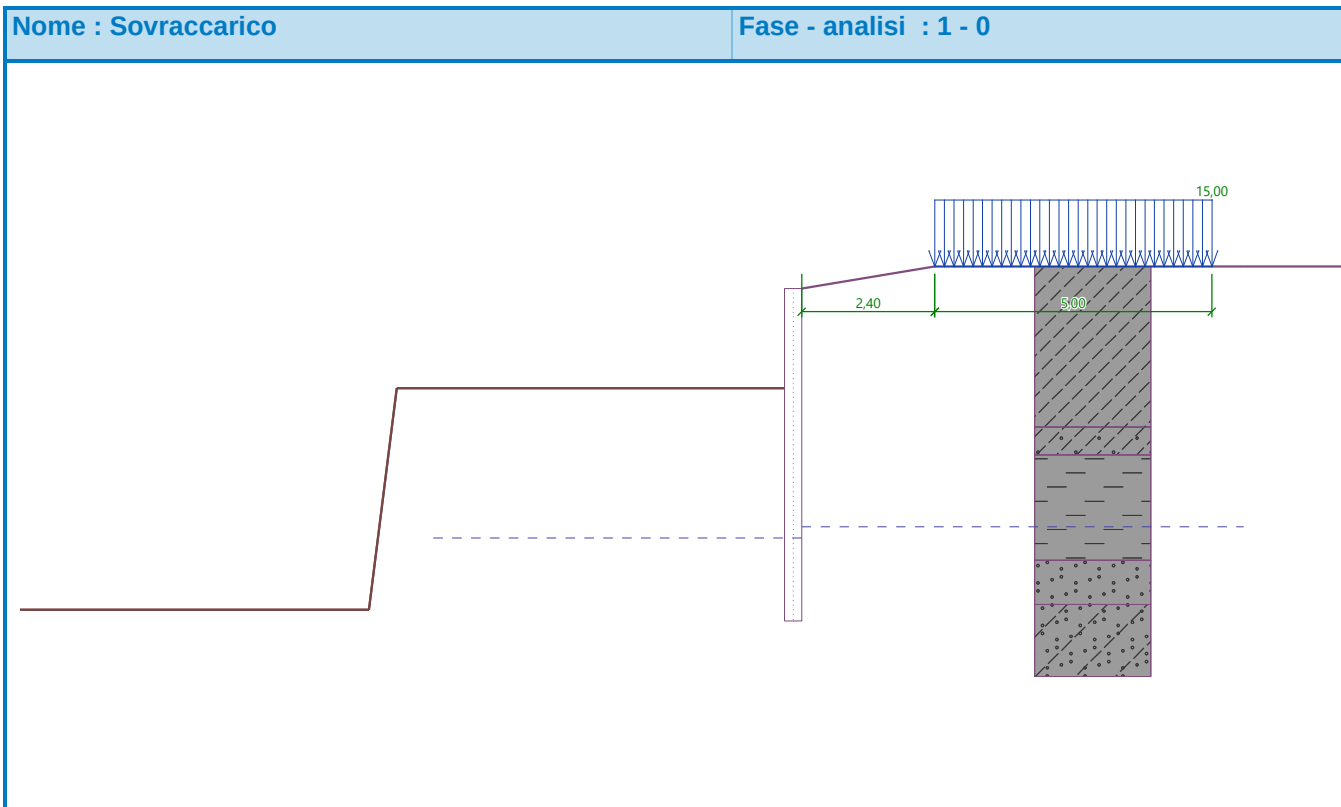
La struttura alla base non è permeabile



Sovraccarichi di superficie

N.	Sovraccarico		Azione	Grand.1 [kN/m ²]	Grand.2 [kN/m ²]	Ord.x x [m]	Lunghezza l [m]	Profondità z [m]
	nuovo	modifica						
1	Sì		variabile	15,00		2,40	5,00	sul terreno

N.	Nome
1	Automezzi



Impostazioni generali

Numero di Elem. Finiti per discretizzare la struttura = 100

La pressione minima è considerata come $\sigma_{a,min} = 0,20\sigma_z$

Impostazioni della fase di progetto

Situazione del progetto : permanente

Analisi risultati

Distribuzione delle pressioni agenti sulla struttura (davanti e dietro il muro)

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
0.00	0.00	0.00	0.00	0.00	2.10	179.45
0.00	0.00	0.00	0.00	0.00	2.10	179.46
0.30	0.00	0.00	0.00	1.08	9.12	189.46
0.33	0.00	0.00	0.00	1.20	9.88	190.59
0.60	0.00	0.00	0.00	2.16	15.89	199.47
0.90	0.00	0.00	0.00	3.24	22.37	209.48

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
1.20	0.00	0.00	0.00	4.32	28.57	219.49
1.50	0.00	0.00	0.00	5.40	34.54	229.50
1.80	0.00	0.00	0.00	6.48	40.31	239.51
1.80	0.00	-0.00	-166.11	6.48	33.83	239.52
2.10	0.00	-5.19	-176.12	7.56	45.93	249.52
2.40	0.00	-10.38	-186.13	8.64	51.45	259.54
2.50	0.00	-12.11	-189.46	9.00	53.27	262.87
2.50	0.00	-7.08	-72.50	12.83	32.59	208.04
2.70	0.00	-9.32	-86.19	14.37	34.79	221.73
3.00	0.00	-12.69	-106.73	16.68	38.06	242.27
3.00	0.00	-21.71	-171.12	11.00	63.61	261.18
3.30	0.00	-26.76	-183.06	12.05	68.85	273.12
3.60	0.00	-31.80	-195.00	13.10	74.06	285.06
3.90	0.00	-36.85	-206.94	14.15	79.28	297.00
4.00	0.00	-38.53	-210.92	14.50	81.01	300.98
4.00	0.00	-38.54	-210.96	14.50	81.03	301.02
4.20	0.00	-41.89	-218.88	15.20	84.49	308.94
4.30	0.00	-43.57	-222.86	15.55	86.23	312.92
4.33	0.00	-44.12	-224.15	15.60	86.81	313.87
4.50	0.00	-46.93	-230.82	15.89	89.69	318.79
4.80	0.00	-49.38	-236.62	16.40	91.86	324.58
4.90	0.00	-50.20	-238.55	16.57	92.59	326.52
4.90	-15.27	-25.34	-230.71	31.54	47.73	399.62
5.10	-15.85	-26.31	-239.54	32.09	48.56	408.45
5.18	-16.09	-26.70	-243.09	32.31	48.89	412.00
5.18	-0.05	-0.05	-0.05	32.31	48.90	412.04
5.40	-0.09	-0.09	-0.09	32.91	49.81	421.69
5.70	-0.15	-0.15	-0.15	33.73	51.08	434.94
5.70	-13.73	-19.75	-19.75	31.00	42.31	409.97

Profondità [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
5.80	-14.02	-19.75	-19.75	31.26	42.60	413.53
6.00	-14.59	-19.75	-19.75	31.79	43.18	420.66

Distribuzioni del modulo della reazione del terreno e forze interne sulla struttura

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
0.00	0.00	0.00	-6.46	0.00	0.00	0.00
0.30	0.00	0.00	-6.22	1.08	-0.16	0.02
0.60	0.00	0.00	-5.99	2.16	-0.65	0.13
0.90	0.00	0.00	-5.76	3.24	-1.46	0.44
1.20	0.00	0.00	-5.53	4.32	-2.59	1.04
1.50	0.00	4.60	-5.30	10.15	-4.62	2.06
1.80	0.00	4.60	-5.08	16.85	-8.62	3.97
1.80	4.60	4.60	-5.08	-12.79	-8.64	4.04
2.10	4.60	4.60	-4.87	-4.09	-6.15	6.16
2.40	4.60	4.60	-4.69	-2.05	-5.23	7.85
2.70	8.62	0.00	-4.52	-33.97	2.08	8.63
3.00	3.46	3.46	-4.39	-5.06	11.39	6.50
3.30	3.46	3.46	-4.28	12.45	8.29	3.47
3.60	3.46	3.46	-4.18	13.32	4.42	1.56
3.90	3.46	3.46	-4.08	14.15	0.30	0.84
4.20	3.46	3.46	-3.99	14.96	-4.06	1.40
4.50	3.46	3.46	-3.90	15.72	-8.67	3.30
4.80	3.46	3.46	-3.83	15.97	-13.42	6.62
5.10	33.13	0.00	-3.77	-119.21	10.24	8.33
5.40	0.00	0.00	-3.74	32.82	14.12	3.29
5.70	0.00	0.00	-3.73	33.58	4.16	0.54
6.00	0.00	0.00	-3.71	12.04	0.00	0.00

Distribuzioni del modulo della reazione del terreno e forze interne sulla struttura - nel dettaglio

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
0.00	0.00	0.00	-6.46	0.00	0.00	0.00
0.06	0.00	0.00	-6.41	0.22	-0.01	0.00
0.12	0.00	0.00	-6.36	0.43	-0.03	0.00
0.18	0.00	0.00	-6.32	0.65	-0.06	0.00
0.24	0.00	0.00	-6.27	0.86	-0.10	0.01
0.30	0.00	0.00	-6.22	1.08	-0.16	0.02
0.36	0.00	0.00	-6.18	1.30	-0.23	0.03
0.42	0.00	0.00	-6.13	1.51	-0.32	0.04
0.48	0.00	0.00	-6.08	1.73	-0.41	0.07
0.54	0.00	0.00	-6.04	1.94	-0.52	0.09
0.60	0.00	0.00	-5.99	2.16	-0.65	0.13
0.66	0.00	0.00	-5.94	2.38	-0.78	0.17
0.72	0.00	0.00	-5.90	2.59	-0.93	0.22
0.78	0.00	0.00	-5.85	2.81	-1.10	0.28
0.84	0.00	0.00	-5.80	3.02	-1.27	0.36
0.90	0.00	0.00	-5.76	3.24	-1.46	0.44
0.96	0.00	0.00	-5.71	3.46	-1.66	0.53
1.02	0.00	0.00	-5.67	3.67	-1.87	0.64
1.08	0.00	0.00	-5.62	3.89	-2.10	0.76
1.14	0.00	0.00	-5.57	4.10	-2.34	0.89
1.20	0.00	0.00	-5.53	4.32	-2.59	1.04
1.26	0.00	0.00	-5.48	4.54	-2.86	1.20
1.32	0.00	4.60	-5.44	5.95	-3.17	1.37
1.38	0.00	4.60	-5.39	7.35	-3.57	1.57
1.44	0.00	4.60	-5.34	8.75	-4.05	1.80
1.50	0.00	4.60	-5.30	10.15	-4.62	2.06
1.56	0.00	4.60	-5.26	11.51	-5.27	2.35
1.62	0.00	4.60	-5.21	12.87	-6.00	2.69
1.68	0.00	4.60	-5.17	14.23	-6.81	3.08

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
1.74	0.00	4.60	-5.12	15.58	-7.71	3.51
1.80	0.00	4.60	-5.08	16.85	-8.62	3.97
1.80	4.60	4.60	-5.08	-12.79	-8.64	4.04
1.86	4.60	4.60	-5.04	-11.14	-7.97	4.50
1.92	4.60	4.60	-4.99	-9.37	-7.36	4.96
1.98	4.60	4.60	-4.95	-7.60	-6.85	5.39
2.04	4.60	4.60	-4.91	-5.84	-6.45	5.78
2.10	4.60	4.60	-4.87	-4.09	-6.15	6.16
2.16	4.60	4.60	-4.83	-3.67	-5.92	6.52
2.22	4.60	4.60	-4.79	-3.25	-5.71	6.87
2.28	4.60	4.60	-4.76	-2.84	-5.53	7.21
2.34	4.60	4.60	-4.72	-2.44	-5.37	7.53
2.40	4.60	4.60	-4.69	-2.05	-5.23	7.85
2.46	4.60	4.60	-4.65	-1.67	-5.12	8.16
2.52	8.62	0.00	-4.62	-34.14	-4.05	8.45
2.58	8.62	0.00	-4.59	-34.07	-2.00	8.64
2.64	8.62	0.00	-4.55	-34.02	0.04	8.69
2.70	8.62	0.00	-4.52	-33.97	2.08	8.63
2.76	8.62	0.00	-4.50	-33.93	4.12	8.44
2.82	8.62	0.00	-4.47	-33.91	6.15	8.14
2.88	8.62	0.00	-4.44	-33.89	8.19	7.71
2.94	8.62	0.00	-4.42	-33.88	10.22	7.15
3.00	3.46	3.46	-4.39	-5.06	11.39	6.50
3.06	3.46	3.46	-4.37	11.68	11.19	5.81
3.12	3.46	3.46	-4.34	11.88	10.48	5.16
3.18	3.46	3.46	-4.32	12.07	9.76	4.55
3.24	3.46	3.46	-4.30	12.26	9.03	3.99
3.30	3.46	3.46	-4.28	12.45	8.29	3.47
3.36	3.46	3.46	-4.26	12.63	7.54	3.00

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
3.42	3.46	3.46	-4.24	12.80	6.78	2.57
3.48	3.46	3.46	-4.22	12.98	6.00	2.18
3.54	3.46	3.46	-4.20	13.15	5.22	1.85
3.60	3.46	3.46	-4.18	13.32	4.42	1.56
3.66	3.46	3.46	-4.16	13.49	3.62	1.32
3.72	3.46	3.46	-4.14	13.65	2.81	1.12
3.78	3.46	3.46	-4.12	13.82	1.98	0.98
3.84	3.46	3.46	-4.10	13.98	1.15	0.88
3.90	3.46	3.46	-4.08	14.15	0.30	0.84
3.96	3.46	3.46	-4.06	14.31	-0.55	0.85
4.02	3.46	3.46	-4.04	14.47	-1.41	0.91
4.08	3.46	3.46	-4.03	14.64	-2.29	1.02
4.14	3.46	3.46	-4.01	14.80	-3.17	1.18
4.20	3.46	3.46	-3.99	14.96	-4.06	1.40
4.26	3.46	3.46	-3.97	15.12	-4.97	1.67
4.32	3.46	3.46	-3.95	15.28	-5.88	2.00
4.38	3.46	3.46	-3.94	15.44	-6.80	2.38
4.44	3.46	3.46	-3.92	15.58	-7.73	2.81
4.50	3.46	3.46	-3.90	15.72	-8.67	3.30
4.56	3.46	3.46	-3.89	15.78	-9.61	3.85
4.62	3.46	3.46	-3.87	15.83	-10.56	4.46
4.68	3.46	3.46	-3.86	15.88	-11.51	5.12
4.74	3.46	3.46	-3.84	15.93	-12.47	5.84
4.80	3.46	3.46	-3.83	15.97	-13.42	6.62
4.86	3.46	3.46	-3.81	16.00	-14.38	7.45
4.92	33.13	0.00	-3.80	-119.80	-11.26	8.24
4.98	33.13	0.00	-3.79	-119.57	-4.08	8.70
5.04	33.13	0.00	-3.78	-119.37	3.08	8.73
5.10	33.13	0.00	-3.77	-119.21	10.24	8.33

Profondità [m]	kh,p [MN/m ³]	kh,z [MN/m ³]	Spostamento [mm]	Pressione [kPa]	Forza di taglio [kN/m]	Momento [kNm/m]
5.16	33.13	0.00	-3.77	-119.09	17.39	7.50
5.22	0.00	0.00	-3.76	32.36	19.99	6.36
5.28	0.00	0.00	-3.75	32.51	18.04	5.22
5.34	0.00	0.00	-3.75	32.66	16.09	4.20
5.40	0.00	0.00	-3.74	32.82	14.12	3.29
5.46	0.00	0.00	-3.74	32.97	12.15	2.50
5.52	0.00	0.00	-3.74	33.12	10.17	1.83
5.58	0.00	0.00	-3.73	33.27	8.17	1.28
5.64	0.00	0.00	-3.73	33.43	6.17	0.85
5.70	0.00	0.00	-3.73	33.58	4.16	0.54
5.76	0.00	0.00	-3.72	11.41	2.81	0.34
5.82	0.00	0.00	-3.72	11.57	2.12	0.19
5.88	0.00	0.00	-3.72	11.73	1.43	0.09
5.94	0.00	0.00	-3.71	11.88	0.72	0.02
6.00	0.00	0.00	-3.71	12.04	0.00	0.00

Valori massimi delle forze interne agenti sulla struttura

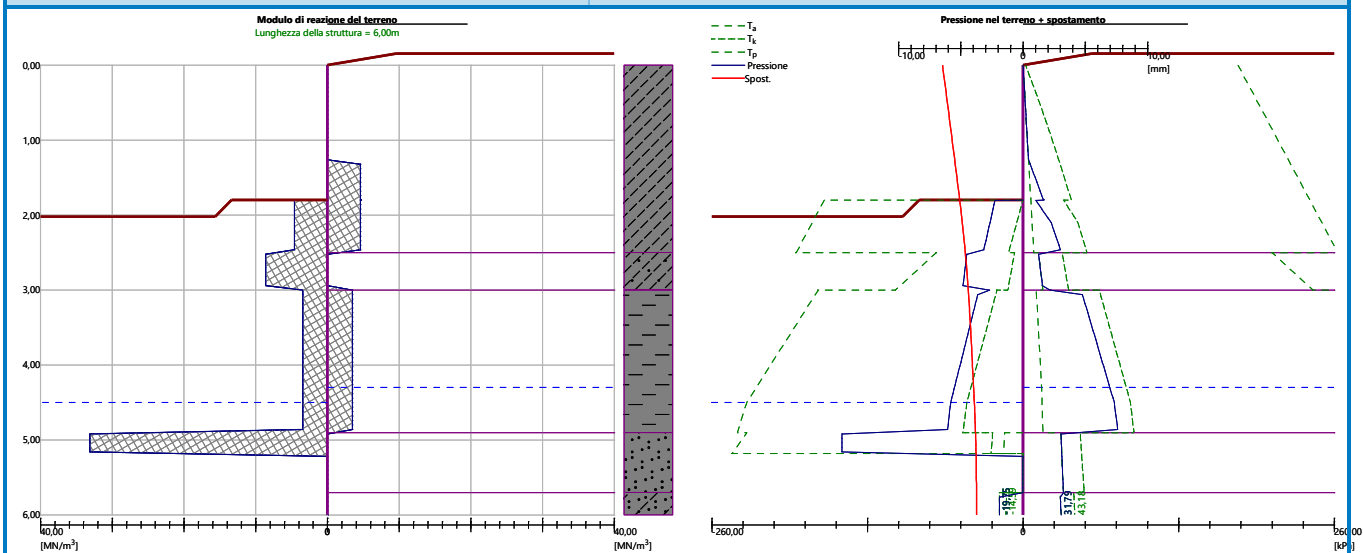
Massima forza di taglio = 19,99 kN/m

Momento massimo = 8,73 kNm/m

Massimo spostamento = 6,5 mm

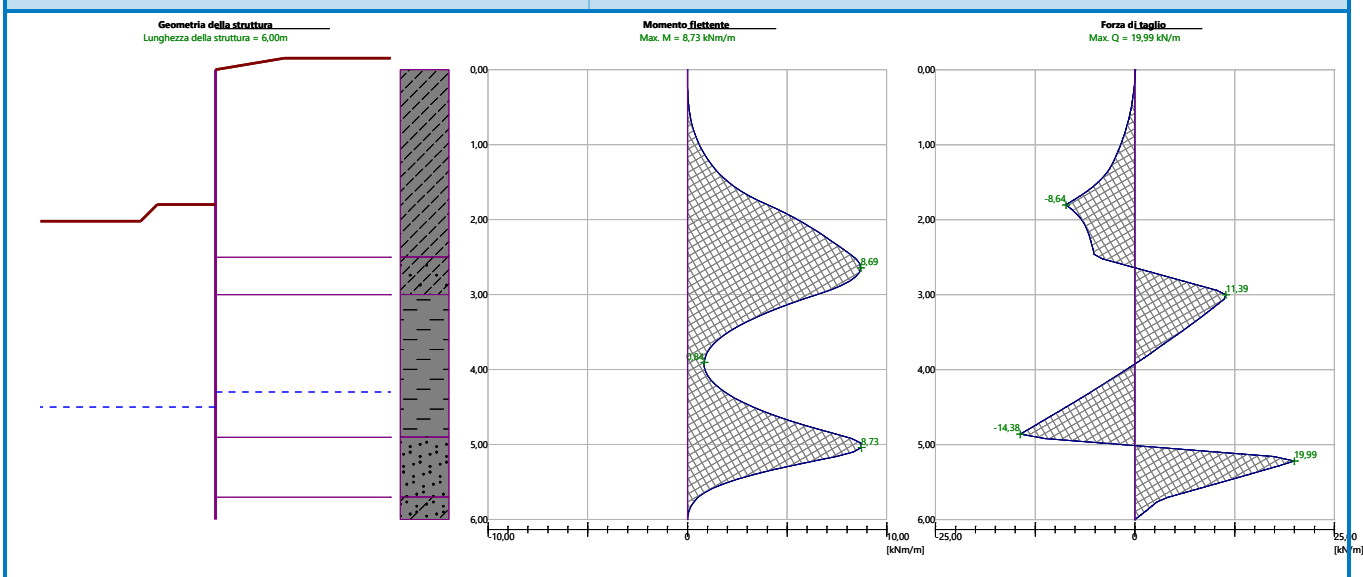
Nome : Analisi

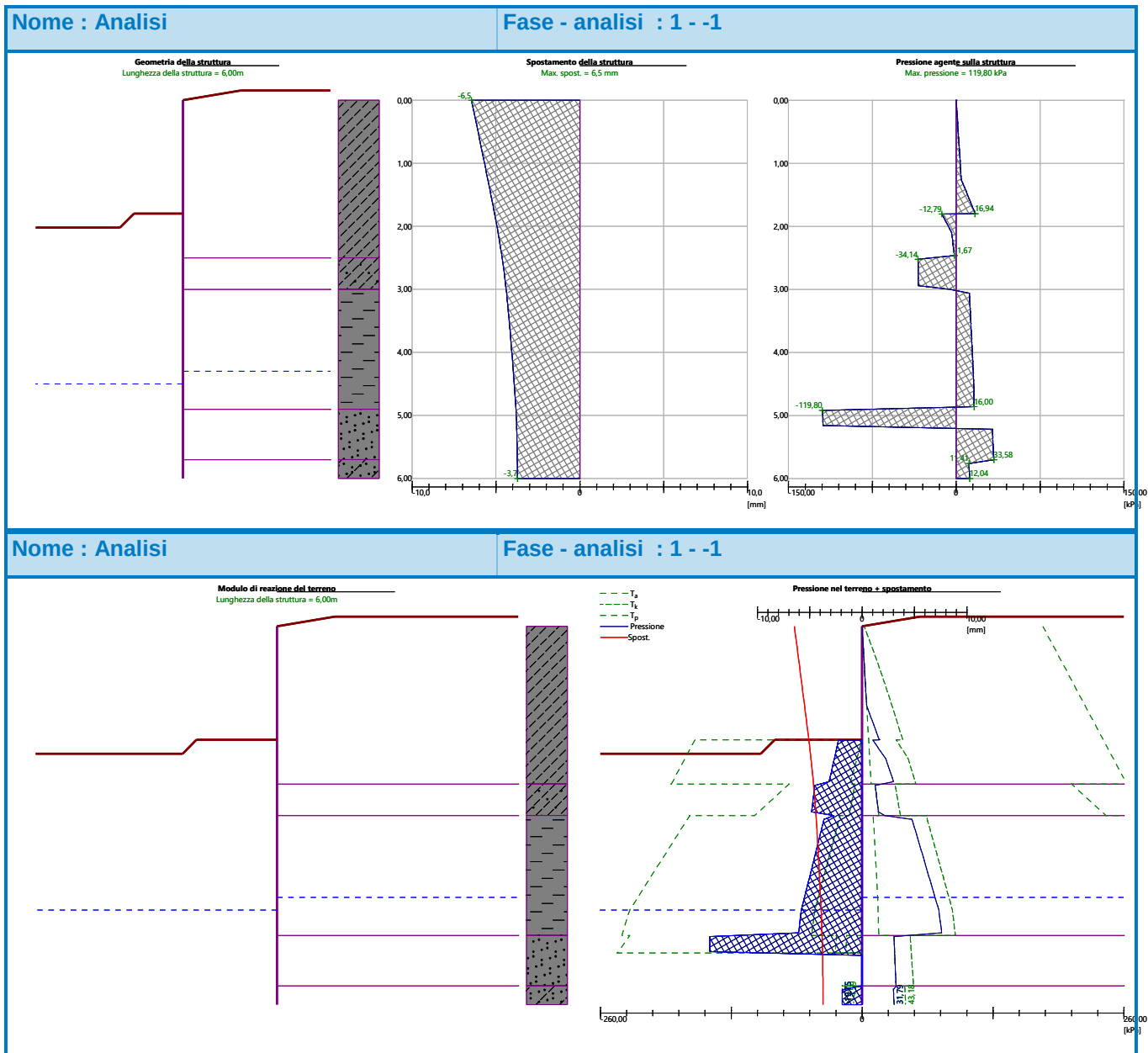
Fase - analisi : 1 - -1



Nome : Analisi

Fase - analisi : 1 - -1





Dimensionamento N. 1

Distribuzione delle forze in costruzione

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.00	-6.46	-6.46	0.00	0.00	0.00	0.00
0.30	-6.22	-6.22	-0.16	-0.16	0.02	0.02

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.60	-5.99	-5.99	-0.65	-0.65	0.13	0.13
0.90	-5.76	-5.76	-1.46	-1.46	0.44	0.44
1.20	-5.53	-5.53	-2.59	-2.59	1.04	1.04
1.50	-5.30	-5.30	-4.62	-4.62	2.06	2.06
1.80	-5.08	-5.08	-8.62	-8.62	3.97	3.97
1.80	-5.08	-5.08	-8.64	-8.64	4.04	4.04
2.10	-4.87	-4.87	-6.15	-6.15	6.16	6.16
2.40	-4.69	-4.69	-5.23	-5.23	7.85	7.85
2.70	-4.52	-4.52	2.08	2.08	8.63	8.63
3.00	-4.39	-4.39	11.39	11.39	6.50	6.50
3.30	-4.28	-4.28	8.29	8.29	3.47	3.47
3.60	-4.18	-4.18	4.42	4.42	1.56	1.56
3.90	-4.08	-4.08	0.30	0.30	0.84	0.84
4.20	-3.99	-3.99	-4.06	-4.06	1.40	1.40
4.50	-3.90	-3.90	-8.67	-8.67	3.30	3.30
4.80	-3.83	-3.83	-13.42	-13.42	6.62	6.62
5.10	-3.77	-3.77	10.24	10.24	8.33	8.33
5.40	-3.74	-3.74	14.12	14.12	3.29	3.29
5.70	-3.73	-3.73	4.16	4.16	0.54	0.54
6.00	-3.71	-3.71	0.00	0.00	0.00	0.00

Distribuzione delle forze in costruzione - nel dettaglio

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.00	-6.46	-6.46	0.00	0.00	0.00	0.00
0.06	-6.41	-6.41	-0.01	-0.01	0.00	0.00
0.12	-6.36	-6.36	-0.03	-0.03	0.00	0.00
0.18	-6.32	-6.32	-0.06	-0.06	0.00	0.00

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
0.24	-6.27	-6.27	-0.10	-0.10	0.01	0.01
0.30	-6.22	-6.22	-0.16	-0.16	0.02	0.02
0.36	-6.18	-6.18	-0.23	-0.23	0.03	0.03
0.42	-6.13	-6.13	-0.32	-0.32	0.04	0.04
0.48	-6.08	-6.08	-0.41	-0.41	0.07	0.07
0.54	-6.04	-6.04	-0.52	-0.52	0.09	0.09
0.60	-5.99	-5.99	-0.65	-0.65	0.13	0.13
0.66	-5.94	-5.94	-0.78	-0.78	0.17	0.17
0.72	-5.90	-5.90	-0.93	-0.93	0.22	0.22
0.78	-5.85	-5.85	-1.10	-1.10	0.28	0.28
0.84	-5.80	-5.80	-1.27	-1.27	0.36	0.36
0.90	-5.76	-5.76	-1.46	-1.46	0.44	0.44
0.96	-5.71	-5.71	-1.66	-1.66	0.53	0.53
1.02	-5.67	-5.67	-1.87	-1.87	0.64	0.64
1.08	-5.62	-5.62	-2.10	-2.10	0.76	0.76
1.14	-5.57	-5.57	-2.34	-2.34	0.89	0.89
1.20	-5.53	-5.53	-2.59	-2.59	1.04	1.04
1.26	-5.48	-5.48	-2.86	-2.86	1.20	1.20
1.32	-5.44	-5.44	-3.17	-3.17	1.37	1.37
1.38	-5.39	-5.39	-3.57	-3.57	1.57	1.57
1.44	-5.34	-5.34	-4.05	-4.05	1.80	1.80
1.50	-5.30	-5.30	-4.62	-4.62	2.06	2.06
1.56	-5.26	-5.26	-5.27	-5.27	2.35	2.35
1.62	-5.21	-5.21	-6.00	-6.00	2.69	2.69
1.68	-5.17	-5.17	-6.81	-6.81	3.08	3.08
1.74	-5.12	-5.12	-7.71	-7.71	3.51	3.51
1.80	-5.08	-5.08	-8.62	-8.62	3.97	3.97
1.80	-5.08	-5.08	-8.64	-8.64	4.04	4.04

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
1.86	-5.04	-5.04	-7.97	-7.97	4.50	4.50
1.92	-4.99	-4.99	-7.36	-7.36	4.96	4.96
1.98	-4.95	-4.95	-6.85	-6.85	5.39	5.39
2.04	-4.91	-4.91	-6.45	-6.45	5.78	5.78
2.10	-4.87	-4.87	-6.15	-6.15	6.16	6.16
2.16	-4.83	-4.83	-5.92	-5.92	6.52	6.52
2.22	-4.79	-4.79	-5.71	-5.71	6.87	6.87
2.28	-4.76	-4.76	-5.53	-5.53	7.21	7.21
2.34	-4.72	-4.72	-5.37	-5.37	7.53	7.53
2.40	-4.69	-4.69	-5.23	-5.23	7.85	7.85
2.46	-4.65	-4.65	-5.12	-5.12	8.16	8.16
2.52	-4.62	-4.62	-4.05	-4.05	8.45	8.45
2.58	-4.59	-4.59	-2.00	-2.00	8.64	8.64
2.64	-4.55	-4.55	0.04	0.04	8.69	8.69
2.70	-4.52	-4.52	2.08	2.08	8.63	8.63
2.76	-4.50	-4.50	4.12	4.12	8.44	8.44
2.82	-4.47	-4.47	6.15	6.15	8.14	8.14
2.88	-4.44	-4.44	8.19	8.19	7.71	7.71
2.94	-4.42	-4.42	10.22	10.22	7.15	7.15
3.00	-4.39	-4.39	11.39	11.39	6.50	6.50
3.06	-4.37	-4.37	11.19	11.19	5.81	5.81
3.12	-4.34	-4.34	10.48	10.48	5.16	5.16
3.18	-4.32	-4.32	9.76	9.76	4.55	4.55
3.24	-4.30	-4.30	9.03	9.03	3.99	3.99
3.30	-4.28	-4.28	8.29	8.29	3.47	3.47
3.36	-4.26	-4.26	7.54	7.54	3.00	3.00
3.42	-4.24	-4.24	6.78	6.78	2.57	2.57
3.48	-4.22	-4.22	6.00	6.00	2.18	2.18

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
3.54	-4.20	-4.20	5.22	5.22	1.85	1.85
3.60	-4.18	-4.18	4.42	4.42	1.56	1.56
3.66	-4.16	-4.16	3.62	3.62	1.32	1.32
3.72	-4.14	-4.14	2.81	2.81	1.12	1.12
3.78	-4.12	-4.12	1.98	1.98	0.98	0.98
3.84	-4.10	-4.10	1.15	1.15	0.88	0.88
3.90	-4.08	-4.08	0.30	0.30	0.84	0.84
3.96	-4.06	-4.06	-0.55	-0.55	0.85	0.85
4.02	-4.04	-4.04	-1.41	-1.41	0.91	0.91
4.08	-4.03	-4.03	-2.29	-2.29	1.02	1.02
4.14	-4.01	-4.01	-3.17	-3.17	1.18	1.18
4.20	-3.99	-3.99	-4.06	-4.06	1.40	1.40
4.26	-3.97	-3.97	-4.97	-4.97	1.67	1.67
4.32	-3.95	-3.95	-5.88	-5.88	2.00	2.00
4.38	-3.94	-3.94	-6.80	-6.80	2.38	2.38
4.44	-3.92	-3.92	-7.73	-7.73	2.81	2.81
4.50	-3.90	-3.90	-8.67	-8.67	3.30	3.30
4.56	-3.89	-3.89	-9.61	-9.61	3.85	3.85
4.62	-3.87	-3.87	-10.56	-10.56	4.46	4.46
4.68	-3.86	-3.86	-11.51	-11.51	5.12	5.12
4.74	-3.84	-3.84	-12.47	-12.47	5.84	5.84
4.80	-3.83	-3.83	-13.42	-13.42	6.62	6.62
4.86	-3.81	-3.81	-14.38	-14.38	7.45	7.45
4.92	-3.80	-3.80	-11.26	-11.26	8.24	8.24
4.98	-3.79	-3.79	-4.08	-4.08	8.70	8.70
5.04	-3.78	-3.78	3.08	3.08	8.73	8.73
5.10	-3.77	-3.77	10.24	10.24	8.33	8.33
5.16	-3.77	-3.77	17.39	17.39	7.50	7.50

	Spost. min [mm]	Spost. max [mm]	Sforzo di taglio minimo [kN/m]	Sforzo di taglio massimo [kN/m]	Momento min. [kNm/m]	Momento max. [kNm/m]
5.22	-3.76	-3.76	19.99	19.99	6.36	6.36
5.28	-3.75	-3.75	18.04	18.04	5.22	5.22
5.34	-3.75	-3.75	16.09	16.09	4.20	4.20
5.40	-3.74	-3.74	14.12	14.12	3.29	3.29
5.46	-3.74	-3.74	12.15	12.15	2.50	2.50
5.52	-3.74	-3.74	10.17	10.17	1.83	1.83
5.58	-3.73	-3.73	8.17	8.17	1.28	1.28
5.64	-3.73	-3.73	6.17	6.17	0.85	0.85
5.70	-3.73	-3.73	4.16	4.16	0.54	0.54
5.76	-3.72	-3.72	2.81	2.81	0.34	0.34
5.82	-3.72	-3.72	2.12	2.12	0.19	0.19
5.88	-3.72	-3.72	1.43	1.43	0.09	0.09
5.94	-3.71	-3.71	0.72	0.72	0.02	0.02
6.00	-3.71	-3.71	0.00	0.00	0.00	0.00

Massimi valori delle forze interne

Massimo spostamento = -6,5 mm
 Spostamento minimo = -3,7 mm
 Momento flettente massimo = 8,73 kNm/m
 Momento flettente minimo = 0,00 kNm/m
 Massima forza di taglio = 19,99 kN/m

Verifica della sezione trasversale - risultati dettagliati

Caratteristiche della sezione trasversale per 1 m del muro:

Area della sezione trasversale $A = 1,133\text{E-}02 \text{ m}^2/\text{m}$
 Modulo di resistenza $W = 8,420\text{E-}04 \text{ m}^3/\text{m}$
 Modulo di resistenza plastico $W_{pl} = 1,022\text{E-}03 \text{ m}^3/\text{m}$
 Momento d'Inerzia $I = 1,305\text{E-}04 \text{ m}^4/\text{m}$
 Momento statico della sezione trasversale $S = 5,110\text{E-}04 \text{ m}^3/\text{m}$
 Momento statico dell'area $S_1 = 3,019\text{E-}04 \text{ m}^3/\text{m}$
 Spessore del taglio del muro $t = 18,4 \text{ mm/m}$

Proprietà materiali:

Tensione di snervamento $f_y = 275,00$ MPa

Fattori parziali:

Coefficiente di resistenza della sezione trasversale $\gamma_{M0} = 1,00$

Resistenza della sezione trasversale:

Resistenza a flessione $M_{c,Rd} = W \cdot f_y / \gamma_{M0} = 231,55$ kNm/m

Resistenza al taglio $V_{c,Rd} = I \cdot t / S \cdot f_y / (\sqrt{3} \cdot \gamma_{M0}) = 745,90$ kN/m

Verifica della sezione in acciaio secondo EN 1993-1-1

Tutte le fasi di costruzione sono considerate nell'analisi.

Fattore parziale sul carico = 1,00

Forze interne per 1 m del muro

$M_{max} = 8,73$ kNm/m; $Q = 3,08$ kN/m

$Q_{max} = 19,99$ kN/m; $M = 6,36$ kNm/m

Verifica del momento massimo $M_{max} + Q$:

Verifica della flessione:

$M_{max} / M_{c,Rd} = 0,038 \leq 1$ **Soddisfatta**

Verifica del taglio:

$Q / V_{c,Rd} = 0,004 \leq 1$ **Soddisfatta**

Verifica dello stato della tensione:

Tensione normale $\sigma_{x,Ed} = 9,81$ MPa

Tensione tangenziale $\tau_{Ed} = 0,39$ MPa

Verifica: $\sqrt{((\sigma_{x,Ed} / (f_y / \gamma_{M0}))^2 + 3 \cdot (\tau_{Ed} / (f_y / \gamma_{M0}))^2)} = 0,036 \leq 1$ **Soddisfatta**

Verifica della massima forza di taglio $Q_{max} + M$:

Verifica della flessione:

$M / M_{c,Rd} = 0,027 \leq 1$ **Soddisfatta**

Verifica del taglio:

$Q_{max} / V_{c,Rd} = 0,027 \leq 1$ **Soddisfatta**

Verifica dello stato della tensione:

Tensione normale $\sigma_{x,Ed} = 7,15$ MPa

Tensione tangenziale $\tau_{Ed} = 2,51$ MPa

Verifica: $\sqrt{((\sigma_{x,Ed} / (f_y / \gamma_{M0}))^2 + 3 \cdot (\tau_{Ed} / (f_y / \gamma_{M0}))^2)} = 0,030 \leq 1$ **Soddisfatta**

La sezione trasversale è **SODDISFATTA**