SOCIETA' PER AZIONI AUTOSTRADA DEL BRENNERO – TRENTO

ORDINE DEGLI INGEGNERI DELLA PROV. DI TRENTO
dott.ing. ROBERTO BOSETTI
INSCRIZIONE ALBO N° 1027

IL RESPONSABILE DEL PROCEDIMENTO
dott. ing. Roberto Bosetti

autostrada del brennero

PROGETTO DEFINITIVO PER LA REALIZZAZIONE DELLA TERZA CORSIA NEL TRATTO COMPRESO TRA VERONA NORD (KM 223) E L'INTERSEZIONE CON L'AUTOSTRADA A1 (KM 314)

B	**LOTTO 3 – da Nogarole Rocca (km 246+185) a Campogalliano (km 312+200)**
4.2.5.1.	**INTERVENTI SULLE OPERE D'ARTE** Ponte sul canale diversivo "Fissero-Tartaro" (pr. km 261+950) Interventi sulle opere minori – Relazione di calcolo

REVISIONE:	DATA:	DESCRIZIONE:	REDAZIONE:	VERIFICA:	APPROVAZIONE:
0	MAR. 2021	EMISSIONE	WEIS	OSS PAPOT	C. COSTA

DATA PROGETTO:
LUGLIO 2009

NUMERO PROGETTO:
31/09

DIREZIONE TECNICA GENERALE

IL DIRETTORE TECNICO GENERALE E PROGETTISTA:

ORDINE DEGLI INGEGNERI DELLA PROV. DI BOLZANO
Dott. Ing. CARLO COSTA
Nr. 891
INGENIEURKAMMER DER PROVINZ BOZEN

INDICE

Relazione statica del tombino al km 261 + 686

1. Caratteristiche dei materiali

1.1. Calcestruzzo

C30/37

1.2. Acciaio per armatura lenta

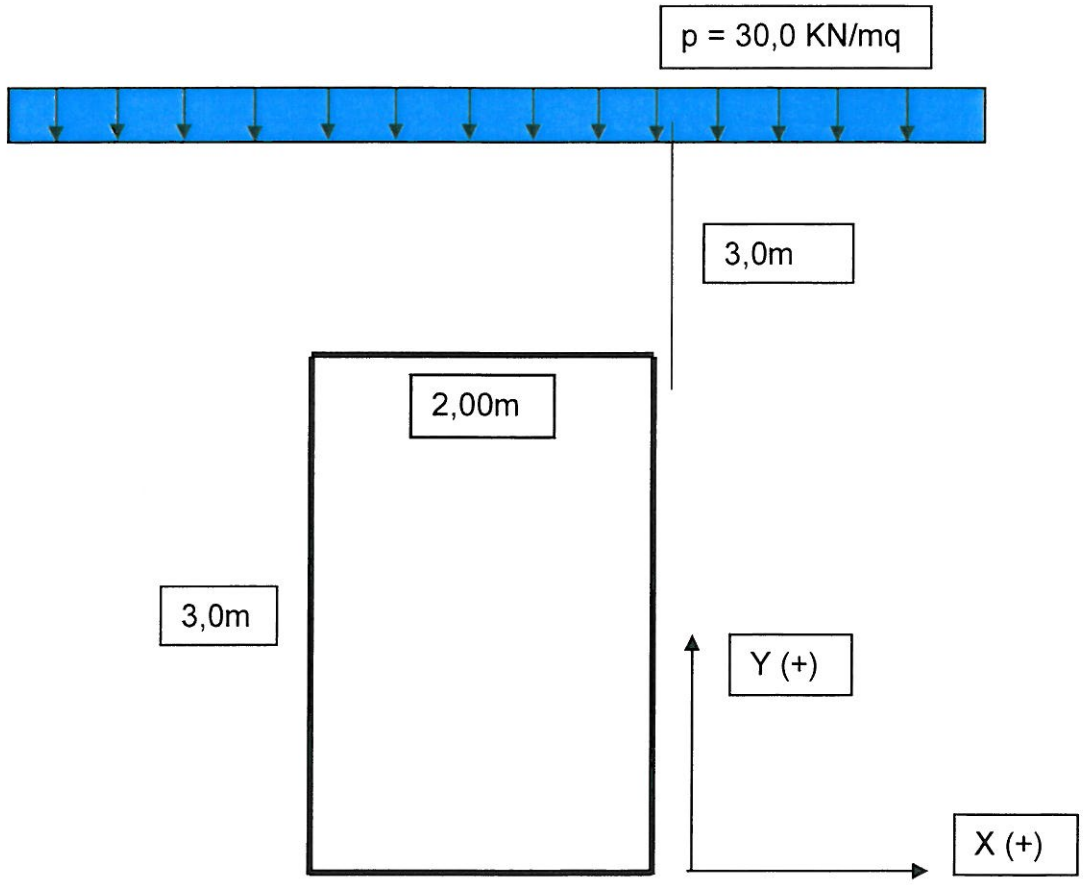
Tipo FeB44K ad aderenza migliorata, controllato in stabilimento

1.3. Acciaio in profilati tubolari per pali

Fe 510B

2. Sistema statico e carichi agenti

Il sistema statico é un telaio incastrato.



Le azioni interne sono state calcolate in automatico. Le ipotesi di carico sono le seguenti:

Carico 1: peso proprio struttura in cemento armato con γ cls = 25,0 KN/mc

Carico 2: Rilevato con materiale sciolto e γ terr = 20,0 KN/mc

Carico 3: Spinta terreno da sx con coeff. di spinta a riposo 0,50 e γ terr = 20,0 KN/mc

Carico 4: Spinta terreno da dx con coeff. di spinta a riposo 0,50 e γ terr = 20,0 KN/mc

Carico 5: Carico accidentale verticale con p = 30,0 KN/mq

Carico 6: Spinta laterale accidentali da sx con coeff. di spinta a riposo 0,50

Carico 7: Spinta laterale accidentali da dx con coeff. di spinta a riposo 0,50

Carico 8: Ritiro cls

I risultati sono riassunti nei tabulati allegati. Per il dimensionamento saranno considerate le combinazioni di carico piú gravose considerando anche la spinta del terreno unilaterale.

3. Dimensionamento struttura in c.a.

3.1. Verifica delle fondazioni, elevazioni e soletta

3.1.1. Azioni interne massime

Mmax =	+/- 100,00 KNm/m
Qmax =	140,00 KN/m
Nmin =	- 160,00 KN/m
Nmax =	+ 50,00 KN/m

3.1.2. Verifica a flessione

Mmax =	+/- 100,00 KNm/m
Qmax =	140,00 KN/m
Nmin =	- 160,00 KN/m
Nmax =	+ 50,00 KN/m

$kh = h*[b/Mz,e]^{0,5} = 25*[1,0/100,0]^{0,5} = 2,50$

$ks = 4,4$

$as = ks*Mz/h - N/\sigma amm = 4,4*100,0/25,0 = 17,60\ cm^2/m$

Scelto: d20/15 con as = 20,93 cm²/m

3.1.3. Verifica a taglio

$\tau = Q/(0,9*b*h) = 140000/(0,9*250*1000) = 0,62Mpa < 0,60Mpa$ (valore ammissibile)

```
*****************************************************
*                                                   *
*           STAAD.Pro                               *
*           Version  2005    Bld 1002.UK.1002       *
*           Proprietary Program of                  *
*           Research Engineers,  Intl.              *
*           Date=    MAY 12, 2008                   *
*           Time=    14:12:29                       *
*                                                   *
*      USER ID: ITB                                 *
*****************************************************
```

```
    1. STAAD SPACE SOTTOPASSO KM 261 + 686
INPUT FILE: sottopasso al km 261 + 686.STD
    2. START JOB INFORMATION
    3. END JOB INFORMATION
    4. INPUT WIDTH 79
    5. UNIT METER KN
    6. JOINT COORDINATES
    7. 1 0 -5 0; 2 0 -2 0; 3 2 -2 0; 4 2 -5 0; 5 0.25 -5 0; 6 0.5 -5 0; 7 0.75 -5 0
    8. 8 1 -5 0; 9 1.25 -5 0; 10 1.5 -5 0; 11 1.75 -5 0
    9. MEMBER INCIDENCES
   10. 1 1 2; 2 2 3; 3 3 4; 4 1 5; 5 5 6; 6 6 7; 7 7 8; 8 8 9; 9 9 10; 10 10 11
   11. 11 11 4
   12. DEFINE MATERIAL START
   13. ISOTROPIC CONCRETE
   14. E 2.2E+007
   15. POISSON 0.17
   16. DENSITY 25
   17. ALPHA 1E-005
   18. DAMP 0.05
   19. END DEFINE MATERIAL
   20. CONSTANTS
   21. MATERIAL CONCRETE MEMB 1 TO 11
   22. *
   23. MEMBER PROPERTY AMERICAN
   24. 1 TO 11 PRIS YD 0.3 ZD 1
   25. *
   26. SUPPORTS
   27. 1 FIXED BUT MY MZ
   28. 4 FIXED BUT FX MY MZ
   29. LOAD 1 PESO PROPRIO
   30. SELFWEIGHT Y -1
   31. LOAD 2 RIEMPIMENTO
   32. MEMBER LOAD
   33. 2 UNI GY -60
   34. LOAD 3 LOADTYPE NONE  TITLE SPINTA TERRENO SINISTRA
   35. MEMBER LOAD
   36. 1 TRAP GX 60 30
   37. LOAD 4 LOADTYPE NONE  TITLE SPINTA TERRENO DESTRA
   38. MEMBER LOAD
   39. 3 TRAP GX -30 -60
   40. LOAD 5 ACCIDENTALE
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41. MEMBER LOAD
42. 2 UNI GY -30
43. LOAD 6 LOADTYPE NONE  TITLE SPINTA ACCIDENTALE SINISTRA
44. MEMBER LOAD
45. 1 UNI GX 15
46. LOAD 7 LOADTYPE NONE  TITLE SPINTA ACCIDENTALE DESTRA
47. MEMBER LOAD
48. 3 UNI GX -15
49. LOAD 8 RITIRO SOLETTA * TEMPERATURA
50. TEMPERATURE LOAD
51. 2 TEMP -30
52. *
53. LOAD COMBINATION 10
54. 1 1.0 2 1.0 3 1.0
55. LOAD COMBINATION 11
56. 1 1.0 2 1.0 4 1.0
57. LOAD COMBINATION 12
58. 1 1.0 2 1.0 3 1.0 4 1.0
59. *
60. LOAD COMBINATION 13
61. 1 1.0 2 1.0 3 1.0 5 1.0 6 1.0
62. LOAD COMBINATION 14
63. 1 1.0 2 1.0 4 1.0 5 1.0 7 1.0
64. LOAD COMBINATION 15
65. 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0 7 1.0
66. *
67. LOAD COMBINATION 16
68. 1 1.0 2 1.0 3 1.0 8 1.0
69. LOAD COMBINATION 17
70. 1 1.0 2 1.0 4 1.0 8 1.0
71. LOAD COMBINATION 18
72. 1 1.0 2 1.0 3 1.0 4 1.0 8 1.0
73. *
74. LOAD COMBINATION 19
75. 1 1.0 2 1.0 3 1.0 5 1.0 6 1.0 8 1.0
76. LOAD COMBINATION 20
77. 1 1.0 2 1.0 4 1.0 5 1.0 7 1.0 8 1.0
78. LOAD COMBINATION 21
79. 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0 7 1.0 8 1.0
80. *
81. PERFORM ANALYSIS PRINT BOTH
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P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 11/ 11/ 2
ORIGINAL/FINAL BAND-WIDTH= 7/ 2/ 18 DOF
TOTAL PRIMARY LOAD CASES = 8, TOTAL DEGREES OF FREEDOM = 59
SIZE OF STIFFNESS MATRIX = 2 DOUBLE KILO-WORDS
REQRD/AVAIL. DISK SPACE = 12.0/ 10627.0 MB

LOADING 1 PESO PROPRIO

SELFWEIGHT Y -1.000

ACTUAL WEIGHT OF THE STRUCTURE = 75.000 KN

LOADING 2 RIEMPIMENTO

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
2	-60.000 GY	0.00	2.00				

LOADING 3 LOADTYPE NONE TITLE SPINTA TERRENO SINISTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
1						60.000	30.000 GX

LOADING 4 LOADTYPE NONE TITLE SPINTA TERRENO DESTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
3						-30.000	-60.000 GX

LOADING 5 ACCIDENTALE

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
2	-30.000 GY	0.00	2.00				

LOADING 6 LOADTYPE NONE TITLE SPINTA ACCIDENTALE SINISTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
1	15.000 GX	0.00	3.00				

LOADING 7 LOADTYPE NONE TITLE SPINTA ACCIDENTALE DESTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
3	-15.000 GX	0.00	3.00				

LOADING 8 RITIRO SOLETTA * TEMPERATURA

TEMPERATURE LOAD IN MEMBERS/PLATES/SOLIDS

NUMBER	TEMPERATURES	
2	-30.00	0.00

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 1
PESO PROPRIO

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -75.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -75.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 75.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 75.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 1)

	MAXIMUMS	AT NODE
X =	3.32906E-05	4
Y =	-1.64845E-03	8
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	-2.11969E-05	5

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 2
RIEMPIMENTO

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 2)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -120.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -120.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 2)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 120.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 120.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 2)

	MAXIMUMS	AT NODE
X =	1.33162E-04	4
Y =	-2.72727E-03	3
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	1.90070E-04	3

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 3
LOADTYPE NONE TITLE SPINTA TERRENO SINISTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 3)
SUMMATION FORCE-X = 135.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 495.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 3)
SUMMATION FORCE-X = -135.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -495.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 3)

	MAXIMUMS	AT NODE
X =	2.36179E-01	2
Y =	-1.54635E-02	6
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	-6.35027E-04	1

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 4
LOADTYPE NONE TITLE SPINTA TERRENO DESTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 4)
SUMMATION FORCE-X = -135.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -495.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 4)
SUMMATION FORCE-X = 135.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 495.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 4)

	MAXIMUMS	AT NODE
X =	-2.37325E-01	3
Y =	-1.52950E-02	10
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	6.30532E-04	4

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 5
ACCIDENTALE

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 5)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -60.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -60.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 5)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 60.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 60.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 5)

	MAXIMUMS	AT NODE
X =	6.65811E-05	4
Y =	-1.36364E-03	3
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	9.50350E-05	3

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 6
LOADTYPE NONE TITLE SPINTA ACCIDENTALE SINISTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 6)
SUMMATION FORCE-X = 45.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 157.50

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 6)
SUMMATION FORCE-X = -45.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -157.50

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 6)

	MAXIMUMS	AT NODE
X =	8.99220E-02	2
Y =	-5.29960E-03	6
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	-2.22682E-04	1

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 7
LOADTYPE NONE TITLE SPINTA ACCIDENTALE DESTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 7)
SUMMATION FORCE-X = -45.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -157.50

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 7)
SUMMATION FORCE-X = 45.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 157.50

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 7)

	MAXIMUMS	AT NODE
X =	-9.02637E-02	3
Y =	-5.24342E-03	10
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	2.21184E-04	4

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 8
RITIRO SOLETTA * TEMPERATURA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 8)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 0.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 8)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 0.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 8)

	MAXIMUMS	AT NODE
X =	-3.00000E-02	3
Y =	-3.29577E-03	8
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	-6.59153E-05	1

LOAD COMBINATION NO. 10
LOAD COMBINATION 10

LOADING-	1.	2.	3.
FACTOR -	1.00	1.00	1.00

LOAD COMBINATION NO. 11
LOAD COMBINATION 11

LOADING-	1.	2.	4.
FACTOR -	1.00	1.00	1.00

LOAD COMBINATION NO. 12
LOAD COMBINATION 12

LOADING-	1.	2.	3.	4.
FACTOR -	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 13
LOAD COMBINATION 13

LOADING-	1.	2.	3.	5.	6.
FACTOR -	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 14
LOAD COMBINATION 14

LOADING-	1.	2.	4.	5.	7.
FACTOR -	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 15
LOAD COMBINATION 15

LOADING-	1.	2.	3.	4.	5.	6.	7.
FACTOR -	1.00	1.00	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 16
LOAD COMBINATION 16

LOADING-	1.	2.	3.	8.
FACTOR -	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 17
LOAD COMBINATION 17

LOADING-	1.	2.	4.	8.
FACTOR -	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 18
LOAD COMBINATION 18

LOADING-	1.	2.	3.	4.	8.
FACTOR -	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 19
LOAD COMBINATION 19

LOADING-	1.	2.	3.	5.	6.	8.
FACTOR -	1.00	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 20
LOAD COMBINATION 20

LOADING-	1.	2.	4.	5.	7.	8.
FACTOR -	1.00	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 21
LOAD COMBINATION 21

LOADING-	1.	2.	3.	4.	5.	6.	7.	8.
FACTOR -	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

********** END OF DATA FROM INTERNAL STORAGE **********

82. LOAD LIST 1 TO 8
83. PRINT SUPPORT REACTION

SUPPORT REACTIONS -UNIT KN METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	37.50	0.00	0.00	0.00	0.00
	2	0.00	60.00	0.00	0.00	0.00	0.00
	3	-135.00	-90.00	0.00	0.00	0.00	0.00
	4	135.00	90.00	0.00	0.00	0.00	0.00
	5	0.00	30.00	0.00	0.00	0.00	0.00
	6	-45.00	-33.75	0.00	0.00	0.00	0.00
	7	45.00	33.75	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00
4	1	0.00	37.50	0.00	0.00	0.00	0.00
	2	0.00	60.00	0.00	0.00	0.00	0.00
	3	0.00	90.00	0.00	0.00	0.00	0.00
	4	0.00	-90.00	0.00	0.00	0.00	0.00
	5	0.00	30.00	0.00	0.00	0.00	0.00
	6	0.00	33.75	0.00	0.00	0.00	0.00
	7	0.00	-33.75	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00

********** END OF LATEST ANALYSIS RESULT **********

84. LOAD LIST 10 TO 21
85. PRINT MAXFORCE ENVELOPE ALL

MEMBER FORCE ENVELOPE

ALL UNITS ARE KN METE

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST	LD	MZ/ MY	DIST	LD	FX	DIST	LD
1	MAX	133.58	0.00	19	92.09	0.00	19			
		0.00	0.00	10	0.00	0.00	10	163.41 C	0.00	14
	MIN	-89.70	3.00	15	-72.16	0.00	14			
		0.00	3.00	21	0.00	3.00	21	36.34 C	3.00	16
2	MAX	140.91	0.00	14	74.22	0.00	14			
		0.00	0.00	10	0.00	0.00	10	89.70 C	0.00	15
	MIN	-140.91	2.00	19	-31.01	0.50	19			
		0.00	2.00	21	0.00	2.00	21	33.00 C	2.00	16
3	MAX	89.70	0.00	15	91.79	3.00	20			
		0.00	0.00	10	0.00	0.00	10	163.41 C	3.00	13
	MIN	-133.38	3.00	20	-71.86	3.00	13			
		0.00	3.00	21	0.00	3.00	21	36.34 C	0.00	17
4	MAX	87.84	0.00	14	72.16	0.00	14			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-74.72	0.25	19	-92.09	0.00	19			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
5	MAX	85.97	0.00	14	50.43	0.00	14			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-76.59	0.25	19	-73.64	0.00	19			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
6	MAX	84.09	0.00	14	29.17	0.00	14			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-78.47	0.25	19	-54.73	0.00	19			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
7	MAX	82.22	0.00	14	8.38	0.00	14			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-80.34	0.25	19	-35.35	0.00	19			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
8	MAX	80.34	0.00	14	8.09	0.25	13			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-82.22	0.25	19	-35.05	0.25	20			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
9	MAX	78.47	0.00	14	28.88	0.25	13			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20

	MIN	-84.09	0.25	19	-54.43	0.25	20			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
10	MAX	76.59	0.00	14	50.13	0.25	13			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-85.97	0.25	19	-73.35	0.25	20			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13
11	MAX	74.72	0.00	14	71.86	0.25	13			
		0.00	0.00	10	0.00	0.00	10	133.38 C	0.00	20
	MIN	-87.84	0.25	19	-91.79	0.25	20			
		0.00	0.25	21	0.00	0.25	21	48.60 T	0.25	13

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

86. PRINT SUPPORT REACTION

SUPPORT REACTIONS -UNIT KN METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	10	-135.00	7.50	0.00	0.00	0.00	0.00
	11	135.00	187.50	0.00	0.00	0.00	0.00
	12	0.00	97.50	0.00	0.00	0.00	0.00
	13	-180.00	3.75	0.00	0.00	0.00	0.00
	14	180.00	251.25	0.00	0.00	0.00	0.00
	15	0.00	127.50	0.00	0.00	0.00	0.00
	16	-135.00	7.50	0.00	0.00	0.00	0.00
	17	135.00	187.50	0.00	0.00	0.00	0.00
	18	0.00	97.50	0.00	0.00	0.00	0.00
	19	-180.00	3.75	0.00	0.00	0.00	0.00
	20	180.00	251.25	0.00	0.00	0.00	0.00
	21	0.00	127.50	0.00	0.00	0.00	0.00
4	10	0.00	187.50	0.00	0.00	0.00	0.00
	11	0.00	7.50	0.00	0.00	0.00	0.00
	12	0.00	97.50	0.00	0.00	0.00	0.00
	13	0.00	251.25	0.00	0.00	0.00	0.00
	14	0.00	3.75	0.00	0.00	0.00	0.00
	15	0.00	127.50	0.00	0.00	0.00	0.00
	16	0.00	187.50	0.00	0.00	0.00	0.00
	17	0.00	7.50	0.00	0.00	0.00	0.00
	18	0.00	97.50	0.00	0.00	0.00	0.00
	19	0.00	251.25	0.00	0.00	0.00	0.00
	20	0.00	3.75	0.00	0.00	0.00	0.00
	21	0.00	127.50	0.00	0.00	0.00	0.00

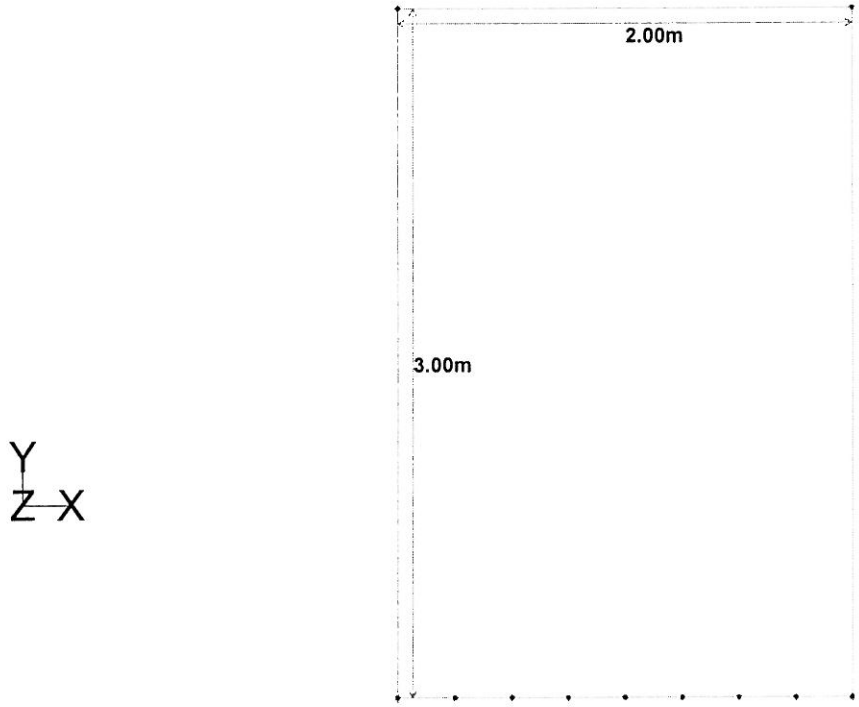
********** END OF LATEST ANALYSIS RESULT **********

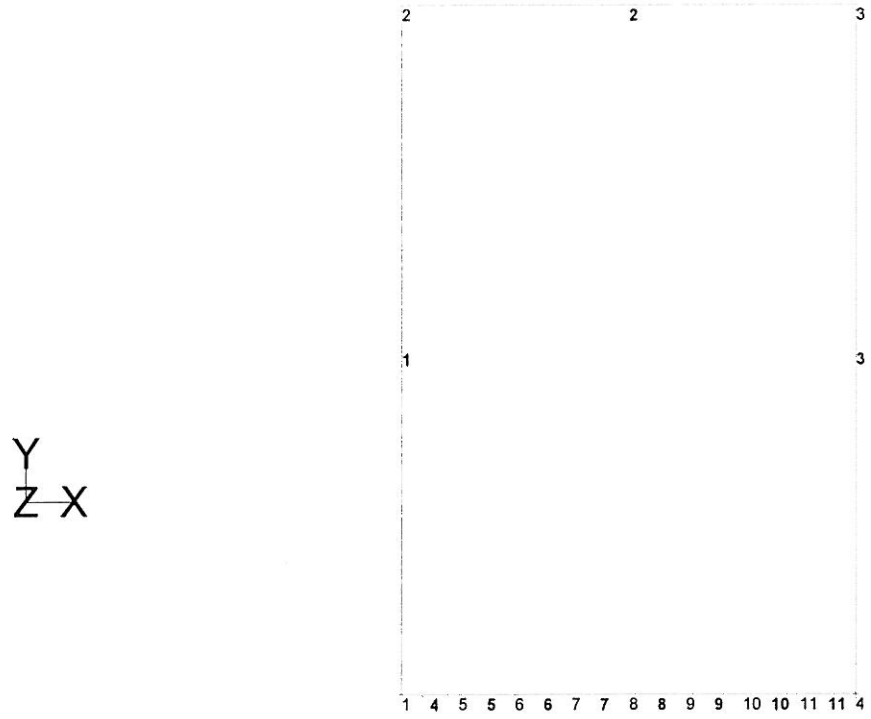
87. FINISH

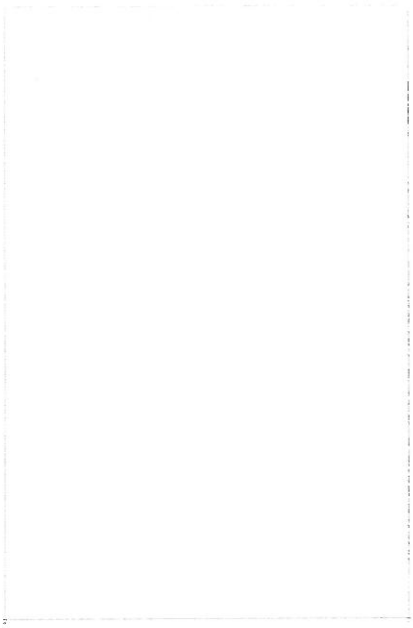
********** END OF THE STAAD.Pro RUN **********

**** DATE= MAY 12,2008 TIME= 14:12:29 ****

```
************************************************************
*         For questions on STAAD.Pro, please contact       *
*   Research Engineers Offices at the following locations  *
*                                                          *
*                Telephone              Email              *
*  USA:       +1 (714)974-2500       support@reiusa.com     *
*  CANADA     +1 (905)632-4771       detech@odandetech.com  *
*  CANADA     +1 (604)629 6087       staad@dowco.com        *
*  UK         +44(1454)207-000       support@reel.co.uk     *
*  FRANCE     +33(0)1 64551084       support@reel.co.uk     *
*  GERMANY    +49/931/40468-71       info@reig.de           *
*  NORWAY     +47 67 57 21 30        staad@edr.no           *
*  SINGAPORE +65 6225-6015/16        support@reiasia.net    *
*  INDIA      +91(033)2357-3575 support@calcutta.reiusa.com *
*  JAPAN      +81(03)5952-6500       eng-eye@crc.co.jp      *
*  CHINA      +86(411)363-1983       support@reiasia.net    *
*                                                          *
*  North America                    support@reiusa.com     *
*  Europe                           support@reel.co.uk     *
*  Asia                             support@reiasia.net    *
************************************************************
```


2.00m
3.00m
Y
Z
X
Load 1


2
2
3
1
3
1 4 5 5 6 6 7 7 8 8 9 9 10 10 11 11 4
Y
Z
X
Load 1



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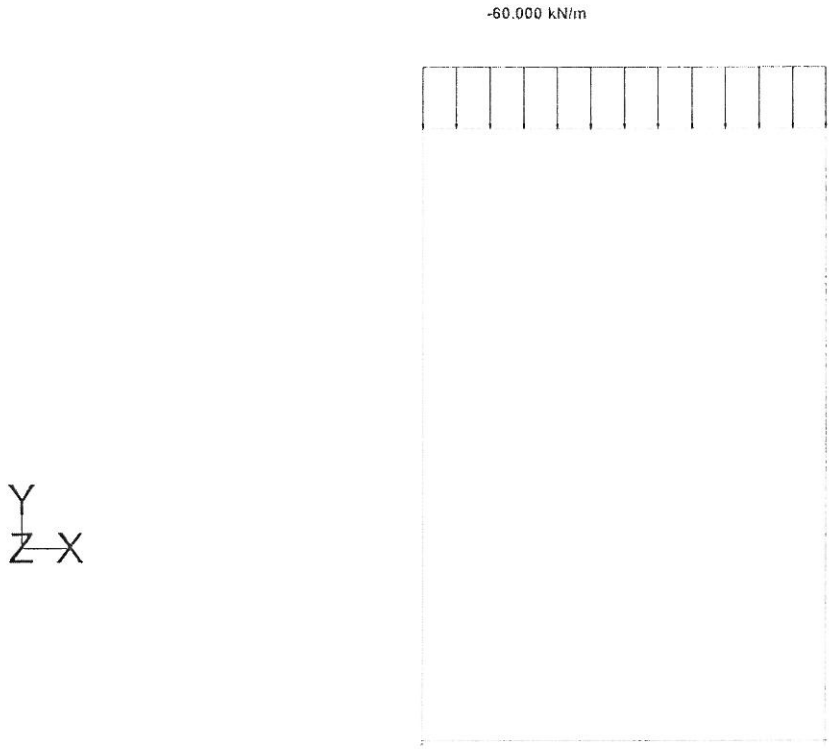
-60.000 kN/m
Y
Z
X
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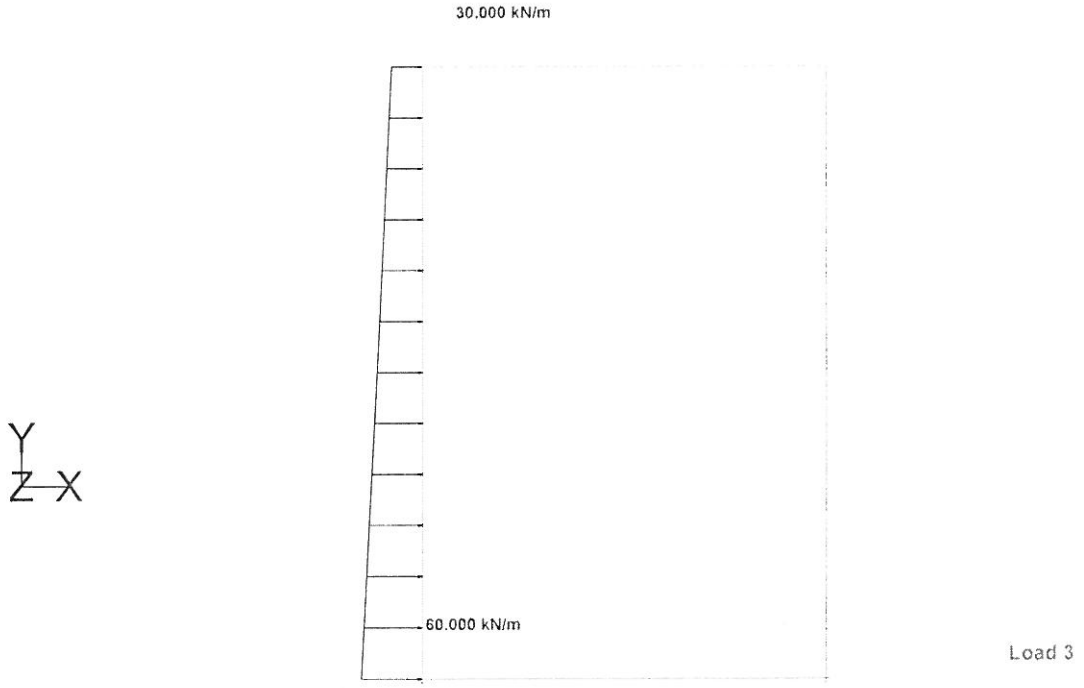
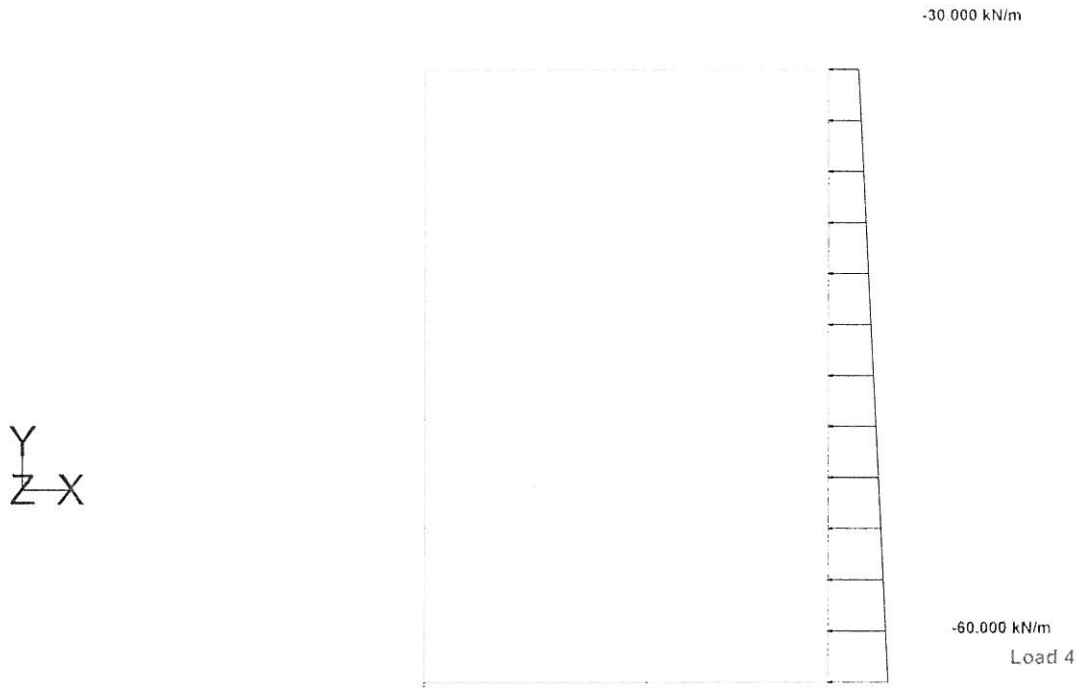
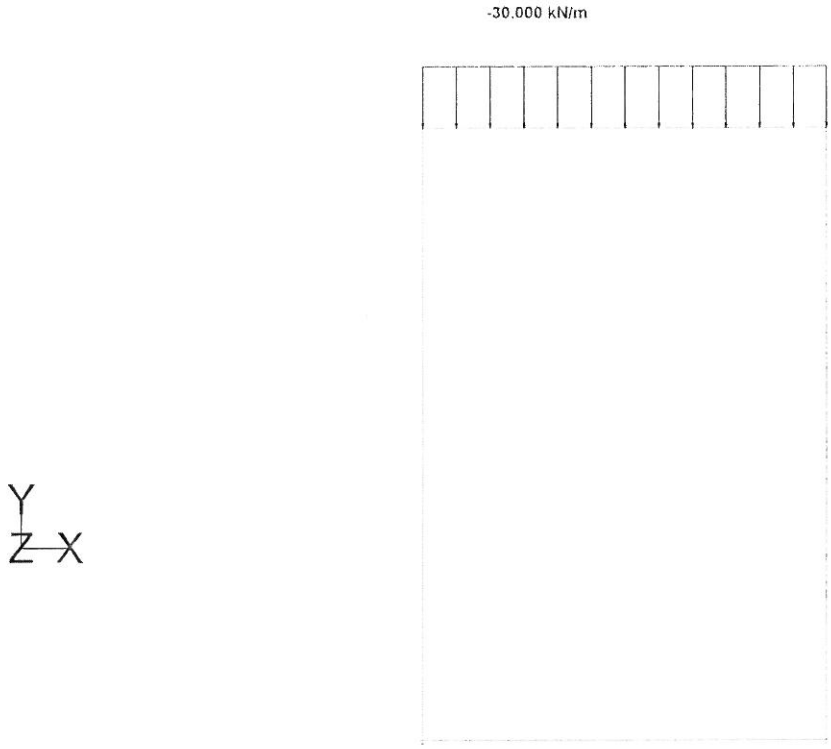
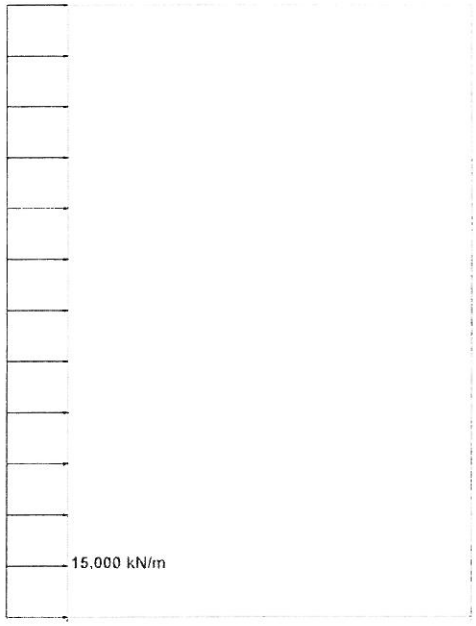

30.000 kN/m
60.000 kN/m
Y
Z
X
Load 3


-30.000 kN/m
Y
Z
X
-60.000 kN/m
Load 4


-30.000 kN/m
Y
Z
X
Load 5



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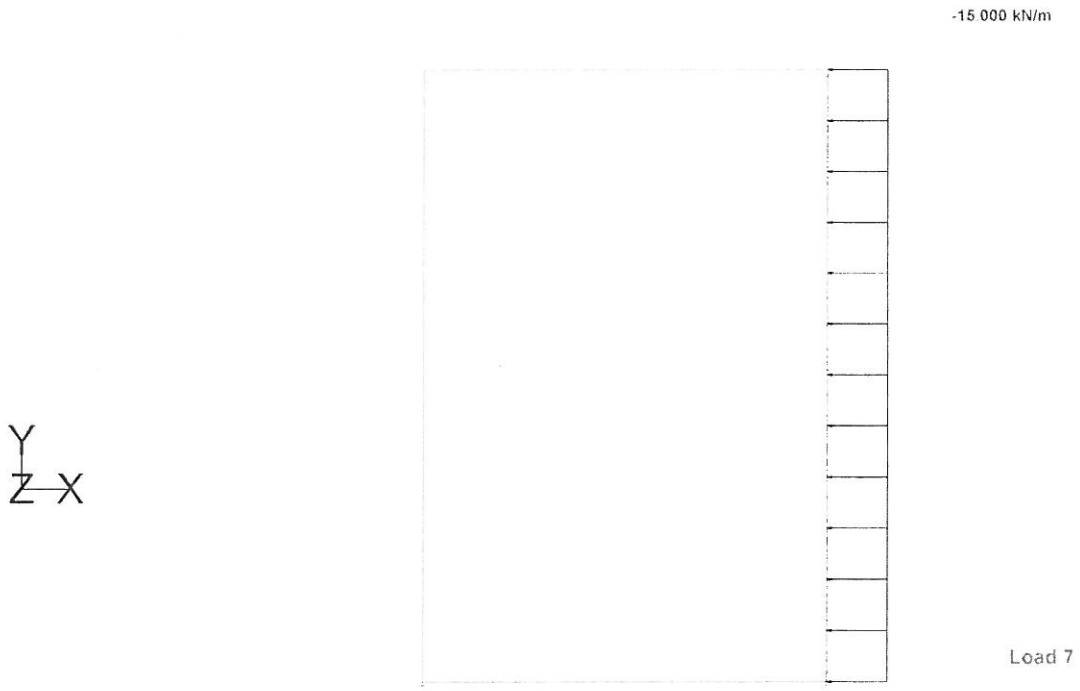
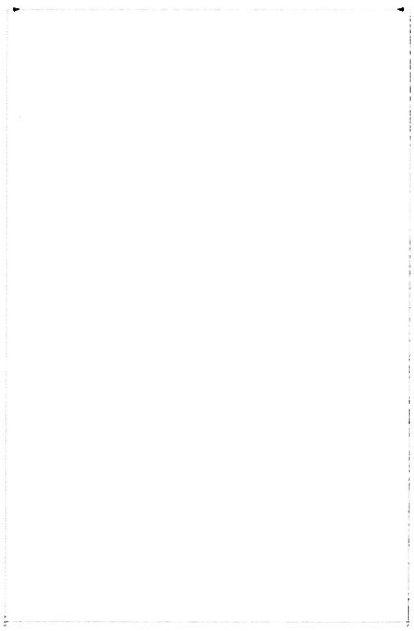

-15.000 kN/m
Y
Z
X
Load 7



Load 8

INDICE

Relazione statica del tombino al km 261 + 981

1. Caratteristiche dei materiali

1.1. Calcestruzzo

C30/37

1.2. Acciaio per armatura lenta

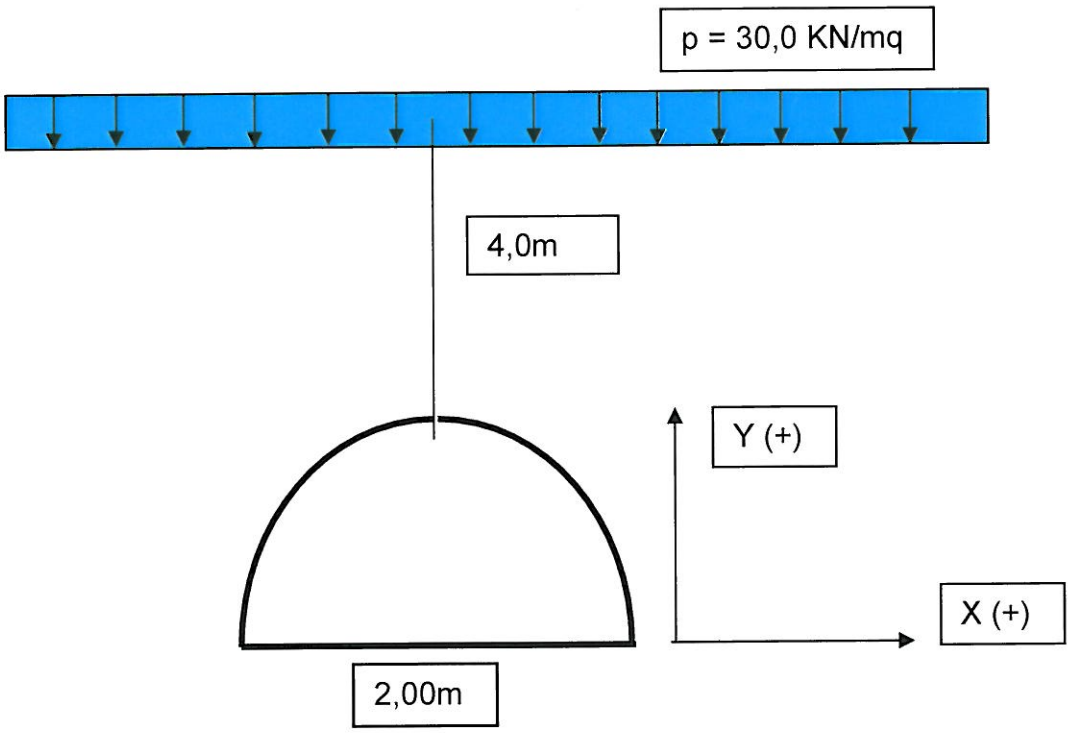
Tipo FeB44K ad aderenza migliorata, controllato in stabilimento

1.3. Acciaio in profilati tubolari per pali

Fe 510B

2. Sistema statico e carichi agenti

Il sistema statico é un telaio incastrato.



Le azioni interne sono state calcolate in automatico. Le ipotesi di carico sono le seguenti:

Carico 1: peso proprio struttura in cemento armato con γ cls = 25,0 KN/mc

Carico 2: Rilevato con materiale sciolto e γ terr = 20,0 KN/mc

Carico 3: Spinta terreno da sx con coeff. di spinta a riposo 0,50 e γ terr = 20,0 KN/mc

Carico 4: Spinta terreno da dx con coeff. di spinta a riposo 0,50 e γ terr = 20,0 KN/mc

Carico 5: Carico accidentale verticale con p = 30,0 KN/mq

Carico 6: Spinta laterale accidentali da sx con coeff. di spinta a riposo 0,50

Carico 7: Spinta laterale accidentali da dx con coeff. di spinta a riposo 0,50

Carico 8: Ritiro cls

I risultati sono riassunti nei tabulati allegati. Per il dimensionamento saranno considerate le combinazioni di carico piú gravose considerando anche la spinta del terreno unilaterale.

3. Dimensionamento struttura in c.a.

3.1. Verifica delle fondazioni, elevazioni e soletta

3.1.1. Azioni interne massime

Mmax =	+/- 20,00 KNm/m
Qmax =	80,00 KN/m
Nmin =	- 300,00 KN/m
Nmax =	+ 100,00 KN/m

3.1.2. Verifica a flessione

Mmax =	+/- 20,00 KNm/m
Qmax =	80,00 KN/m
Nmin =	- 300,00 KN/m
Nmax =	+ 100,00 KN/m

$kh = h*[b/Mz,e]^{0,5} = 25*[1,0/20,0]^{0,5} = 5,59$

$ks = 4,3$

$as = ks*Mz/h - N/\sigma amm = 4,3*20,0/25,0 = 3,44\ cm^2/m$

Scelto: d16/20 inferiore e superiore con as = 10,00 cm²/m

3.1.3. Verifica a taglio

$\tau = Q/(0,9*b*h) = 80000/(0,9*250*1000) = 0,36Mpa < 0,60Mpa$ (valore ammissibile)

```
*****************************************************
*                                                   *
*           STAAD.Pro                               *
*           Version  2005    Bld 1002.UK.1002       *
*           Proprietary Program of                  *
*           Research Engineers,  Intl.              *
*           Date=    MAY 13, 2008                   *
*           Time=    12:35: 6                       *
*                                                   *
*      USER ID: ITB                                 *
*****************************************************
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```
    1. STAAD SPACE SOTTOPASSO KM 261 + 981
INPUT FILE: sottopasso al km 261 + 981.STD
    2. START JOB INFORMATION
    3. ENGINEER DATE 13-MAY-08
    4. END JOB INFORMATION
    5. INPUT WIDTH 79
    6. UNIT METER KN
    7. JOINT COORDINATES
    8. 1 0 -5 0; 4 2 -5 0; 5 0.25 -5 0; 11 1.75 -5 0; 23 0.5 -5 0; 24 0.75 -5 0
    9. 25 1 -5 0; 26 1.25 -5 0; 27 1.5 -5 0; 37 1.77274 -4.29294 -1.66909E-018
   10. 38 1.69282 -4.1 -6.56264E-018; 39 1.56569 -3.93431 -1.43472E-017
   11. 40 1.4 -3.80718 -2.44921E-017; 41 1.20706 -3.72726 -3.63062E-017
   12. 42 1 -3.7 -4.89842E-017; 43 0.792945 -3.72726 -6.16623E-017
   13. 44 0.6 -3.80718 -7.34764E-017; 45 0.434315 -3.93431 -8.36213E-017
   14. 46 0.30718 -4.1 -9.14059E-017; 47 0.227259 -4.29294 -9.62994E-017
   15. 48 0.0568148 -4.82324 -2.40749E-017; 49 0.11363 -4.64647 -4.81497E-017
   16. 50 0.170445 -4.46971 -7.22246E-017; 51 1.82956 -4.46971 -1.25182E-018
   17. 52 1.88637 -4.64647 -8.34547E-019; 53 1.94319 -4.82324 -4.17274E-019
   18. MEMBER INCIDENCES
   19. 4 1 5; 11 11 4; 25 5 23; 26 23 24; 27 24 25; 28 25 26; 29 26 27; 30 27 11
   20. 40 37 38; 41 38 39; 42 39 40; 43 40 41; 44 41 42; 45 42 43; 46 43 44; 47 44 45
   21. 48 45 46; 49 46 47; 50 1 48; 51 37 51; 52 48 49; 53 49 50; 54 50 47; 55 51 52
   22. 56 52 53; 57 53 4
   23. DEFINE MATERIAL START
   24. ISOTROPIC CONCRETE
   25. E 2.2E+007
   26. POISSON 0.17
   27. DENSITY 25
   28. ALPHA 1E-005
   29. DAMP 0.05
   30. END DEFINE MATERIAL
   31. CONSTANTS
   32. MATERIAL CONCRETE MEMB 4 11 25 TO 30 40 TO 57
   33. *
   34. MEMBER PROPERTY AMERICAN
   35. 4 11 25 TO 30 40 TO 57 PRIS YD 0.3 ZD 1
   36. *
   37. SUPPORTS
   38. 1 FIXED BUT MY MZ
   39. 4 FIXED BUT FX MY MZ
   40. LOAD 1 PESO PROPRIO
```

```
41. SELFWEIGHT Y -1
42. LOAD 2 RIEMPIMENTO
43. MEMBER LOAD
44. 40 TO 57 UNI GY -80
45. LOAD 3 LOADTYPE NONE  TITLE SPINTA TERRENO SINISTRA
46. MEMBER LOAD
47. 45 TO 50 52 TO 54 TRAP GX 50 50
48. LOAD 4 LOADTYPE NONE  TITLE SPINTA TERRENO DESTRA
49. MEMBER LOAD
50. 40 TO 44 51 55 TO 57 TRAP GX -50 -50
51. LOAD 5 ACCIDENTALE
52. MEMBER LOAD
53. 40 TO 57 UNI GY -30
54. LOAD 6 LOADTYPE NONE  TITLE SPINTA ACCIDENTALE SINISTRA
55. MEMBER LOAD
56. 45 TO 50 52 TO 54 UNI GX 15
57. LOAD 7 LOADTYPE NONE  TITLE SPINTA ACCIDENTALE DESTRA
58. MEMBER LOAD
59. 40 TO 44 51 55 TO 57 UNI GX -15
60. LOAD 8 RITIRO SOLETTA * TEMPERATURA
61. *
62. LOAD COMBINATION 10
63. 1 1.0 2 1.0 3 1.0
64. LOAD COMBINATION 11
65. 1 1.0 2 1.0 4 1.0
66. LOAD COMBINATION 12
67. 1 1.0 2 1.0 3 1.0 4 1.0
68. *
69. LOAD COMBINATION 13
70. 1 1.0 2 1.0 3 1.0 5 1.0 6 1.0
71. LOAD COMBINATION 14
72. 1 1.0 2 1.0 4 1.0 5 1.0 7 1.0
73. LOAD COMBINATION 15
74. 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0 7 1.0
75. *
76. LOAD COMBINATION 16
77. 1 1.0 2 1.0 3 1.0 8 1.0
78. LOAD COMBINATION 17
79. 1 1.0 2 1.0 4 1.0 8 1.0
80. LOAD COMBINATION 18
81. 1 1.0 2 1.0 3 1.0 4 1.0 8 1.0
82. *
83. LOAD COMBINATION 19
84. 1 1.0 2 1.0 3 1.0 5 1.0 6 1.0 8 1.0
85. LOAD COMBINATION 20
86. 1 1.0 2 1.0 4 1.0 5 1.0 7 1.0 8 1.0
87. LOAD COMBINATION 21
88. 1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 6 1.0 7 1.0 8 1.0
89. *
90. PERFORM ANALYSIS PRINT BOTH
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 26/ 26/ 2
ORIGINAL/FINAL BAND-WIDTH= 24/ 2/ 18 DOF
TOTAL PRIMARY LOAD CASES = 8, TOTAL DEGREES OF FREEDOM = 149
SIZE OF STIFFNESS MATRIX = 3 DOUBLE KILO-WORDS
REQRD/AVAIL. DISK SPACE = 12.1/ 10622.4 MB

LOADING 1 PESO PROPRIO

SELFWEIGHT Y -1.000

ACTUAL WEIGHT OF THE STRUCTURE = 41.803 KN

LOADING 2 RIEMPIMENTO

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
40	-80.000 GY	0.00	0.21				
41	-80.000 GY	0.00	0.21				
42	-80.000 GY	0.00	0.21				
43	-80.000 GY	0.00	0.21				
44	-80.000 GY	0.00	0.21				
45	-80.000 GY	0.00	0.21				
46	-80.000 GY	0.00	0.21				
47	-80.000 GY	0.00	0.21				
48	-80.000 GY	0.00	0.21				
49	-80.000 GY	0.00	0.21				
50	-80.000 GY	0.00	0.19				
51	-80.000 GY	0.00	0.19				
52	-80.000 GY	0.00	0.19				
53	-80.000 GY	0.00	0.19				
54	-80.000 GY	0.00	0.19				
55	-80.000 GY	0.00	0.19				
56	-80.000 GY	0.00	0.19				
57	-80.000 GY	0.00	0.19				

LOADING 3 LOADTYPE NONE TITLE SPINTA TERRENO SINISTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
45	50.000 GX	0.00	0.21				
46	50.000 GX	0.00	0.21				
47	50.000 GX	0.00	0.21				
48	50.000 GX	0.00	0.21				
49	50.000 GX	0.00	0.21				
50	50.000 GX	0.00	0.19				
52	50.000 GX	0.00	0.19				
53	50.000 GX	0.00	0.19				
54	50.000 GX	0.00	0.19				

LOADING 4 LOADTYPE NONE TITLE SPINTA TERRENO DESTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
40	-50.000 GX	0.00	0.21				
41	-50.000 GX	0.00	0.21				
42	-50.000 GX	0.00	0.21				
43	-50.000 GX	0.00	0.21				
44	-50.000 GX	0.00	0.21				
51	-50.000 GX	0.00	0.19				
55	-50.000 GX	0.00	0.19				
56	-50.000 GX	0.00	0.19				
57	-50.000 GX	0.00	0.19				

LOADING 5 ACCIDENTALE

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
40	-30.000 GY	0.00	0.21				
41	-30.000 GY	0.00	0.21				
42	-30.000 GY	0.00	0.21				
43	-30.000 GY	0.00	0.21				
44	-30.000 GY	0.00	0.21				
45	-30.000 GY	0.00	0.21				
46	-30.000 GY	0.00	0.21				
47	-30.000 GY	0.00	0.21				
48	-30.000 GY	0.00	0.21				
49	-30.000 GY	0.00	0.21				
50	-30.000 GY	0.00	0.19				
51	-30.000 GY	0.00	0.19				
52	-30.000 GY	0.00	0.19				
53	-30.000 GY	0.00	0.19				
54	-30.000 GY	0.00	0.19				
55	-30.000 GY	0.00	0.19				
56	-30.000 GY	0.00	0.19				
57	-30.000 GY	0.00	0.19				

LOADING 6 LOADTYPE NONE TITLE SPINTA ACCIDENTALE SINISTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
45	15.000 GX	0.00	0.21				
46	15.000 GX	0.00	0.21				
47	15.000 GX	0.00	0.21				
48	15.000 GX	0.00	0.21				
49	15.000 GX	0.00	0.21				
50	15.000 GX	0.00	0.19				
52	15.000 GX	0.00	0.19				
53	15.000 GX	0.00	0.19				
54	15.000 GX	0.00	0.19				

LOADING 7 LOADTYPE NONE TITLE SPINTA ACCIDENTALE DESTRA

MEMBER LOAD - UNIT KN METE

MEMBER	UDL	L1	L2	CON	L	LIN1	LIN2
40	-15.000 GX	0.00	0.21				
41	-15.000 GX	0.00	0.21				
42	-15.000 GX	0.00	0.21				
43	-15.000 GX	0.00	0.21				
44	-15.000 GX	0.00	0.21				
51	-15.000 GX	0.00	0.19				
55	-15.000 GX	0.00	0.19				
56	-15.000 GX	0.00	0.19				
57	-15.000 GX	0.00	0.19				

LOADING 8 RITIRO SOLETTA * TEMPERATURA

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 1
PESO PROPRIO

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -41.80
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -41.80

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 1)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 41.80
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 41.80

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 1)

	MAXIMUMS	AT NODE
X =	3.30968E-04	50
Y =	-1.58094E-03	25
Z =	1.09016E-19	45
RX=	1.65465E-21	38
RY=	1.72300E-21	38
RZ=	-2.01842E-05	5

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 2
RIEMPIMENTO

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 2)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -285.90
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -285.90

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 2)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 285.90
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 285.90

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 2)

	MAXIMUMS	AT NODE
X =	1.13681E-03	4
Y =	-3.45316E-03	42
Z =	-3.38319E-19	47
RX=	-3.81902E-21	38
RY=	-5.94296E-21	38
RZ=	2.24747E-05	40

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 3
LOADTYPE NONE TITLE SPINTA TERRENO SINISTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 3)
SUMMATION FORCE-X = 89.34
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 376.84

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 3)
SUMMATION FORCE-X = -89.34
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -376.84

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 3)

	MAXIMUMS	AT NODE
X =	1.19645E-02	45
Y =	-3.43051E-03	45
Z =	-3.30169E-19	50
RX=	-1.55671E-20	49
RY=	-3.75967E-21	47
RZ=	-1.47861E-04	49

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 4
LOADTYPE NONE TITLE SPINTA TERRENO DESTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 4)
SUMMATION FORCE-X = -89.34
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -376.84

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 4)
SUMMATION FORCE-X = 89.34
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 376.84

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 4)

	MAXIMUMS	AT NODE
X =	-1.25931E-02	38
Y =	3.66977E-03	44
Z =	2.25022E-19	47
RX=	7.23994E-21	50
RY=	5.38187E-21	38
RZ=	1.36256E-04	52

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 5
ACCIDENTALE

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 5)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = -107.21
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -107.21

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 5)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 107.21
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 107.21

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 5)

	MAXIMUMS	AT NODE
X =	4.26302E-04	4
Y =	-1.29494E-03	42
Z =	-7.34510E-20	47
RX=	-1.43213E-21	38
RY=	-2.22861E-21	38
RZ=	8.42803E-06	40

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 6
LOADTYPE NONE TITLE SPINTA ACCIDENTALE SINISTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 6)
SUMMATION FORCE-X = 26.80
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 113.05

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 6)
SUMMATION FORCE-X = -26.80
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -113.05

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 6)

	MAXIMUMS	AT NODE
X =	3.58934E-03	45
Y =	-1.02915E-03	45
Z =	-1.00130E-19	50
RX=	-3.12131E-21	50
RY=	-1.12790E-21	47
RZ=	-4.43583E-05	49

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 7
LOADTYPE NONE TITLE SPINTA ACCIDENTALE DESTRA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 7)
SUMMATION FORCE-X = -26.80
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= -113.05

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 7)
SUMMATION FORCE-X = 26.80
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 113.05

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 7)

	MAXIMUMS	AT NODE
X =	-3.77794E-03	38
Y =	1.10093E-03	44
Z =	-2.86401E-20	38
RX=	2.02741E-21	38
RY=	1.61456E-21	38
RZ=	4.08767E-05	52

STATIC LOAD/REACTION/EQUILIBRIUM SUMMARY FOR CASE NO. 8
RITIRO SOLETTA * TEMPERATURA

***TOTAL APPLIED LOAD (KN METE) SUMMARY (LOADING 8)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 0.00

***TOTAL REACTION LOAD(KN METE) SUMMARY (LOADING 8)
SUMMATION FORCE-X = 0.00
SUMMATION FORCE-Y = 0.00
SUMMATION FORCE-Z = 0.00

SUMMATION OF MOMENTS AROUND THE ORIGIN-
MX= 0.00 MY= 0.00 MZ= 0.00

MAXIMUM DISPLACEMENTS (CM /RADIANS) (LOADING 8)

	MAXIMUMS	AT NODE
X =	0.00000E+00	0
Y =	0.00000E+00	0
Z =	0.00000E+00	0
RX=	0.00000E+00	0
RY=	0.00000E+00	0
RZ=	0.00000E+00	0

LOAD COMBINATION NO. 10
LOAD COMBINATION 10

LOADING-	1.	2.	3.
FACTOR -	1.00	1.00	1.00

LOAD COMBINATION NO. 11
LOAD COMBINATION 11

LOADING-	1.	2.	4.
FACTOR -	1.00	1.00	1.00

LOAD COMBINATION NO. 12
LOAD COMBINATION 12

LOADING-	1.	2.	3.	4.
FACTOR -	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 13
LOAD COMBINATION 13

LOADING-	1.	2.	3.	5.	6.
FACTOR -	1.00	1.00	1.00	1.00	1.00

LOAD COMBINATION NO. 14
LOAD COMBINATION 14

```
LOADING-     1.     2.     4.     5.     7.
FACTOR -   1.00   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    15
  LOAD COMBINATION 15

LOADING-     1.     2.     3.     4.     5.     6.     7.
FACTOR -   1.00   1.00   1.00   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    16
  LOAD COMBINATION 16

LOADING-     1.     2.     3.     8.
FACTOR -   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    17
  LOAD COMBINATION 17

LOADING-     1.     2.     4.     8.
FACTOR -   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    18
  LOAD COMBINATION 18

LOADING-     1.     2.     3.     4.     8.
FACTOR -   1.00   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    19
  LOAD COMBINATION 19

LOADING-     1.     2.     3.     5.     6.     8.
FACTOR -   1.00   1.00   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    20
  LOAD COMBINATION 20

LOADING-     1.     2.     4.     5.     7.     8.
FACTOR -   1.00   1.00   1.00   1.00   1.00   1.00

  LOAD COMBINATION NO.    21
  LOAD COMBINATION 21

LOADING-     1.     2.     3.     4.     5.     6.     7.     8.
FACTOR -   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00


  ************ END OF DATA FROM INTERNAL STORAGE ************


   91. LOAD LIST 1 TO 8
   92. PRINT SUPPORT REA
```

SUPPORT REACTIONS -UNIT KN METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	20.90	0.00	0.00	0.00	0.00
	2	0.00	142.95	0.00	0.00	0.00	0.00
	3	-89.34	-34.94	0.00	0.00	0.00	0.00
	4	89.34	34.94	0.00	0.00	0.00	0.00
	5	0.00	53.61	0.00	0.00	0.00	0.00
	6	-26.80	-10.48	0.00	0.00	0.00	0.00
	7	26.80	10.48	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00
4	1	0.00	20.90	0.00	0.00	0.00	0.00
	2	0.00	142.95	0.00	0.00	0.00	0.00
	3	0.00	34.94	0.00	0.00	0.00	0.00
	4	0.00	-34.94	0.00	0.00	0.00	0.00
	5	0.00	53.61	0.00	0.00	0.00	0.00
	6	0.00	10.48	0.00	0.00	0.00	0.00
	7	0.00	-10.48	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00

********** END OF LATEST ANALYSIS RESULT **********

93. LOAD LIST 10 TO 21
94. PRINT MAXFORCE ENVELOPE ALL

MEMBER FORCE ENVELOPE

ALL UNITS ARE KN METE

MAX AND MIN FORCE VALUES AMONGST ALL SECTION LOCATIONS

MEMB		FY/ FZ	DIST DIST	LD LD	MZ/ MY	DIST DIST	LD LD	FX	DIST	LD
4	MAX	22.51	0.00	14	14.67	0.00	14			
		0.00	0.00	13	0.00	0.00	14	21.22 C	0.00	14
	MIN	-9.38	0.25	19	-15.95	0.00	19			
		0.00	0.25	20	0.00	0.00	19	93.73 T	0.25	19
11	MAX	9.38	0.00	14	14.07	0.25	13			
		0.00	0.00	13	0.00	0.00	14	21.22 C	0.00	14
	MIN	-22.51	0.25	19	-15.35	0.25	20			
		0.00	0.25	20	0.00	0.25	16	93.73 T	0.25	19
25	MAX	20.63	0.00	14	9.28	0.00	14			
		0.00	0.00	13	0.00	0.00	14	21.22 C	0.00	14
	MIN	-11.26	0.25	19	-13.84	0.00	19			
		0.00	0.25	20	0.00	0.00	19	93.73 T	0.25	19
26	MAX	18.76	0.00	14	4.35	0.00	14			
		0.00	0.00	13	0.00	0.00	14	21.22 C	0.00	14
	MIN	-13.13	0.25	19	-11.26	0.00	19			
		0.00	0.25	20	0.00	0.00	19	93.73 T	0.25	19
27	MAX	16.88	0.00	14	-0.10	0.00	14			
		0.00	0.00	13	0.00	0.00	14	21.22 C	0.00	14
	MIN	-15.01	0.25	19	-8.21	0.00	19			
		0.00	0.25	20	0.00	0.00	19	93.73 T	0.25	19
28	MAX	15.01	0.00	14	-0.71	0.25	13			
		0.00	0.00	10	0.00	0.00	14	21.22 C	0.00	14
	MIN	-16.88	0.25	19	-7.61	0.25	20			
		0.00	0.25	21	0.00	0.25	19	93.73 T	0.25	19
29	MAX	13.13	0.00	14	3.75	0.25	13			
		0.00	0.00	10	0.00	0.00	14	21.22 C	0.00	14
	MIN	-18.76	0.25	19	-10.66	0.25	20			
		0.00	0.25	18	0.00	0.25	19	93.73 T	0.25	19
30	MAX	11.26	0.00	14	8.67	0.25	13			
		0.00	0.00	10	0.00	0.00	14	21.22 C	0.00	14
	MIN	-20.63	0.25	19	-13.24	0.25	20			
		0.00	0.25	18	0.00	0.25	19	93.73 T	0.25	19
40	MAX	10.32	0.00	14	14.32	0.21	13			
		0.00	0.00	13	0.00	0.21	13	177.32 C	0.00	13

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	MIN	-37.39	0.21	19	-13.98	0.10	20			
		0.00	0.21	20	0.00	0.21	20	57.51 C	0.21	17
41	MAX	9.00	0.00	14	15.07	0.21	13			
		0.00	0.00	13	0.00	0.00	14	159.06 C	0.00	13
	MIN	-27.47	0.21	21	-13.67	0.07	20			
		0.00	0.21	17	0.00	0.00	19	49.73 C	0.21	17
42	MAX	25.48	0.00	13	15.07	0.00	13			
		0.00	0.00	13	0.00	0.00	14	137.69 C	0.00	13
	MIN	-26.45	0.21	20	-12.54	0.02	20			
		0.00	0.21	17	0.00	0.00	19	48.61 C	0.21	17
43	MAX	37.57	0.00	13	11.78	0.00	13			
		0.00	0.00	13	0.00	0.00	14	118.64 C	0.21	15
	MIN	-36.56	0.21	20	-9.91	0.00	20			
		0.00	0.21	20	0.00	0.00	19	52.32 C	0.00	17
44	MAX	42.25	0.00	13	6.30	0.00	13			
		0.00	0.00	13	0.00	0.00	11	130.70 C	0.21	15
	MIN	-42.54	0.21	20	-5.19	0.00	20			
		0.00	0.21	20	0.00	0.00	19	60.43 C	0.00	17
45	MAX	42.39	0.00	13	7.22	0.21	14			
		0.00	0.00	11	0.00	0.00	10	130.70 C	0.00	15
	MIN	-42.09	0.21	20	-6.11	0.21	19			
		0.00	0.21	16	0.00	0.21	21	59.51 C	0.21	16
46	MAX	36.10	0.00	13	12.61	0.21	14			
		0.00	0.00	11	0.00	0.00	10	118.64 C	0.00	15
	MIN	-37.11	0.21	20	-10.74	0.21	19			
		0.00	0.21	21	0.00	0.21	21	51.47 C	0.21	16
47	MAX	25.72	0.00	13	15.74	0.21	14			
		0.00	0.00	10	0.00	0.00	11	138.64 C	0.21	14
	MIN	-24.75	0.21	20	-13.23	0.19	19			
		0.00	0.21	21	0.00	0.21	19	47.88 C	0.00	16
48	MAX	27.46	0.00	15	15.74	0.00	14			
		0.00	0.00	10	0.00	0.00	14	159.79 C	0.21	14
	MIN	-9.96	0.21	19	-14.22	0.12	19			
		0.00	0.21	21	0.00	0.21	19	49.17 C	0.00	16
49	MAX	38.50	0.00	14	14.80	0.00	14			
		0.00	0.00	11	0.00	0.00	14	177.78 C	0.21	14
	MIN	-11.43	0.21	19	-14.35	0.10	19			
		0.00	0.21	21	0.00	0.21	19	57.16 C	0.00	16
50	MAX	76.29	0.00	13	15.95	0.00	13			
		0.00	0.00	14	0.00	0.00	13	257.89 C	0.00	14
	MIN	-23.49	0.19	20	-14.67	0.00	20			
		0.00	0.19	16	0.00	0.00	20	108.38 C	0.19	16
51	MAX	42.38	0.00	13	7.49	0.00	13			
		0.00	0.00	15	0.00	0.19	13	195.21 C	0.19	13

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	MIN	-20.65	0.19	20	-13.48	0.00	20			
		0.00	0.19	16	0.00	0.00	20	70.79 C	0.00	17
52	MAX	58.12	0.00	13	3.47	0.00	13			
		0.00	0.00	14	0.00	0.00	10	237.12 C	0.00	14
	MIN	-30.17	0.19	20	-10.93	0.00	20			
		0.00	0.19	19	0.00	0.19	21	95.76 C	0.19	16
53	MAX	39.96	0.00	13	0.28	0.19	14			
		0.00	0.00	14	0.00	0.19	14	216.35 C	0.00	14
	MIN	-36.85	0.19	20	-11.37	0.19	19			
		0.00	0.19	19	0.00	0.19	19	83.13 C	0.19	16
54	MAX	21.79	0.00	13	7.74	0.19	14			
		0.00	0.00	14	0.00	0.00	13	195.58 C	0.00	14
	MIN	-43.53	0.19	20	-13.72	0.19	19			
		0.00	0.19	19	0.00	0.00	20	70.51 C	0.19	16
55	MAX	35.71	0.00	13	0.24	0.00	13			
		0.00	0.00	13	0.00	0.19	13	215.98 C	0.19	13
	MIN	-38.81	0.19	20	-11.33	0.00	20			
		0.00	0.19	20	0.00	0.19	20	83.42 C	0.00	17
56	MAX	29.02	0.00	13	3.08	0.19	14			
		0.00	0.00	13	0.00	0.19	13	236.75 C	0.19	13
	MIN	-56.98	0.19	20	-10.53	0.19	19			
		0.00	0.19	17	0.00	0.00	19	96.04 C	0.00	17
57	MAX	22.36	0.00	13	15.35	0.19	14			
		0.00	0.00	10	0.00	0.19	10	257.52 C	0.19	13
	MIN	-75.14	0.19	20	-14.07	0.19	19			
		0.00	0.19	17	0.00	0.00	19	108.67 C	0.00	17

********** END OF FORCE ENVELOPE FROM INTERNAL STORAGE **********

95. PRINT SUPPORT REA

SUPPORT REACTIONS -UNIT KN METE STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	10	-89.34	128.91	0.00	0.00	0.00	0.00
	11	89.34	198.79	0.00	0.00	0.00	0.00
	12	0.00	163.85	0.00	0.00	0.00	0.00
	13	-116.15	172.04	0.00	0.00	0.00	0.00
	14	116.15	262.88	0.00	0.00	0.00	0.00
	15	0.00	217.46	0.00	0.00	0.00	0.00
	16	-89.34	128.91	0.00	0.00	0.00	0.00
	17	89.34	198.79	0.00	0.00	0.00	0.00
	18	0.00	163.85	0.00	0.00	0.00	0.00
	19	-116.15	172.04	0.00	0.00	0.00	0.00
	20	116.15	262.88	0.00	0.00	0.00	0.00
	21	0.00	217.46	0.00	0.00	0.00	0.00
4	10	0.00	198.79	0.00	0.00	0.00	0.00
	11	0.00	128.91	0.00	0.00	0.00	0.00
	12	0.00	163.85	0.00	0.00	0.00	0.00
	13	0.00	262.88	0.00	0.00	0.00	0.00
	14	0.00	172.04	0.00	0.00	0.00	0.00
	15	0.00	217.46	0.00	0.00	0.00	0.00
	16	0.00	198.79	0.00	0.00	0.00	0.00
	17	0.00	128.91	0.00	0.00	0.00	0.00
	18	0.00	163.85	0.00	0.00	0.00	0.00
	19	0.00	262.88	0.00	0.00	0.00	0.00
	20	0.00	172.04	0.00	0.00	0.00	0.00
	21	0.00	217.46	0.00	0.00	0.00	0.00

********** END OF LATEST ANALYSIS RESULT **********

96. FINISH

********** END OF THE STAAD.Pro RUN **********

**** DATE= MAY 13,2008 TIME= 12:35: 7 ****

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************************************************************
*         For questions on STAAD.Pro, please contact       *
*   Research Engineers Offices at the following locations  *
*                                                          *
*                Telephone                Email            *
*  USA:       +1 (714)974-2500       support@reiusa.com     *
*  CANADA     +1 (905)632-4771       detech@odandetech.com  *
*  CANADA     +1 (604)629 6087       staad@dowco.com        *
*  UK         +44(1454)207-000       support@reel.co.uk     *
*  FRANCE     +33(0)1 64551084       support@reel.co.uk     *
*  GERMANY    +49/931/40468-71       info@reig.de           *
*  NORWAY     +47 67 57 21 30        staad@edr.no           *
*  SINGAPORE +65 6225-6015/16        support@reiasia.net    *
*  INDIA      +91(033)2357-3575 support@calcutta.reiusa.com *
*  JAPAN      +81(03)5952-6500       eng-eye@crc.co.jp      *
*  CHINA      +86(411)363-1983       support@reiasia.net    *
*                                                          *
*  North America                   support@reiusa.com      *
*  Europe                          support@reel.co.uk      *
*  Asia                            support@reiasia.net     *
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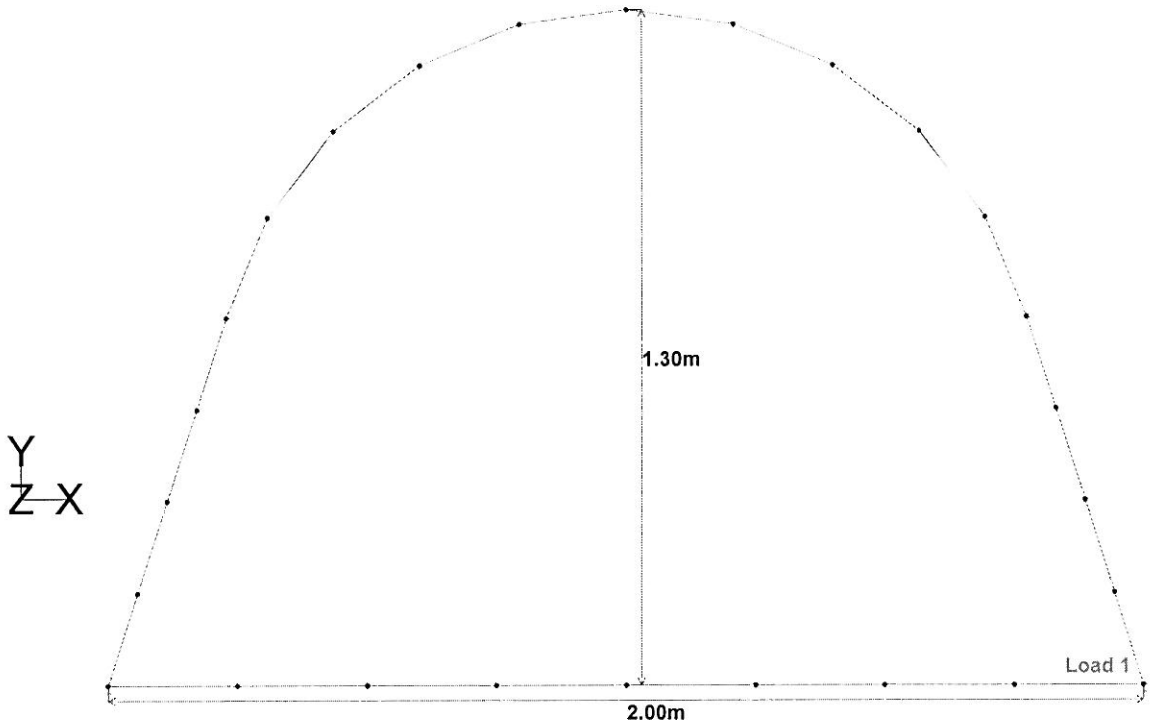
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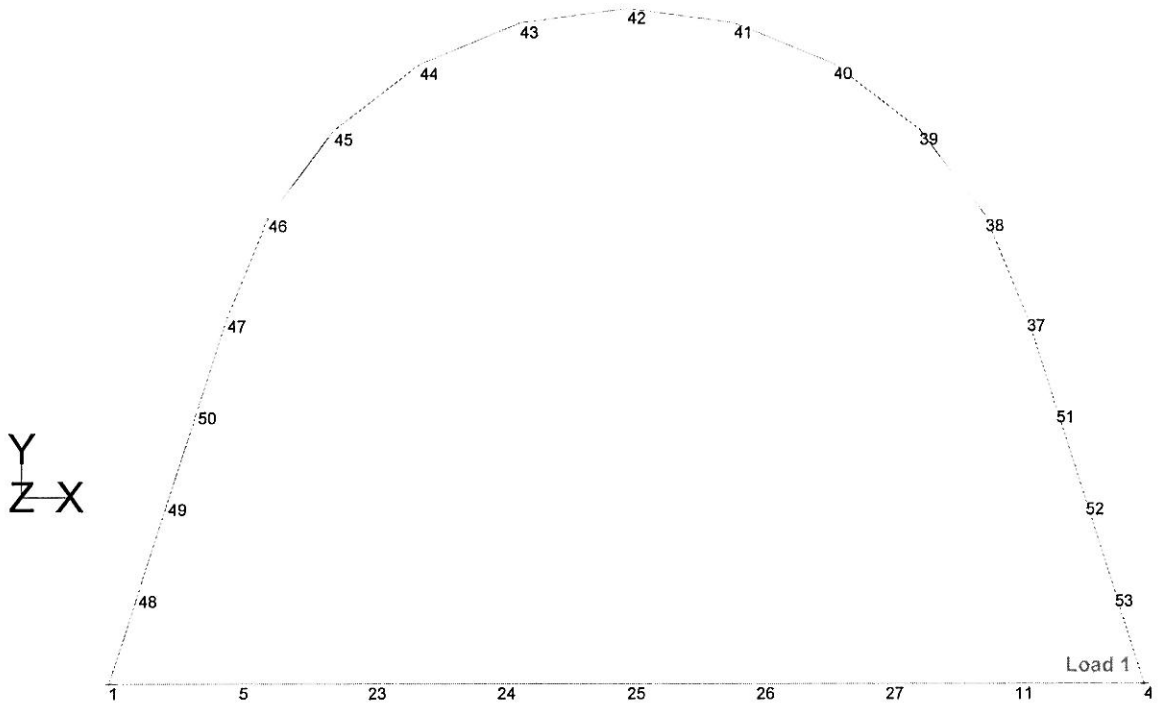
X
Load 1
2.00m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25
26
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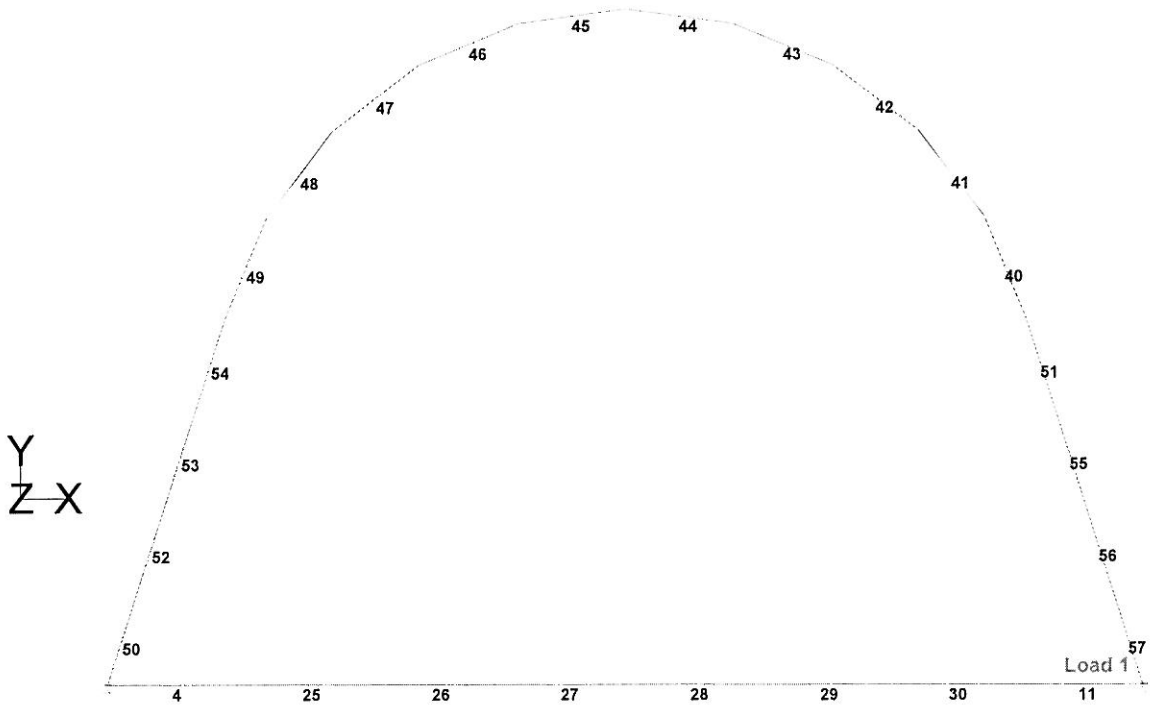
11
4
Y
Z
X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Load 1
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27
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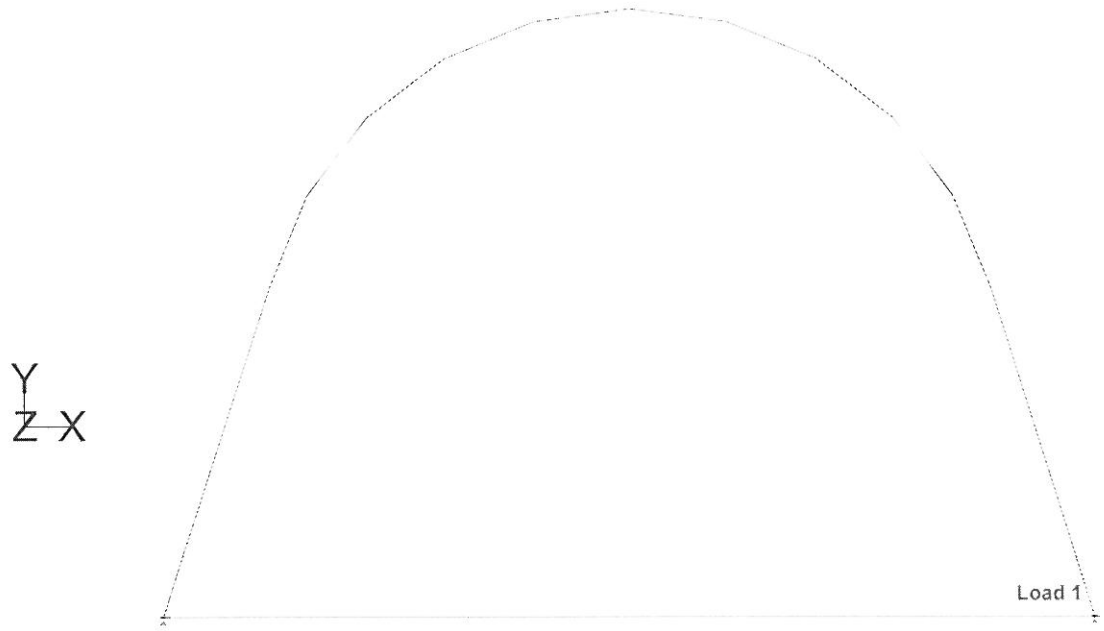
29
30
11
Y
Z
X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Z X
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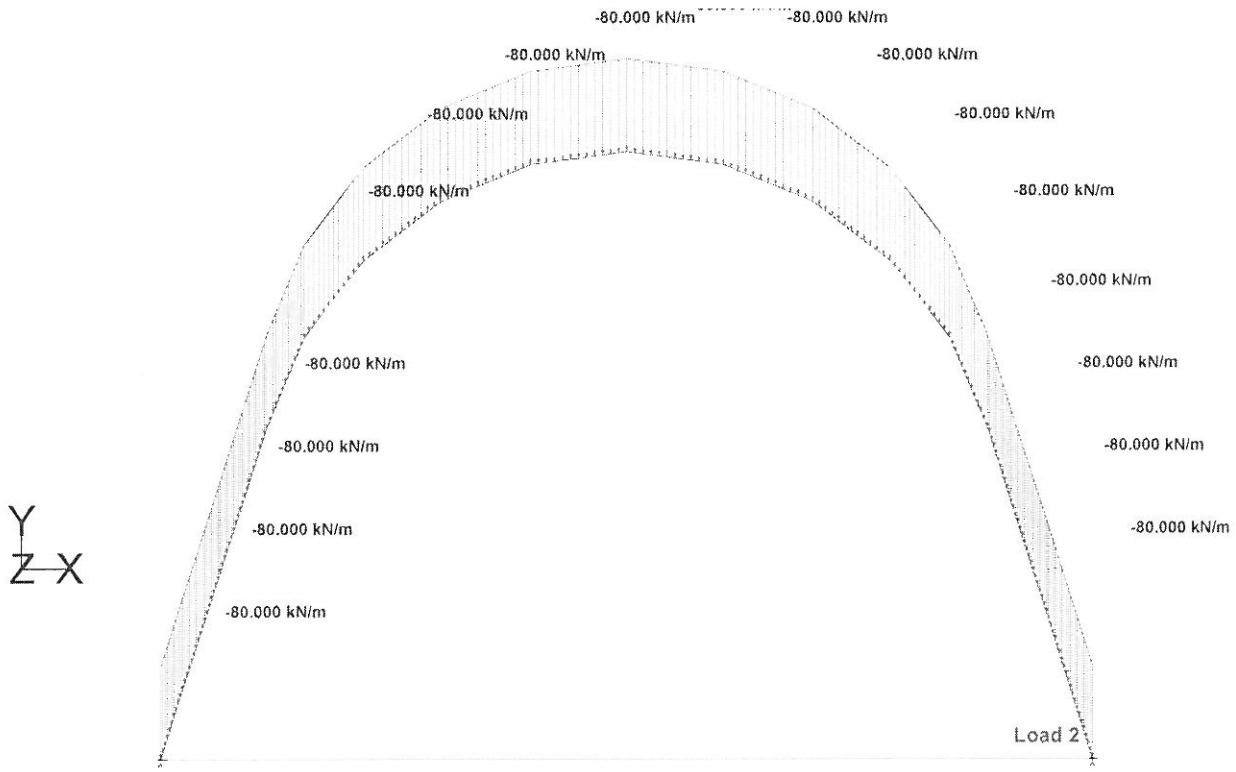
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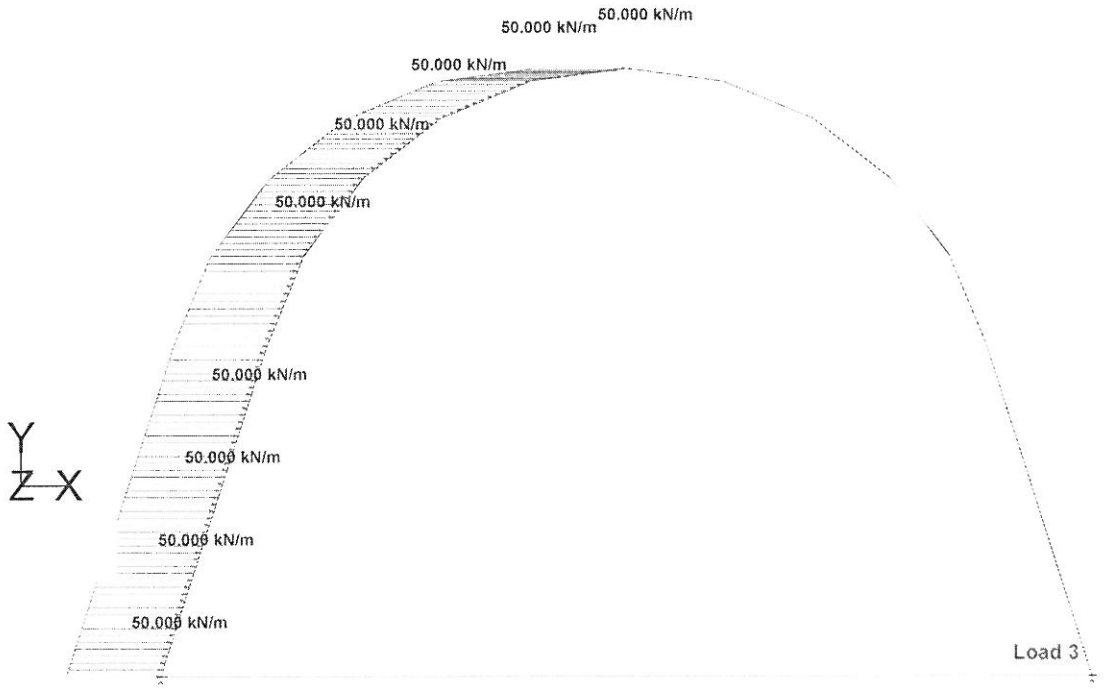
Y
Z
X
Load 2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Y
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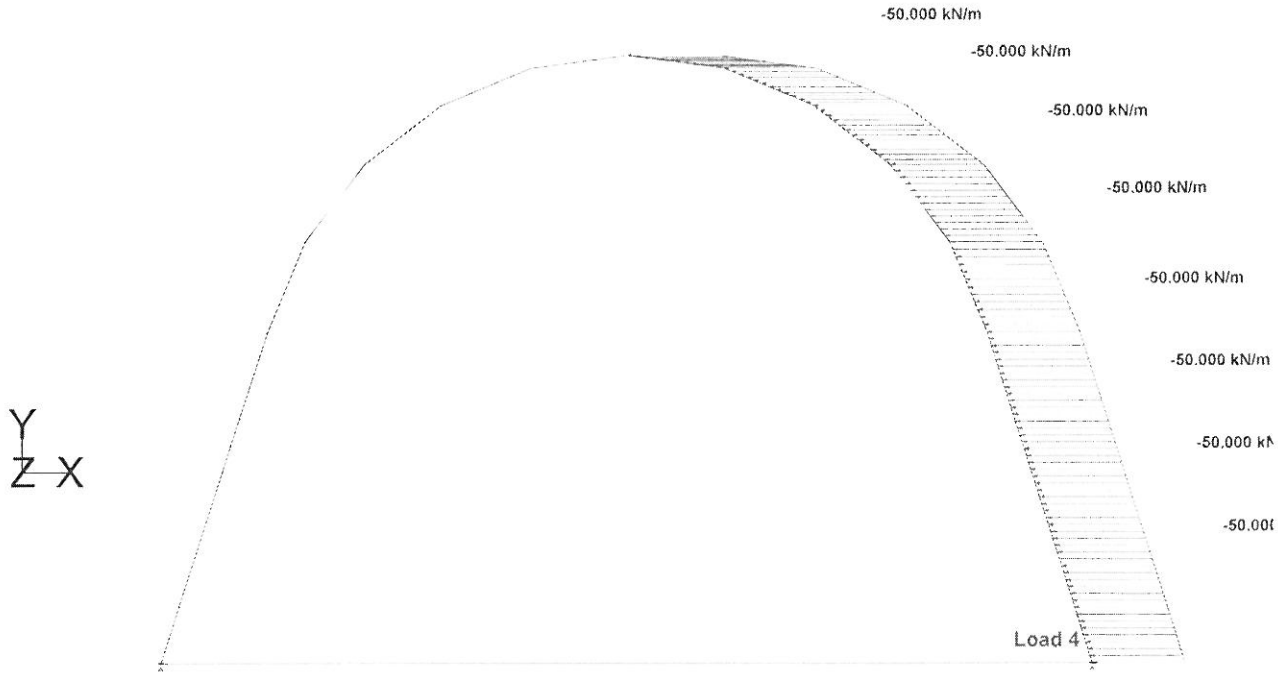
X
Load 3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-50.000 kN/m
-50.000 kN/m
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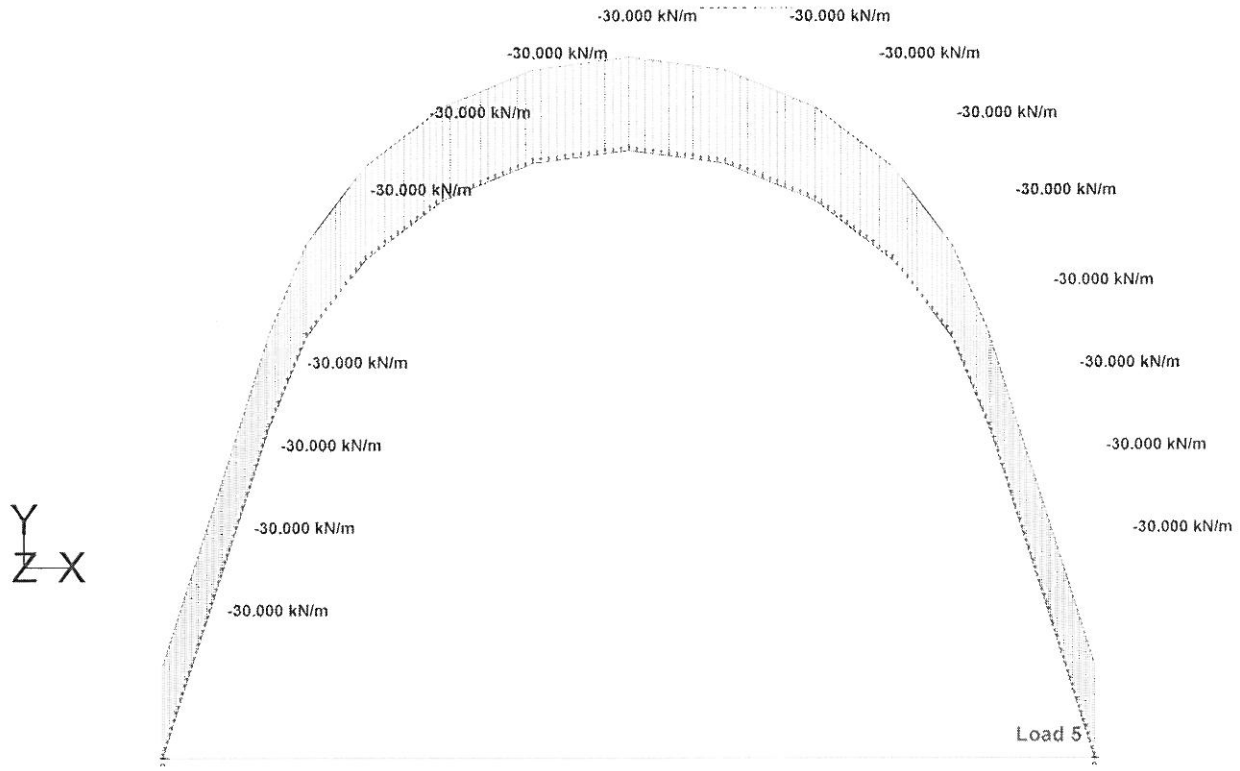
-50.00
Load 4
Y
Z
X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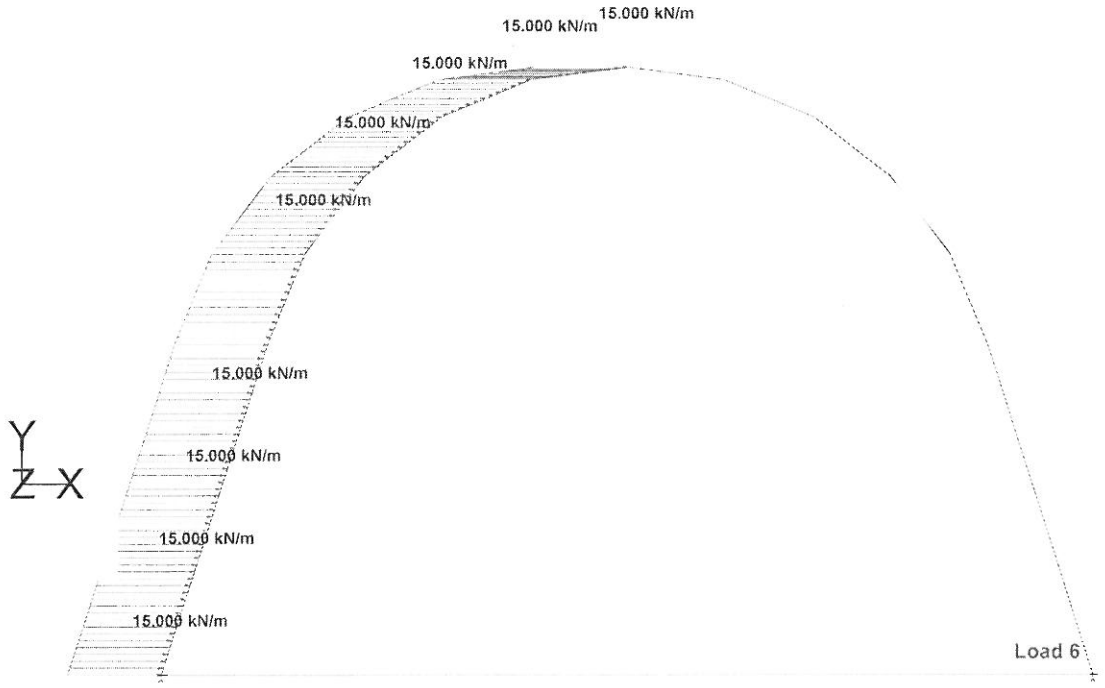
Z X
Load 5: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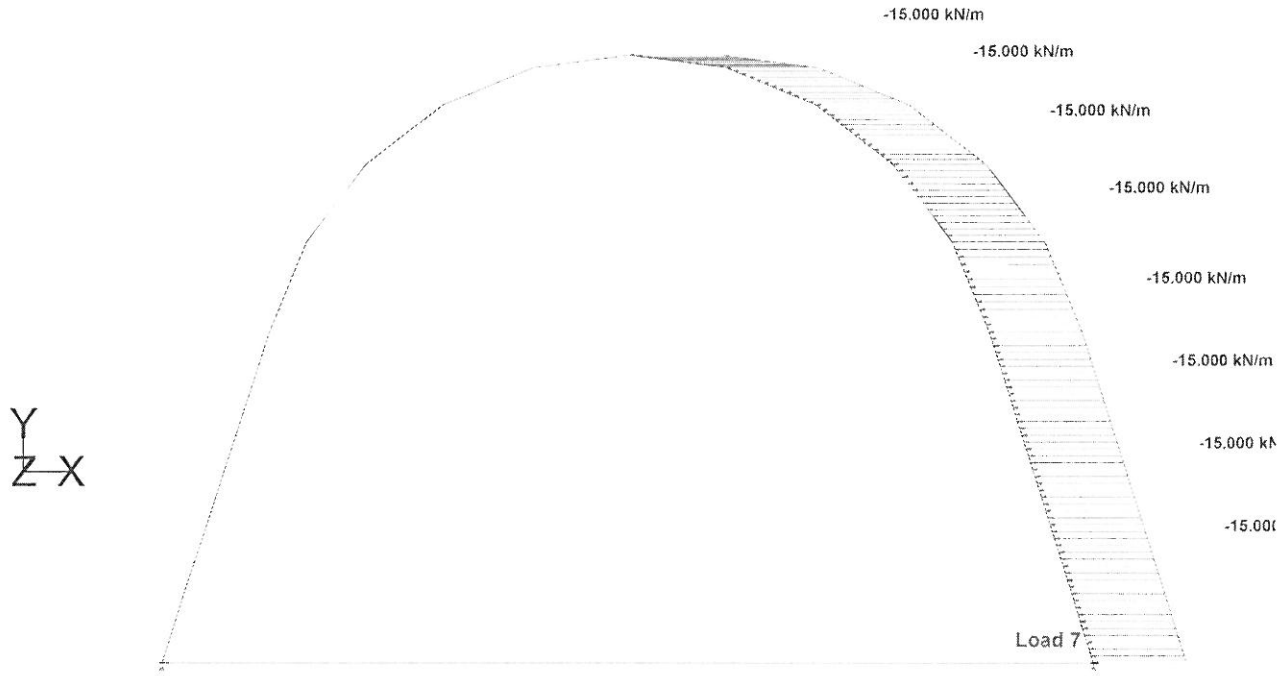
15.000 kN/m
15.000 kN/m
15.000 kN/m
Y
Z
X
Load 6


-15.000 kN/m
-15.000 kN/m
-15.000 kN/m
-15.000 kN/m
-15.000 kN/m
-15.000 kN/m
-15.000 kN
-15.00(
Y
Z
X
Load 7

INDICE

Relazione statica delle paratie provvisionali in micropali e tiranti per la realizzazione del ponte A22 sul fiume Mincio, del ponte A22 sul canale Fissero - Tartaro e per le opere minori limitrofe (2 tombini e 3 sottopassi).

1. Caratteristiche dei materiali

1.1. Calcestruzzo

C30/37

1.2. Acciaio per armatura lenta

Tipo FeB44K ad aderenza migliorata, controllato in stabilimento

1.3. Acciaio in profilati

Fe 510B

2. Verifica della paratia

2.1. Carichi agenti e azioni interne micropali

Azioni massime sui pali (interasse 50cm):

Mmax = 100,00*0,5 = 50,00 KNm/palo

Qmax = 130,00*0,5 = 65,00 KN/palo

Nmax = 222,00*0,5 = 111,00 KN/palo

scelto: Micropali con lunghezza lg = 12,00m con tubo d`armatura 168/8,8mm in Fe510B e diamtero foro ϕ = 250,0mm

Calcolo portanza micropali a flessione:

Mmax = 100,00*0,5 = 50,00 KNm/palo

Nmax = 222,00*0,5 = 111,00 KN/palo

$W_{pl} = (A/2)*2*y_s = (43,99/2)*2*(2*r/\pi) = 235,4\ cm^3$

A	N	M	Wpl	$sigma_{max}$	$sigma_{amm}$
[mm]	[N]	[Nmm]	[mm^3]	[N/mm^2]	[N/mm^2]
4399.01	111000.00	50000000.00	235400.00	237.64	245

Calcolo portanza micropali a taglio:

Qmax = 65,00 KN/palo

T = 2*Q/A = 2*65000/4399 = 29,55 Mpa < 145,0 MPa

Calcolo portanza geostatica micropali a compressione: (lunghezza minima bulbo l_{bulbo} = 2,0m)

Dalla relazione geotecnica si addotta un taglio limite qs = 300 kN/m²

Pmax = 111,00 KN

lpalo	lbulbo	d	q	Pamm	Pmax
[m]	[m]	[m]	[kN/m²]	[kN]	[kN]
12	2	0.25	300	271.0	111

Micropalo con diametro di perforazione d = 250,0mm, lg = 12,00m

Nota: la pressione di iniezione sará misurata in situ e saranno tarati i tagli limite per aderenza. Inoltre il palo non potrá essere giuntato!

2.2. Trave di ripartizione in acciaio

Azioni massime sulla trave:

Trazione max tiranti:

Nmax = 215*2,80 = 600,00 KN/tirante

Flessione e taglio massimo nelle travi di ripartizione:

Mmax = 215,00*2,8^2/10 = 168,00 KNm

Qmax = 215,00*2,8*0,6 = 361,00 KN

Verifica a flessione e taglio

Scelto: 2 Trave IPE270 in Fe510

W = 429,0 cm^3

σ = M/W = 168,0*10^6/(2*429,0*10^3)= 196,0 MPA < 245,0 MPA

Aq = 17,10 cm^2

τ = Q/(2*Aq) = 361000,/(2*1710,0) = 106,0 MPA < 145,0 MPa

2.3. Dimensionamento dei tiranti:

Tensione di snervamento ft = 1570 N/mm²

Tensione di rottura fy = 1770 N/mm²

Sezione trefolo 0,6": 139 mm²

Sigma amm.: 1098 N/mm²

Portata con 4 trefoli:

Namm = 1098*4*139 = 610 kN > Nmax = 600,00 kN

Rilevamento della lunghezza del bulbo

Lb = Pe/(π*d*qs/γ) =	9,80 m
Forza permanente tirante: Pe =	600,00 kN
Diametro bulbo: d =	130 mm
Taglio limite: qs =	300 kN/m^2
Fattore di sicurezza: γ =	2,0

Lunghezza tiranti: Ltot = 15,0m

EINGABEDATEN SYSTEM

BAUGRUBENABSCHLUSS (SYSTEM)

Wandkopf:	x [m]	y [m]	Wandneigung α [°]	Wandlänge [m]
	0.00	0.00	0.00	12.00

Geschlossene Wand (Spundwand):

δ_a [ϕ]	δ_p [ϕ]	EI [kNm²/m]	γ_R
0.67	-0.50	15000.00	1.00

TERRAINOBERFLÄCHE

y [m]	Horizontal
0.00	

Verteilte Auflast:

p [kN/m²]	r	wie Erddruck
0.00	0.00	Nein

BODENSCHICHTEN

y [m]	γ [kN/m³]	ϕ [°]	c_a [kN/m²]	c_p [kN/m²]	k [m/s]	k_{ah}	k_{0h}	k_{ph}	γ_u [kN/m³]
0.00	20.00	30.00	0.00						

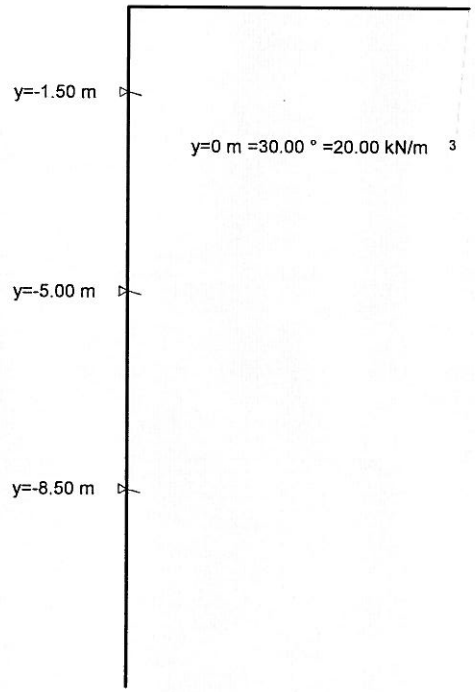
ABSTÜTZUNGEN

	y [m]	α [°]	Lager	f [kN/m²]	dx [m]	
1	-1.50	-15.00	starr		*	Anker
2	-5.00	-15.00	starr		*	Anker
3	-8.50	-15.00	starr		*	Anker

*: Auflagerverschiebung von letzter Etappe übernehmen

Baugrundmodell (System)

Mstb. 1 :133.2



Baugrundmodell (System)

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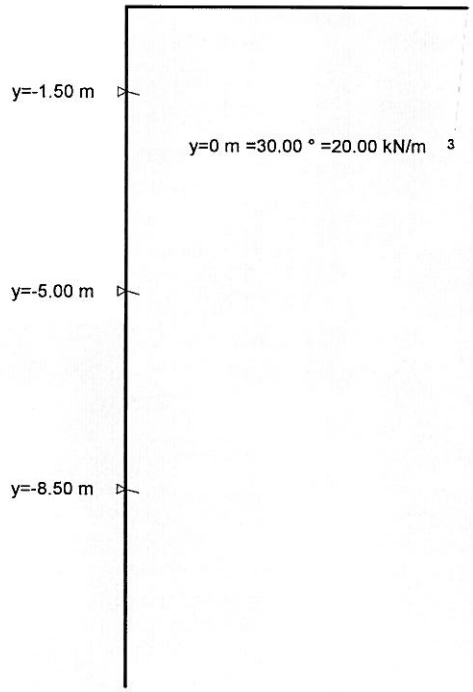

Baugrundmodell (System)

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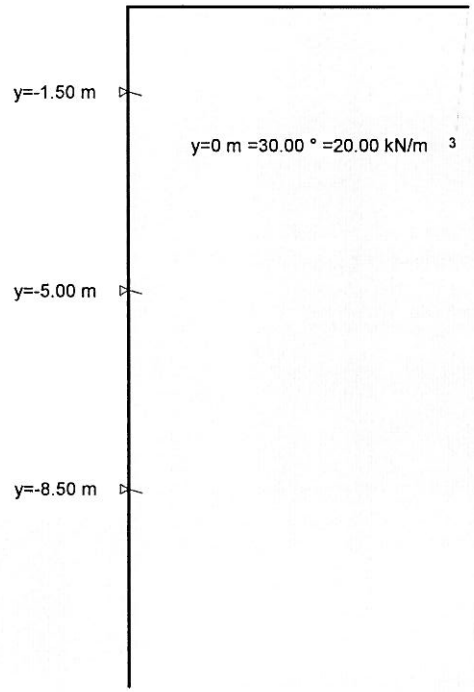

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Baugrundmodell (System)

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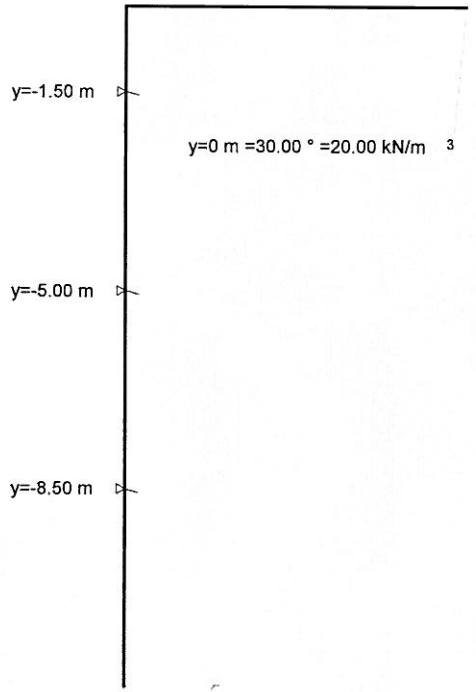


EINGABEDATEN Etappe 1: Etappe 1

BAUGRUBENABSCHLUSS (ETAPPE)

Wandkopf	Frei
Wandfuss	Einbindetiefe gesucht
	Eingespannt
Erdwiderstand	Widerstandsbeiwert γ_R=1.00
	Automatische Form
Erddruck	Umlagerung bis Aushubtiefe
	Umlagerung in Rechteck
	Vergrösserungsfaktor bei Umlagerung = 1.30
	Minimaler Erddruck e_{min}=5.00
	Ruhedruckanteil r=0.00
Lastfaktoren:	A:1.00 ψ
Auflast	
Lastfaktoren:	A:1.00 ψ

BAUGRUBENSOHLE

y [m]	Horizontal
-2.00	

Niveaulagen: A:0.00
Verteilte Auflast:: p=0.00 [kN/m²]

AKTIVE ABSTÜTZUNGEN

y [m]	y [m]	y [m]	y [m]	y [m]

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

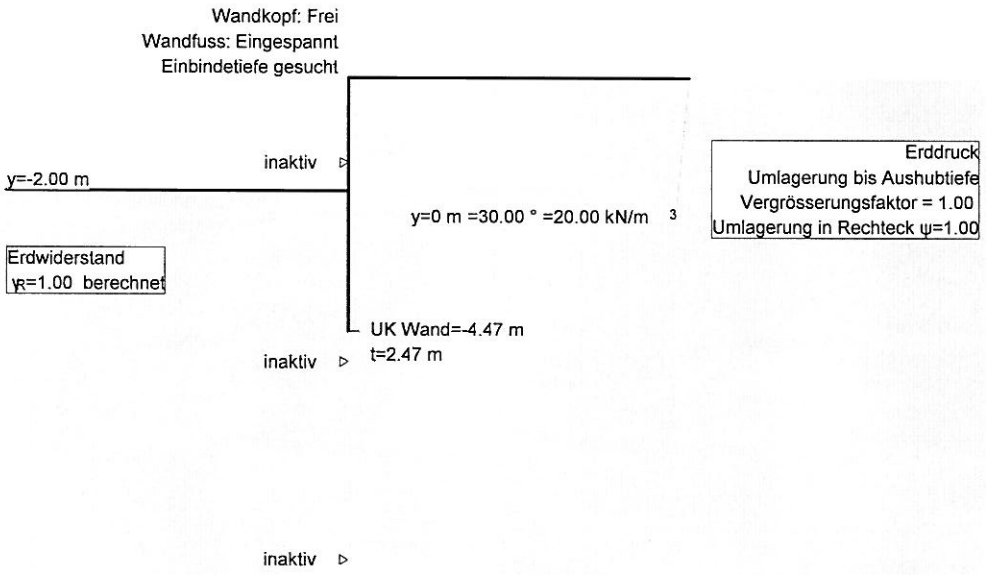
DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Grenzwert Wandlänge/Stützkräfte

Mstb. 1 :133.2



EINGABEDATEN Etappe 2: Etappe 2

BAUGRUBENABSCHLUSS (ETAPPE)

Wandkopf	Frei
Wandfuss	Einbindetiefe gesucht
	Eingespannt
Erdwiderstand	Widerstandsbeiwert γ_R=1.00
	Automatische Form
Erddruck	Umlagerung bis Aushubtiefe
	Umlagerung in Rechteck
	Vergrösserungsfaktor bei Umlagerung = 1.30
	Minimaler Erddruck e_{min}=5.00
	Ruhedruckanteil r=0.00
Lastfaktoren:	A:1.00 ψ
Auflast	
Lastfaktoren:	A:1.00 ψ

BAUGRUBENSOHLE

y [m]	Horizontal
-5.50	

Niveaulagen: A:0.00
Verteilte Auflast:: p=0.00 [kN/m²]

AKTIVE ABSTÜTZUNGEN

	y [m]	y [m]	y [m]	y [m]	y [m]
1	-1.50				

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Grenzwert Wandlänge/Stützkräfte

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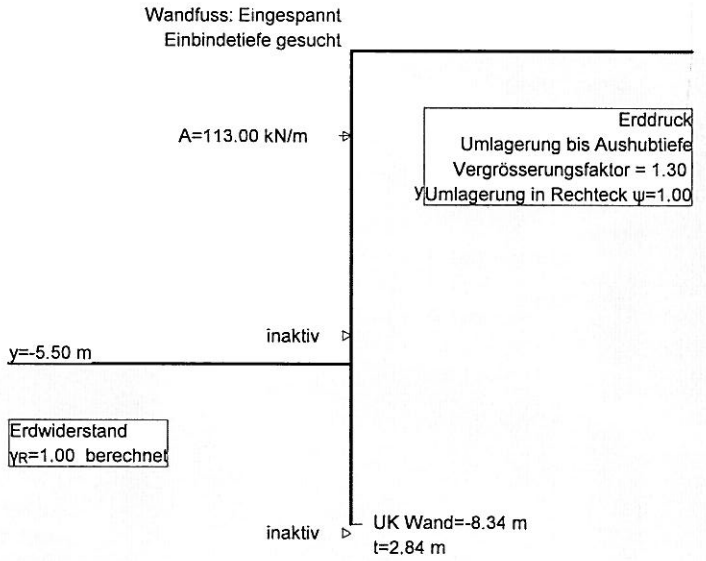


EINGABEDATEN Etappe 3: Etappe 3

BAUGRUBENABSCHLUSS (ETAPPE)

Wandkopf	Frei
Wandfuss	Einbindetiefe gesucht
	Aufgelegt
Erdwiderstand	Widerstandsbeiwert γ_R=1.00
	Automatische Form
Erddruck	Umlagerung bis Aushubtiefe
	Umlagerung in Rechteck
	Vergrösserungsfaktor bei Umlagerung = 1.30
	Minimaler Erddruck e_{min}=5.00
	Ruhedruckanteil r=0.00
Lastfaktoren:	A:1.00 ψ
Auflast	
Lastfaktoren:	A:1.00 ψ

BAUGRUBENSOHLE

y [m]	Horizontal
-9.00	

Niveaulagen: A:0.00
Verteilte Auflast:: p=0.00 [kN/m²]

AKTIVE ABSTÜTZUNGEN

	y [m]		y [m]	y [m]	y [m]	y [m]
2	-5.00	1	-1.50			

GEFÄHRDUNGSBILDER

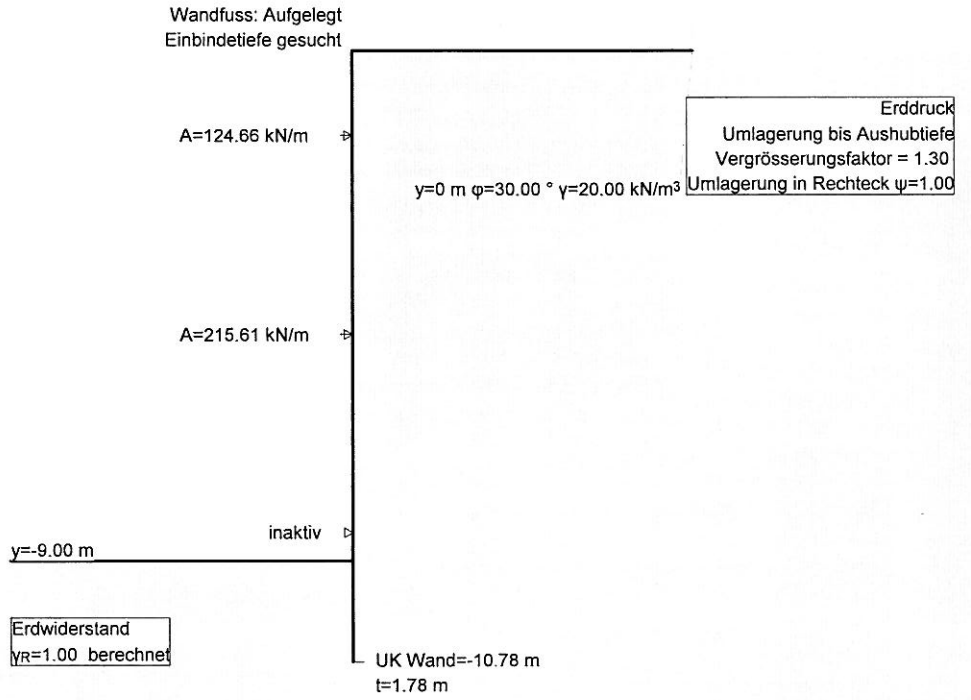
A : Standard-Gefährdungsbild

DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:
A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Grenzwert Wandlänge/Stützkräfte

Mstb. 1 :133.2



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EINGABEDATEN Etappe 4: Endzustand

BAUGRUBENABSCHLUSS (ETAPPE)

Wandkopf	Frei
Wandfuss	Einbindetiefe gesucht
	Aufgelegt
Erdwiderstand	Widerstandsbeiwert γ_R=1.00
	Automatische Form
Erddruck	Umlagerung bis Aushubtiefe
	Umlagerung in Rechteck
	Vergrösserungsfaktor bei Umlagerung = 1.30
	Minimaler Erddruck e_{min}=5.00
	Ruhedruckanteil r=0.00
Lastfaktoren:	A:1.00 ψ
Auflast	
Lastfaktoren:	A:1.00 ψ

BAUGRUBENSOHLE

y [m]	Horizontal
-9.00	

Niveaulagen: A:0.00
Verteilte Auflast:: p=0.00 [kN/m²]

AKTIVE ABSTÜTZUNGEN

	y [m]		y [m]		y [m]	y [m]	y [m]
3	-8.50	2	-5.00	1	-1.50		

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

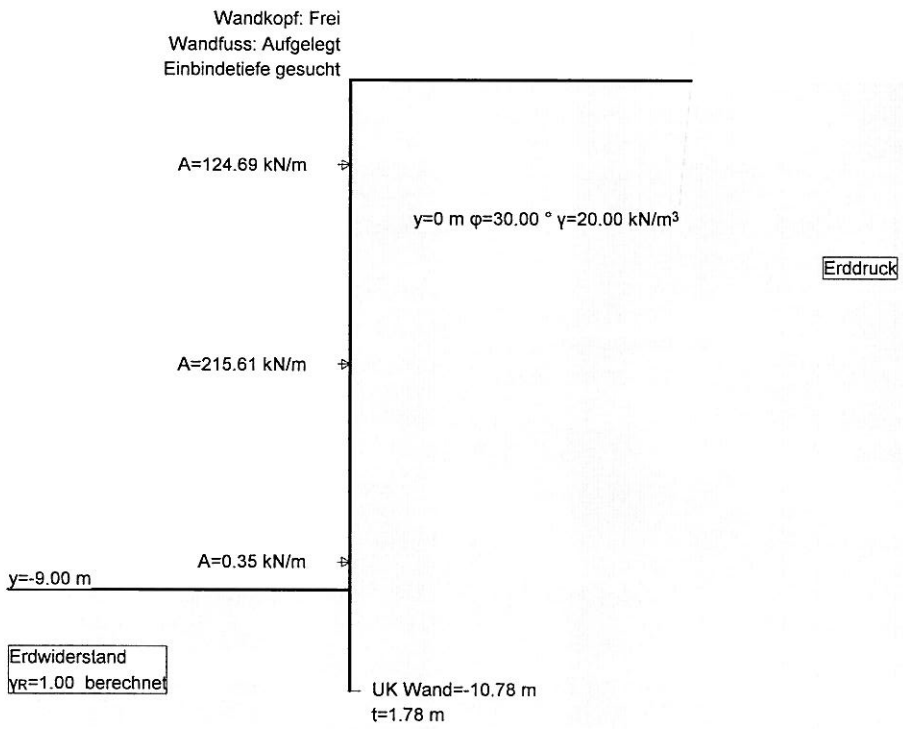
DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Grenzwert Wandlänge/Stützkräfte

Mstb. 1 :133.2



EINGABEDATEN LASTEN Etappe 1: Etappe 1

VERTEILTE BODENLASTEN

x_1 [m]	y_1 [m]	x_2 [m]	y_2 [m]	p_{y1} [kN/m²]	p_{y2} [kN/m²]	r	wie Erddruck
0.00	0.00	10.04	-0.02	-30.00	-30.00	0.00	Nein

Lastfaktoren: A:1.00 ψ

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

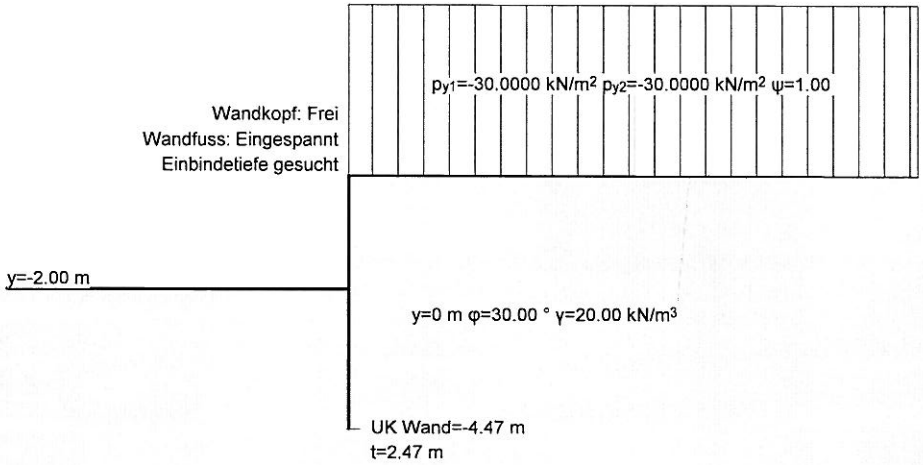
DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Wandlänge/Stützkräfte

Mstb. 1 :133.2



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EINGABEDATEN LASTEN Etappe 2: Etappe 2

VERTEILTE BODENLASTEN

x_1 [m]	y_1 [m]	x_2 [m]	y_2 [m]	p_{y1} [kN/m²]	p_{y2} [kN/m²]	r	wie Erddruck
0.00	0.00	10.04	-0.02	-30.00	-30.00	0.00	Nein

Lastfaktoren: A:1.00 ψ

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

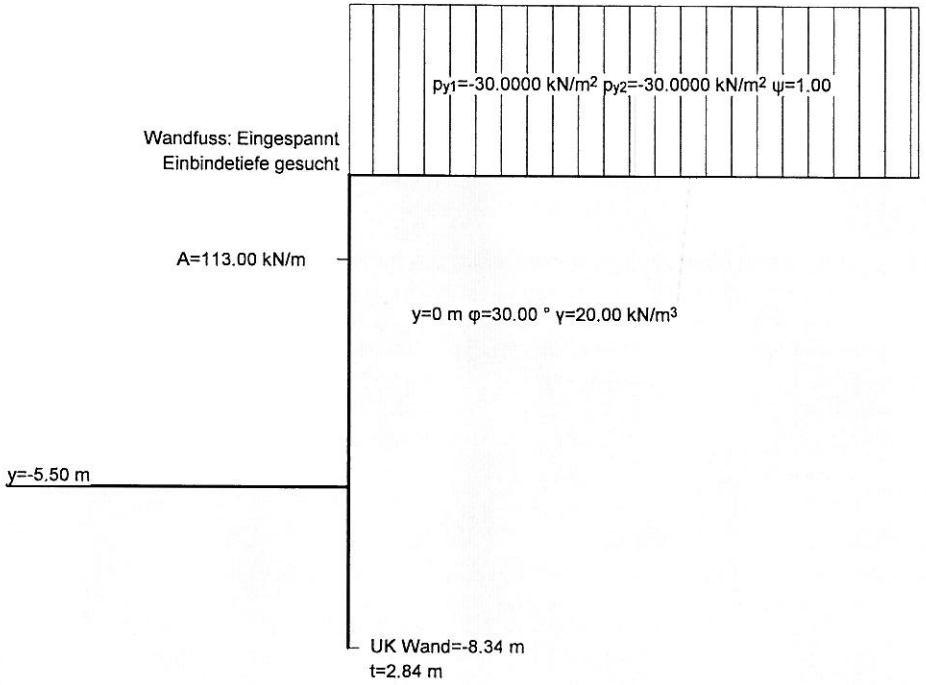
DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Wandlänge/Stützkräfte

Mstb. 1 :133.2



EINGABEDATEN LASTEN Etappe 3: Etappe 3

VERTEILTE BODENLASTEN

x_1 [m]	y_1 [m]	x_2 [m]	y_2 [m]	p_{y1} [kN/m²]	p_{y2} [kN/m²]	r	wie Erddruck
0.00	0.00	10.04	-0.02	-30.00	-30.00	0.00	Nein

Lastfaktoren: A:1.00 ψ

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

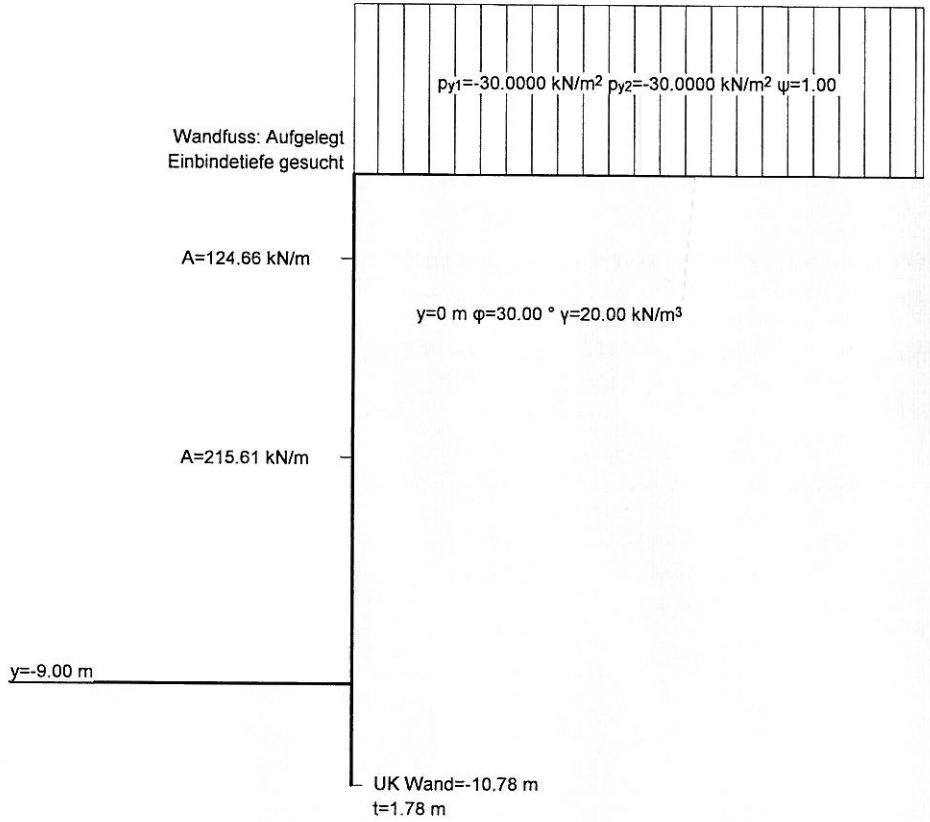
DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Wandlänge/Stützkräfte

Mstb. 1 :133.2



EINGABEDATEN LASTEN Etappe 4: Endzustand

VERTEILTE BODENLASTEN

x_1 [m]	y_1 [m]	x_2 [m]	y_2 [m]	p_{y1} [kN/m²]	p_{y2} [kN/m²]	r	wie Erddruck
0.00	0.00	11.92	-0.02	-30.00	-30.00	0.00	Nein

Lastfaktoren: A:1.00 ψ

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

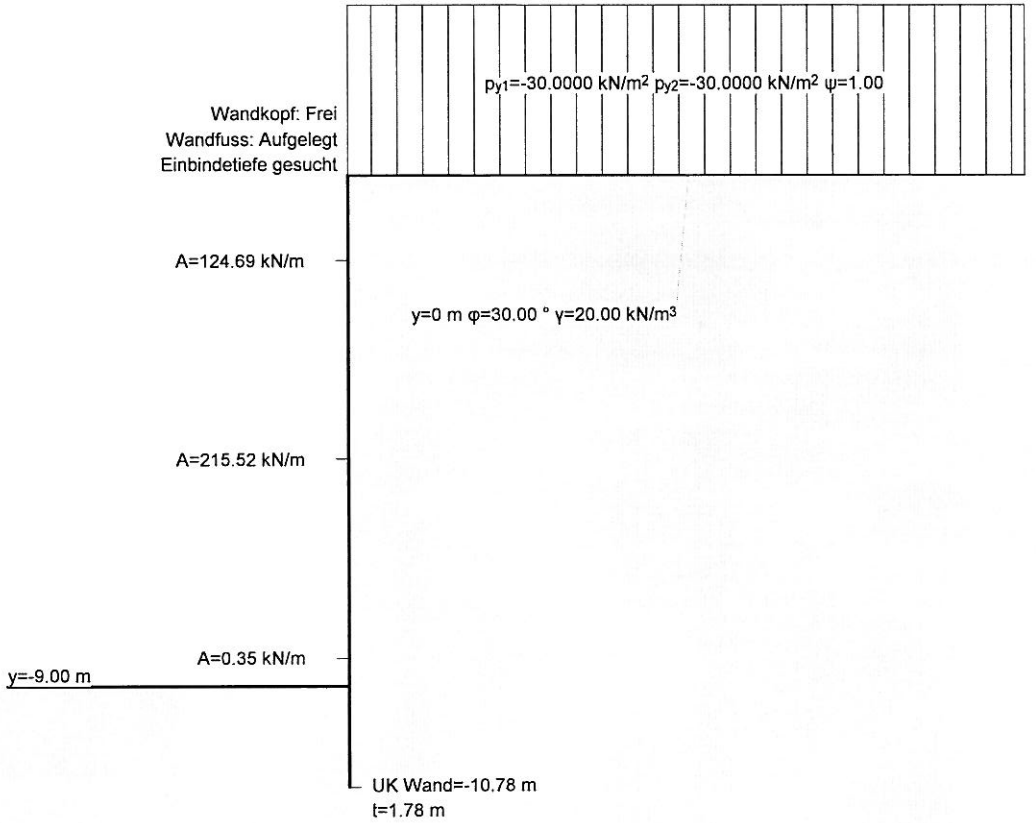
DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

Wandlänge/Stützkräfte

Mstb. 1 :133.2



Nr.:

R E S U L T A T E E T A P P E 4

Gefährdungsbild: Standard-Gefährdungsbild

Wandtyp: geschlossene Wand

ERDDRUCKBEIWERTE DER BODENSCHICHTEN

y [m]	gamma [kN/m³]	phi [°]	ca [kN/m²]	cp [kN/m²]	Kah	K0h	Kph
0.00	20.00	30.00	0.00	0.00	0.2794	0.5000	4.8069

Wandreibungswinkel aktiv = 0.667*phi passiv = -0.500*phi
Neigungen: Wand = 0.00° Terrain = 0.00° Sohle = 0.00°

WANDDRÜCKE

y [m]	Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.0000	0.0000	32.6876	8.2556	0.0000	-0.0000	40.9433
-0.8948	5.0000	32.6876	8.2556	0.0000	-0.0000	40.9433
-1.5000	8.3814	32.6876	8.2556	0.0000	-0.0000	40.9433
-5.0000	27.9381	32.6876	8.2556	0.0000	-0.0000	40.9433
-8.5000	47.4948	32.6876	8.2556	0.0000	-0.0000	40.9433
-9.0000	50.2886	32.6876	8.2556	0.0000	-0.0000	40.9433
-9.0000	50.2886	50.2886	8.2556	0.0000	-0.0000	58.5443
-10.3024	57.5660	57.5660	8.2556	0.0000	-125.2116	-59.3900
-10.7814	60.2427	60.2427	8.2556	0.0000	-171.2660	-102.7677

Legende:
Da: Aktiver Erddruck (Kennwertniveau)
Du: Umgelagerter Erddruck
Do: Nicht umgelagerter Erddruck
Dw: Wasserdruck
Ew: Erdwiderstand
Dr: Resultierender Erddruck

ABSTÜTZUNGEN

y [m]	horizontale Komponente [kN/m]	Kraft [kN/m]
-1.5000	120.4	124.7
-5.0000	208.2	215.5
-8.5000	0.3	0.4

VERSCHIEBUNGEN UND SCHNITTKRÄFTE

y [m]	Vx [kN/m]	Mz [kNm/m]	Dx [mm]	Rz
0.0000	-0.0	0.0	-14.0	0.0037
-0.5000	-20.5	-5.1	-12.2	0.0036
-0.8948	-36.6	-16.4	-10.8	0.0033
-0.8948	-36.6	-16.4	-10.8	0.0033
-1.3948	-57.1	-39.8	-9.3	0.0024
-1.5000	-61.4	-46.1	-9.1	0.0021
-1.5000	59.0	-46.1	-9.1	0.0021
-2.0000	38.6	-21.7	-8.1	0.0019
-2.5000	18.1	-7.5	-7.3	0.0014
-3.0000	-2.4	-3.6	-6.7	0.0007
-3.5000	-22.9	-9.9	-6.6	-0.0001
-4.0000	-43.3	-26.5	-6.9	-0.0012
-4.5000	-63.8	-53.2	-7.8	-0.0025
-5.0000	-84.3	-90.3	-9.4	-0.0040
-5.0000	123.9	-90.3	-9.4	-0.0040
-5.5000	103.4	-33.4	-11.8	-0.0052
-6.0000	83.0	13.2	-14.5	-0.0055
-6.5000	62.5	49.5	-17.2	-0.0050
-7.0000	42.0	75.6	-19.3	-0.0035
-7.5000	21.5	91.5	-20.5	-0.0012
-8.0000	1.1	97.2	-20.4	0.0020
-8.5000	-19.4	92.6	-18.4	0.0060
-8.5000	-19.1	92.6	-18.4	0.0060
-9.0000	-39.5	77.9	-14.7	0.0089
-9.0000	-39.5	77.9	-14.7	0.0089
-9.5000	-57.5	52.7	-9.7	0.0111
-10.0000	-52.8	24.2	-3.8	0.0123
-10.3024	-39.0	10.1	-0.0	0.0127
-10.3024	-38.8	10.1	-0.0	0.0127
-10.7814	-0.0	-0.0	6.1	0.0128

Legende:
Vx: Querkräfte
Mz: Momente
Dx: Deformationen
Rz: Verdrehung

RESULTATE FÜR DIE WANDBEMESSUNG

Extremal- und zugehörige Schnittkräfte:
- Maximales Mz= 97.2 [kNm/m] (zugehörige Vx= 0.3 [kN/m])
- Minimales Mz= -90.3 [kNm/m] (zugehörige Vx= -84.3 [kN/m])
- Maximale Vx= 123.9 [kN/m] (zugehöriges Mz= -90.3 [kNm/m])
- Minimale Vx= -84.3 [kN/m] (zugehöriges Mz= -90.3 [kNm/m])

Belastungsnullpunkt = 0.647 [m] (ab Sohle)
Einbindetiefe = 1.781 [m]

Resultierende Vertikalkraft = -222.582 [kN/m]

G R E N Z W E R T E bis E T A P P E 4

GRENZWERTE DER VERSCHIEDENEN WANDDRÜCKE

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	7.264	8.254	0.000	-0.000	15.518
0.000	Max	0.000	32.688	8.256	0.000	-0.000	40.943
-0.500	Min	2.794	7.264	8.254	0.000	-0.000	15.518
-0.500	Max	2.794	32.688	8.256	0.000	-0.000	40.943
-0.895	Min	5.000	7.264	8.254	0.000	-0.000	15.518
-0.895	Max	5.000	32.688	8.256	0.000	-0.000	40.943
-1.395	Min	7.794	7.264	8.254	0.000	-0.000	15.518
-1.395	Max	7.794	32.688	8.256	0.000	-0.000	40.943
-1.500	Min	8.381	7.264	8.254	0.000	-0.000	15.518
-1.500	Max	8.381	32.688	8.256	0.000	-0.000	40.943
-1.500	Min	8.381	7.264	8.254	0.000	-0.000	15.518

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	7.264	8.254	0.000	-0.000	15.518
-1.500	Max	8.381	32.688	8.256	0.000	-0.000	40.943
-2.000	Min	11.175	7.264	8.254	0.000	-0.000	15.518
-2.000	Max	11.175	32.688	8.256	0.000	-0.000	40.943
-2.000	Min	11.175	11.175	8.254	0.000	-0.000	19.429
-2.000	Max	11.175	32.688	8.256	0.000	-0.000	40.943
-2.500	Min	13.969	13.969	8.254	0.000	-48.069	-25.846
-2.500	Max	13.969	32.688	8.256	0.000	-0.000	40.943
-3.000	Min	16.763	16.763	8.254	0.000	-96.139	-71.122
-3.000	Max	16.763	32.688	8.256	0.000	-0.000	40.943
-3.500	Min	19.557	19.557	8.254	0.000	-144.208	-116.397
-3.500	Max	19.557	32.688	8.256	0.000	-0.000	40.943
-4.000	Min	22.351	19.976	8.254	0.000	-192.277	-161.673
-4.000	Max	22.351	32.688	8.256	0.000	-0.000	40.943
-4.093	Min	22.868	19.976	8.254	0.000	-201.174	-170.052
-4.093	Max	22.868	32.688	8.256	0.000	-0.000	40.943
-4.500	Min	25.144	19.976	8.254	0.000	-0.000	28.230
-4.500	Max	25.144	32.688	8.256	0.000	-0.000	40.943
-5.000	Min	27.938	19.976	8.254	0.000	-0.000	28.230
-5.000	Max	27.938	32.688	8.256	0.000	-0.000	40.943
-5.000	Min	27.938	19.976	8.254	0.000	-0.000	28.230
-5.000	Max	27.938	32.688	8.256	0.000	-0.000	40.943
-5.500	Min	30.732	19.976	8.254	0.000	-0.000	28.230
-5.500	Max	30.732	32.688	8.256	0.000	-0.000	40.943
-5.500	Min	30.732	30.732	8.254	0.000	-0.000	38.986
-5.500	Max	30.732	32.688	8.256	0.000	-0.000	40.943
-6.000	Min	33.526	32.688	8.254	0.000	-48.069	-6.289
-6.000	Max	33.526	33.526	8.256	0.000	-0.000	40.943
-6.500	Min	36.320	32.688	8.254	0.000	-96.139	-51.565
-6.500	Max	36.320	36.320	8.256	0.000	-0.000	40.943

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	7.264	8.254	0.000	-0.000	15.518
-7.000	Min	39.113	32.688	8.254	0.000	-144.208	-96.840
-7.000	Max	39.113	39.113	8.256	0.000	-0.000	40.943
-7.500	Min	41.907	32.688	8.254	0.000	-192.277	-142.116
-7.500	Max	41.907	41.907	8.256	0.000	-0.000	40.943
-7.937	Min	44.349	32.688	8.254	0.000	-234.294	-181.691
-7.937	Max	44.349	44.349	8.256	0.000	-0.000	40.943
-8.000	Min	44.701	32.688	8.254	0.000	-0.000	40.942
-8.000	Max	44.701	32.688	8.256	0.000	-0.000	40.943
-8.500	Min	47.495	32.688	8.254	0.000	-0.000	40.942
-8.500	Max	47.495	32.688	8.256	0.000	-0.000	40.943
-8.500	Min	47.495	32.688	8.254	0.000	-0.000	40.942
-8.500	Max	47.495	32.688	8.256	0.000	-0.000	40.943
-9.000	Min	50.289	32.688	8.254	0.000	-0.000	40.942
-9.000	Max	50.289	32.688	8.256	0.000	-0.000	40.943
-9.000	Min	50.289	50.289	8.254	0.000	-0.000	58.543
-9.000	Max	50.289	50.289	8.256	0.000	-0.000	58.544
-9.500	Min	53.082	53.082	8.254	0.000	-48.069	13.267
-9.500	Max	53.082	53.082	8.256	0.000	-48.069	13.269
-10.000	Min	55.876	55.876	8.254	0.000	-96.139	-32.008
-10.000	Max	55.876	55.876	8.256	0.000	-96.139	-32.007
-10.300	Min	57.550	57.550	8.254	0.000	-124.936	-59.132
-10.300	Max	57.550	57.550	8.256	0.000	-124.936	-59.130
-10.300	Min	57.550	57.550	8.254	0.000	-124.936	-59.132
-10.300	Max	57.550	57.550	8.256	0.000	-124.936	-59.130
-10.302	Min	57.566	57.566	8.254	0.000	-125.212	-59.391
-10.302	Max	57.566	57.566	8.256	0.000	-125.212	-59.390
-10.302	Min	57.566	57.566	8.254	0.000	-125.212	-59.391
-10.302	Max	57.566	57.566	8.256	0.000	-125.212	-59.390
-10.777	Min	60.217	60.217	8.254	0.000	-170.821	-102.350
-10.777	Max	60.217	60.217	8.256	0.000	-170.821	-102.349

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	7.264	8.254	0.000	-0.000	15.518
-10.781	Min	60.243	60.243	8.256	0.000	-171.266	-102.768
-10.781	Max	60.243	60.243	8.256	0.000	-171.266	-102.768

Legende:
Da: Aktiver Erddruck (Kennwertniveau)
Du: Umgelagerter Erddruck
Do: Nicht umgelagerter Erddruck
Dw: Wasserdruck
Ew: Erdwiderstand
Dr: Resultierender Erddruck

ABSTÜTZUNGEN (Maximalwerte)

y [m]	horizontale Komponente [kN/m]	Kraft [kN/m]
-1.500	120.4	124.7
-5.000	208.3	215.6
-8.500	0.3	0.4

GRENZWERTE DER WANDDRÜCKE, VERSCHIEBUNGEN UND SCHNITTKRÄFTE

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
0.000	Min	15.518	-20.0	-0.0	-0.0
0.000	Max	40.943	-7.1	-0.0	0.0
-0.500	Min	15.518	-16.3	-20.5	-5.1
-0.500	Max	40.943	-7.7	-7.8	-1.9
-0.895	Min	15.518	-13.4	-36.6	-16.4
-0.895	Max	40.943	-8.1	-13.9	-6.2
-1.395	Min	15.518	-9.8	-57.1	-39.8
-1.395	Max	40.943	-8.9	-21.6	-15.1
-1.500	Min	15.518	-9.1	-61.4	-46.1
-1.500	Max	40.943	-9.1	-23.3	-17.5
-1.500	Min	15.518	-9.1	-23.3	-46.1
-1.500	Max	40.943	-9.1	66.8	-17.5
-2.000	Min	15.518	-10.2	-31.0	-31.0

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
-2.000	Max	40.943	-5.9	52.7	-1.9
-2.000	Min	19.429	-10.2	-31.0	-31.0
-2.000	Max	40.943	-5.9	52.7	-1.9
-2.500	Min	-25.846	-11.1	-29.4	-47.1
-2.500	Max	40.943	-3.3	38.6	20.9
-3.000	Min	-71.122	-11.9	-5.2	-56.7
-3.000	Max	40.943	-1.5	24.5	36.7
-3.500	Min	-116.397	-12.2	-22.9	-48.5
-3.500	Max	40.943	-0.4	41.7	45.4
-4.000	Min	-161.673	-12.0	-43.4	-26.5
-4.000	Max	40.943	-0.0	111.2	47.0
-4.093	Min	-170.052	-11.8	-47.1	-31.5
-4.093	Max	40.943	0.0	126.6	46.0
-4.500	Min	28.230	-11.1	-63.8	-53.3
-4.500	Max	40.943	-7.8	-17.9	41.6
-5.000	Min	28.230	-9.4	-84.3	-90.3
-5.000	Max	40.943	-9.4	-32.0	29.1
-5.000	Min	28.230	-9.4	-32.0	-90.3
-5.000	Max	40.943	-9.4	124.0	29.1
-5.500	Min	28.230	-11.8	-46.1	-33.4
-5.500	Max	40.943	-7.1	103.5	9.6
-5.500	Min	38.986	-11.8	-46.1	-33.4
-5.500	Max	40.943	-7.1	103.5	9.6
-6.000	Min	-6.289	-14.5	-54.3	-16.4
-6.000	Max	40.943	-4.8	83.0	13.2
-6.500	Min	-51.565	-17.2	-39.8	-40.9
-6.500	Max	40.943	-2.8	62.6	49.6
-7.000	Min	-96.840	-19.3	-2.7	-52.5
-7.000	Max	40.943	-1.2	42.1	75.7
-7.500	Min	-142.116	-20.5	21.5	-39.9

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
-7.500	Max	40.943	-0.3	57.0	91.7
-7.937	Min	-181.691	-20.4	3.6	-0.1
-7.937	Max	40.943	0.0	127.8	96.6
-8.000	Min	40.942	-20.4	1.1	97.2
-8.000	Max	40.943	-20.4	1.1	97.4
-8.500	Min	40.942	-18.4	-19.4	92.6
-8.500	Max	40.943	-18.4	-19.3	92.8
-8.500	Min	40.942	-18.4	-19.3	92.6
-8.500	Max	40.943	-18.4	-19.1	92.8
-9.000	Min	40.942	-14.7	-39.8	77.9
-9.000	Max	40.943	-14.7	-39.5	78.0
-9.000	Min	58.543	-14.7	-39.8	77.9
-9.000	Max	58.544	-14.7	-39.5	78.0
-9.500	Min	13.267	-9.7	-57.7	52.7
-9.500	Max	13.269	-9.7	-57.5	52.7
-10.000	Min	-32.008	-3.8	-53.1	24.1
-10.000	Max	-32.007	-3.8	-52.8	24.2
-10.300	Min	-59.132	-0.0	-39.4	10.0
-10.300	Max	-59.130	-0.0	-39.1	10.3
-10.300	Min	-59.132	-0.0	-39.1	10.0
-10.300	Max	-59.130	-0.0	-38.5	10.3
-10.302	Min	-59.391	-0.0	-39.0	10.0
-10.302	Max	-59.390	0.0	-38.3	10.1
-10.302	Min	-59.391	-0.0	-38.8	10.0
-10.302	Max	-59.390	0.0	-38.3	10.1
-10.777	Min	-102.350	6.1	-0.4	-0.0
-10.777	Max	-102.349	6.1	0.0	0.1
-10.781	Min	-102.768	6.1	-0.0	-0.0
-10.781	Max	-102.768	6.1	-0.0	-0.0

Legende:
Dr: Resultierender Erddruck
Dx: Deformationen
Vx: Querkräfte
Mz: Momente

GRENZWERTE DER RESULTATE FÜR DIE WANDBEMESSUNG

Extremal- und zugehörige Schnittkräfte:

- Maximales Mz=	97.4 [kNm/m]	(zugehörige	Vx=	0.4 [kN/m])
- Minimales Mz=	-90.3 [kNm/m]	(zugehörige	Vx=	-84.3 [kN/m])
- Maximale Vx=	127.8 [kN/m]	(zugehöriges	Mz=	-0.1 [kNm/m])
- Minimale Vx=	-84.3 [kN/m]	(zugehöriges	Mz=	-90.3 [kNm/m])

Belastungsnullpunkt	=	0.647 [m]	(ab Sohle)
Erforderliche Kote UK_Wand	=	-10.781 [m]	
Max. resultierende Vertikalkraft	=	25.850 [kN/m]	
Min. resultierende Vertikalkraft	=	-222.601 [kN/m]	

INDICE

Relazione statica delle paratie provvisionali Jet per la realizzazione del risanamento delle pile in alveo del ponte A22 sul fiume Mincio e del ponte A22 sul canale Fissero – Tartaro.

1. Caratteristiche dei materiali

1.1. Calcestruzzo

Terreno iniettato Rck10

1.2. Acciaio in profilati tubolari

Fe 510B

2. Verifica della paratia

2.1. Carichi agenti e azioni interne micropali

Azioni massime nella sezione id incastro a fondo scavo

Nota: la paratia presso la quota di fondo scavo è contrastata da tappo di fondo che realizza una vincolazione rigida della paratia.

Mmax =	460,00 KNm/m
Qmax =	150,00 KN/m
Nmax = 1,80*25,0*6,0 =	270,00 KN/m

scelto: Micropali con lunghezza lg = 12,00m con tubo d`armatura 101/8,0mm in Fe510B e diamtero foro ϕ = 250,0mm

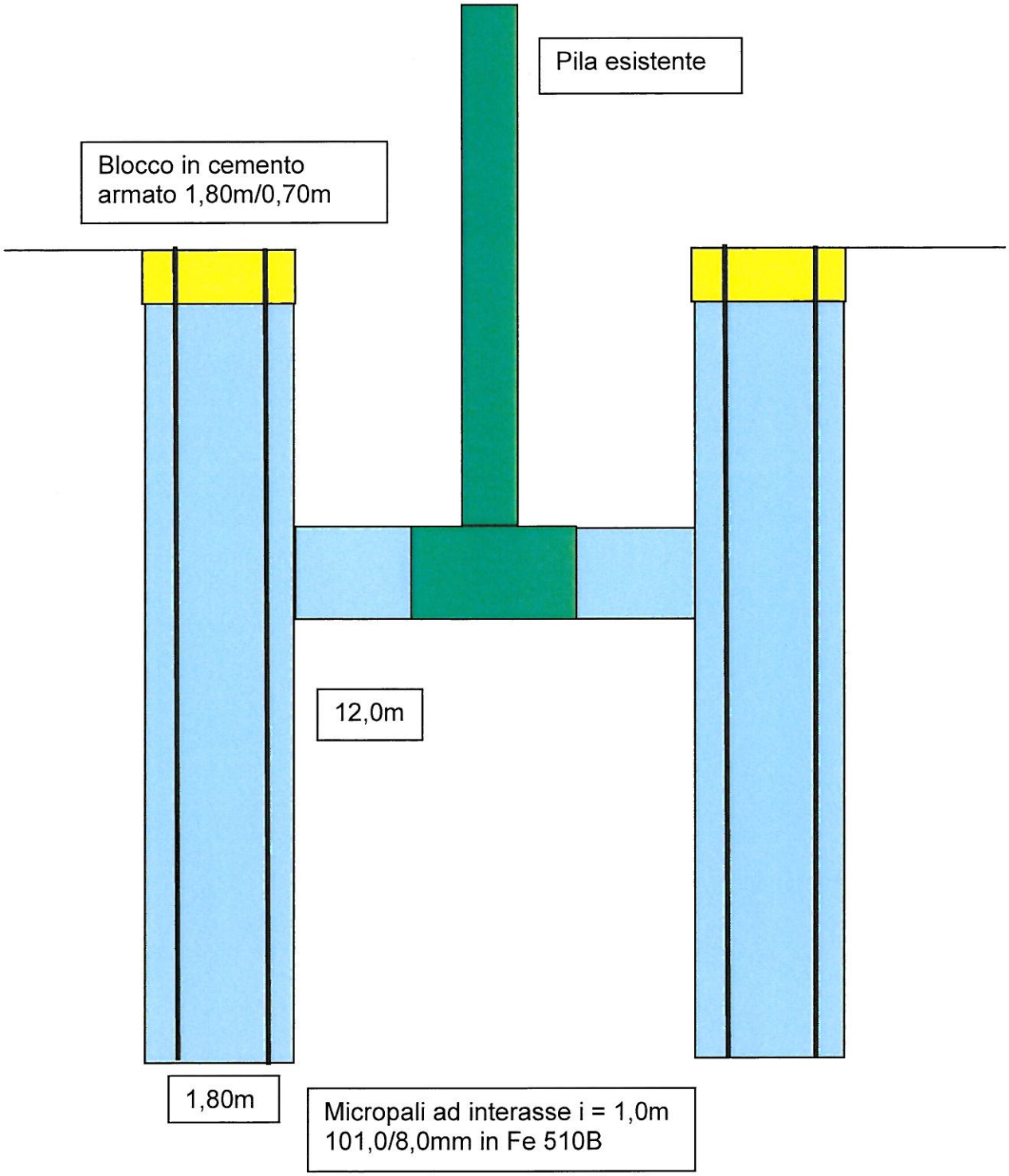
Trazione massima nei pali ad interasse di 1,0m in senso trasversale e longitudinale

N = M/e = 460,0/1,0 = 460,0 KN

A = (101,0 – 8,0)*3,14*8,0 = 2336,0 mm2

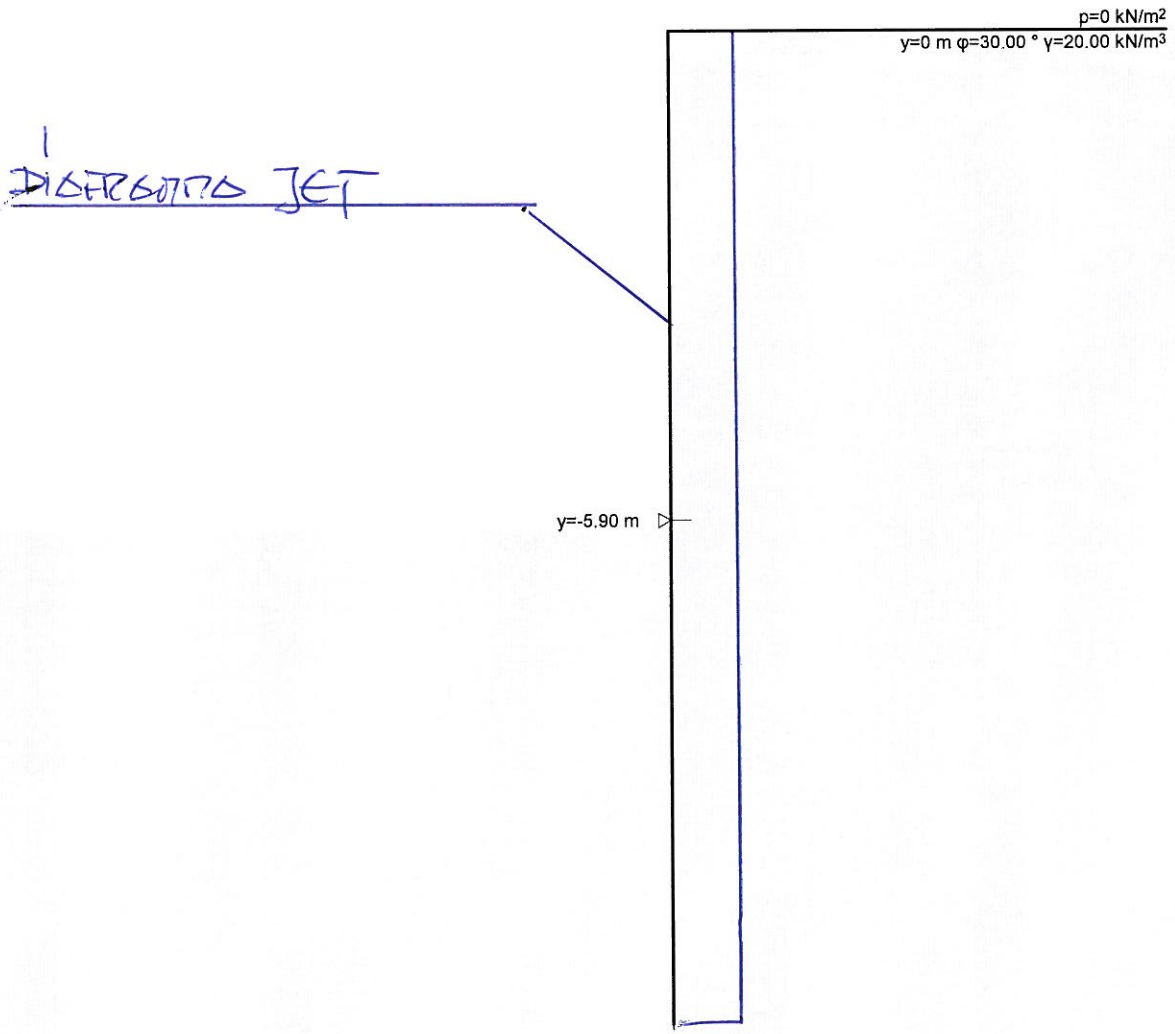
σ = N/A = 460000,0/2336,0 = 197,0 Mpa < 245,0 MPA

τ = Q/(h*b) = 0,150/(1,80*1,0) = 0,08 Mpa (valore sufficientemente basso)


Pila esistente
Blocco in cemento armato 1,80m/0,70m
12,0m
1,80m
Micropali ad interasse i = 1,0m
101,0/8,0mm in Fe 510B

Baugrundmodell (System)

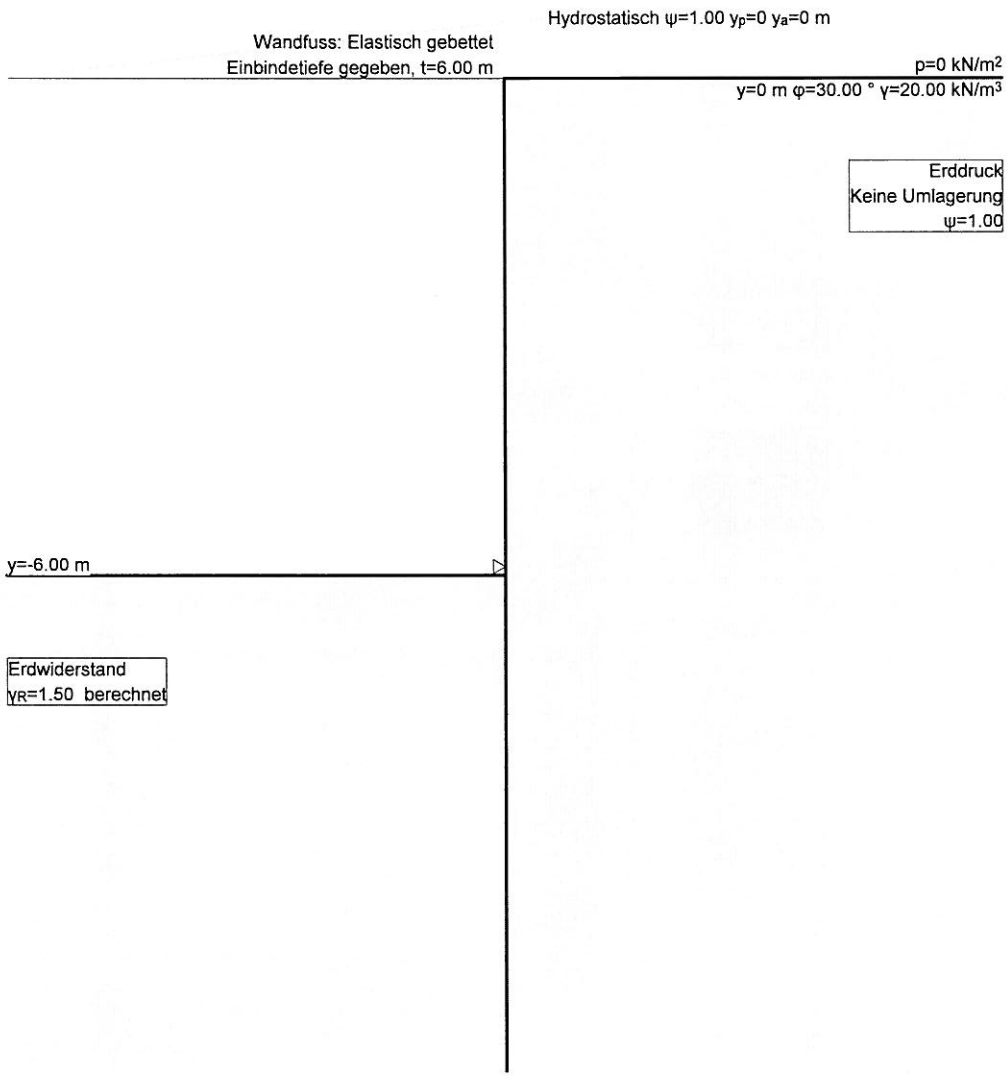
Mstb. 1 :91.3



Nr.:

Baugrundmodell (Etappe)

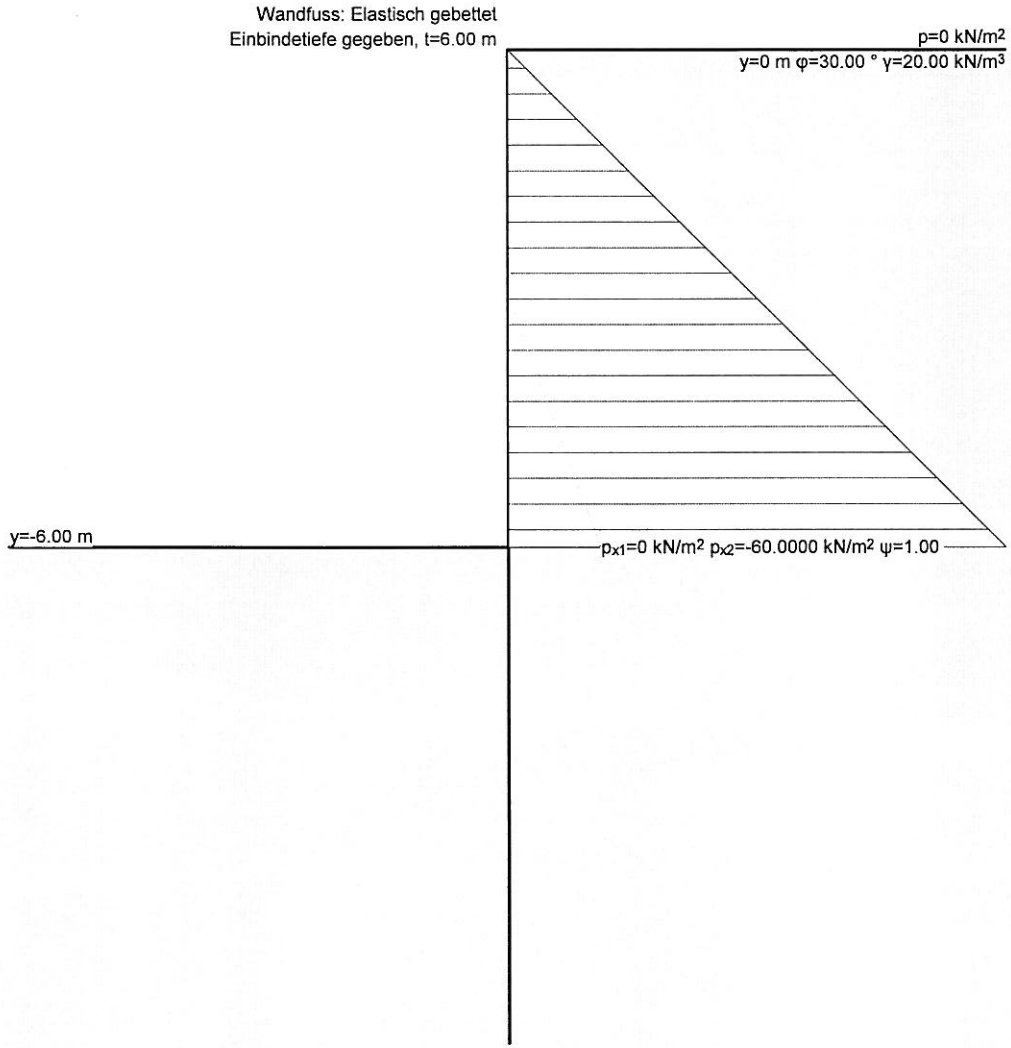
Mstb. 1 :91.3



Nr.:

Lasten

Mstb. 1 :91.3



C:\aprojekt\mincio\Verbau Mincio\Jetgrouting Mincio.L4G

R E S U L T A T E E T A P P E 1

Gefährdungsbild: Standard-Gefährdungsbild

Wandtyp: geschlossene Wand

ERDDRUCKBEIWERTE DER BODENSCHICHTEN

y [m]	gamma [kN/m³]	phi [°]	ca [kN/m²]	cp [kN/m²]	Kah	K0h	Kph
0.00	20.00	30.00	0.00	0.00	0.2794	0.5000	

Wandreibungswinkel aktiv = 0.667*phi passiv = -0.500*phi
Neigungen: Wand = 0.00° Terrain = 0.00° Sohle = 0.00°

WANDDRÜCKE

y [m]	Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.0000	0.0000	5.0000	0.0000	0.0000	-0.0000	5.0000
-1.7897	5.0000	5.0000	17.8967	0.0000	-0.0000	22.8967
-5.9000	16.4835	16.4835	59.0000	0.0000	-0.0000	75.4835
-6.0000	16.7629	16.7629	60.0000	0.0000	-0.0000	76.7629
-6.0000	16.7629	16.7629	0.0000	0.0000	-0.0000	16.7629
-6.3000	17.6010	17.6010	0.0000	0.0000	-0.0000	17.6010
-6.3000	17.6010	17.6010	0.0000	0.0000	-0.0090	17.5920
-6.9000	19.2773	19.2773	0.0000	0.0000	-0.0090	19.2683
-6.9000	19.2773	19.2773	0.0000	0.0000	-0.0853	19.1920
-7.5000	20.9536	20.9536	0.0000	0.0000	-0.0853	20.8683
-7.5000	20.9536	20.9536	0.0000	0.0000	-0.2692	20.6844
-8.1000	22.6299	22.6299	0.0000	0.0000	-0.2692	22.3607
-8.1000	22.6299	22.6299	0.0000	0.0000	-0.5874	22.0425
-8.7000	24.3062	24.3062	0.0000	0.0000	-0.5874	23.7188
-8.7000	24.3062	24.3062	0.0000	0.0000	-1.0580	23.2482
-9.3000	25.9825	25.9825	0.0000	0.0000	-1.0580	24.9245
-9.3000	25.9825	25.9825	0.0000	0.0000	-1.6915	24.2910
-9.9000	27.6588	27.6588	0.0000	0.0000	-1.6915	25.9673

y [m]	Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.0000	0.0000	5.0000	0.0000	0.0000	-0.0000	5.0000
-9.9000	27.6588	27.6588	0.0000	0.0000	-2.4925	25.1663
-10.5000	29.3350	29.3350	0.0000	0.0000	-2.4925	26.8425
-10.5000	29.3350	29.3350	0.0000	0.0000	-3.4614	25.8737
-11.1000	31.0113	31.0113	0.0000	0.0000	-3.4614	27.5499
-11.1000	31.0113	31.0113	0.0000	0.0000	-4.5958	26.4155
-11.7000	32.6876	32.6876	0.0000	0.0000	-4.5958	28.0918
-11.7000	32.6876	32.6876	0.0000	0.0000	-5.8926	26.7950
-12.0000	33.5258	33.5258	0.0000	0.0000	-5.8926	27.6331

Legende:
Da: Aktiver Erddruck (Kennwertniveau)
Du: Umgelagerter Erddruck
Do: Nicht umgelagerter Erddruck
Dw: Wasserdruck
Ew: Erdwiderstand
Dr: Resultierender Erddruck

ABSTÜTZUNGEN

y [m]	horizontale Komponente [kN/m]	Kraft [kN/m]
-5.9000	373.5	373.5

VERSCHIEBUNGEN UND SCHNITTKRÄFTE

y [m]	Vx [kN/m]	Mz [kNm/m]	Dx [mm]	Rz
0.0000	0.0	0.0	-0.2	0.0001
-0.5000	-3.7	-0.8	-0.2	0.0001
-1.0000	-10.0	-4.2	-0.2	0.0001
-1.5000	-18.7	-11.2	-0.1	0.0001
-1.7897	-25.0	-17.6	-0.1	0.0001
-1.7897	-25.0	-17.6	-0.1	0.0001
-2.2897	-38.0	-33.2	-0.1	0.0001
-2.7897	-54.3	-56.1	-0.0	0.0001
-3.2897	-73.7	-88.0	-0.0	0.0001
-3.7897	-96.3	-130.3	0.0	0.0000

y [m]	Vx [kN/m]	Mz [kNm/m]	Dx [mm]	Rz
-4.2897	-122.2	-184.8	0.0	0.0000
-4.7897	-151.2	-253.1	0.0	0.0000
-5.2897	-183.5	-336.6	0.0	-0.0000
-5.7897	-218.9	-437.1	0.0	-0.0001
-5.9000	-227.2	-461.7	-0.0	-0.0001
-5.9000	146.4	-461.7	-0.0	-0.0001
-6.0000	138.8	-447.4	-0.0	-0.0001
-6.0000	138.8	-447.4	-0.0	-0.0001
-6.3000	133.6	-406.5	-0.0	-0.0001
-6.3000	133.6	-406.5	-0.0	-0.0001
-6.8000	124.5	-342.0	-0.1	-0.0001
-6.9000	122.6	-329.6	-0.1	-0.0002
-6.9000	122.6	-329.6	-0.1	-0.0002
-7.4000	112.6	-270.8	-0.2	-0.0002
-7.5000	110.5	-259.6	-0.2	-0.0002
-7.5000	110.7	-259.6	-0.2	-0.0002
-8.0000	99.9	-206.9	-0.3	-0.0002
-8.1000	97.6	-197.1	-0.3	-0.0002
-8.1000	98.0	-197.1	-0.3	-0.0002
-8.6000	86.3	-151.0	-0.4	-0.0002
-8.7000	83.9	-142.4	-0.5	-0.0002
-8.7000	84.5	-142.4	-0.5	-0.0002
-9.2000	72.0	-103.3	-0.6	-0.0002
-9.3000	69.5	-96.2	-0.6	-0.0002
-9.3000	70.5	-96.2	-0.6	-0.0002
-9.8000	57.1	-64.3	-0.7	-0.0003
-9.9000	54.4	-58.7	-0.8	-0.0003
-9.9000	55.9	-58.7	-0.8	-0.0003
-10.4000	41.7	-34.3	-0.9	-0.0003
-10.5000	38.8	-30.2	-0.9	-0.0003
-10.5000	40.9	-30.2	-0.9	-0.0003
-11.0000	25.8	-13.5	-1.1	-0.0003

y [m]	Vx [kN/m]	Mz [kNm/m]	Dx [mm]	Rz
-11.1000	22.7	-11.1	-1.1	-0.0003
-11.1000	25.5	-11.1	-1.1	-0.0003
-11.6000	9.7	-2.3	-1.2	-0.0003
-11.7000	6.4	-1.5	-1.2	-0.0003
-11.7000	9.9	-1.5	-1.2	-0.0003
-12.0000	-0.0	-0.0	-1.3	-0.0003

Legende:
Vx: Querkräfte
Mz: Momente
Dx: Deformationen
Rz: Verdrehung

RESULTATE FÜR DIE WANDBEMESSUNG

Extremal- und zugehörige Schnittkräfte:
- Maximales Mz= 0.0 [kNm/m] (zugehörige Vx= 0.0 [kN/m])
- Minimales Mz= -461.7 [kNm/m] (zugehörige Vx= 146.4 [kN/m])
- Maximale Vx= 146.4 [kN/m] (zugehöriges Mz= -461.7 [kNm/m])
- Minimale Vx= -227.2 [kN/m] (zugehöriges Mz= -461.7 [kNm/m])

Belastungsnullpunkt = 0.000 [m] (ab Sohle)
Einbindetiefe = 6.000 [m]

Resultierende Vertikalkraft = -140.365 [kN/m]

G R E N Z W E R T E bis E T A P P E 1

GRENZWERTE DER VERSCHIEDENEN WANDDRÜCKE

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	5.000	0.000	0.000	-0.000	5.000
0.000	Max	0.000	5.000	0.000	0.000	-0.000	5.000
-0.500	Min	1.397	5.000	5.000	0.000	-0.000	10.000
-0.500	Max	1.397	5.000	5.000	0.000	-0.000	10.000
-1.000	Min	2.794	5.000	10.000	0.000	-0.000	15.000
-1.000	Max	2.794	5.000	10.000	0.000	-0.000	15.000
-1.500	Min	4.191	5.000	15.000	0.000	-0.000	20.000
-1.500	Max	4.191	5.000	15.000	0.000	-0.000	20.000
-1.790	Min	5.000	5.000	17.897	0.000	-0.000	22.897
-1.790	Max	5.000	5.000	17.897	0.000	-0.000	22.897
-2.290	Min	6.397	6.397	22.897	0.000	-0.000	29.294
-2.290	Max	6.397	6.397	22.897	0.000	-0.000	29.294
-2.790	Min	7.794	7.794	27.897	0.000	-0.000	35.690
-2.790	Max	7.794	7.794	27.897	0.000	-0.000	35.690
-3.290	Min	9.191	9.191	32.897	0.000	-0.000	42.087
-3.290	Max	9.191	9.191	32.897	0.000	-0.000	42.087
-3.790	Min	10.588	10.588	37.897	0.000	-0.000	48.484
-3.790	Max	10.588	10.588	37.897	0.000	-0.000	48.484
-4.290	Min	11.985	11.985	42.897	0.000	-0.000	54.881
-4.290	Max	11.985	11.985	42.897	0.000	-0.000	54.881
-4.790	Min	13.381	13.381	47.897	0.000	-0.000	61.278
-4.790	Max	13.381	13.381	47.897	0.000	-0.000	61.278
-5.290	Min	14.778	14.778	52.897	0.000	-0.000	67.675
-5.290	Max	14.778	14.778	52.897	0.000	-0.000	67.675
-5.790	Min	16.175	16.175	57.897	0.000	-0.000	74.072
-5.790	Max	16.175	16.175	57.897	0.000	-0.000	74.072

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	5.000	0.000	0.000	-0.000	5.000
-5.900	Min	16.483	16.483	59.000	0.000	-0.000	75.483
-5.900	Max	16.483	16.483	59.000	0.000	-0.000	75.483
-5.900	Min	16.483	16.483	59.000	0.000	-0.000	75.483
-5.900	Max	16.483	16.483	59.000	0.000	-0.000	75.483
-6.000	Min	16.763	16.763	60.000	0.000	-0.000	76.763
-6.000	Max	16.763	16.763	60.000	0.000	-0.000	76.763
-6.000	Min	16.763	16.763	0.000	0.000	-0.000	16.763
-6.000	Max	16.763	16.763	0.000	0.000	-0.000	16.763
-6.300	Min	17.601	17.601	0.000	0.000	-0.000	17.601
-6.300	Max	17.601	17.601	0.000	0.000	-0.000	17.601
-6.300	Min	17.601	17.601	0.000	0.000	-0.009	17.601
-6.300	Max	17.601	17.601	0.000	0.000	-0.009	17.601
-6.800	Min	18.998	18.998	0.000	0.000	-0.009	18.998
-6.800	Max	18.998	18.998	0.000	0.000	-0.009	18.998
-6.900	Min	19.277	19.277	0.000	0.000	-0.009	19.277
-6.900	Max	19.277	19.277	0.000	0.000	-0.009	19.277
-6.900	Min	19.277	19.277	0.000	0.000	-0.085	19.277
-6.900	Max	19.277	19.277	0.000	0.000	-0.085	19.277
-7.400	Min	20.674	20.674	0.000	0.000	-0.085	20.674
-7.400	Max	20.674	20.674	0.000	0.000	-0.085	20.674
-7.500	Min	20.954	20.954	0.000	0.000	-0.085	20.954
-7.500	Max	20.954	20.954	0.000	0.000	-0.085	20.954
-7.500	Min	20.954	20.954	0.000	0.000	-0.269	20.954
-7.500	Max	20.954	20.954	0.000	0.000	-0.269	20.954
-8.000	Min	22.351	22.351	0.000	0.000	-0.269	22.351
-8.000	Max	22.351	22.351	0.000	0.000	-0.269	22.351
-8.100	Min	22.630	22.630	0.000	0.000	-0.269	22.630
-8.100	Max	22.630	22.630	0.000	0.000	-0.269	22.630
-8.100	Min	22.630	22.630	0.000	0.000	-0.587	22.630
-8.100	Max	22.630	22.630	0.000	0.000	-0.587	22.630
-8.600	Min	24.027	24.027	0.000	0.000	-0.587	24.027

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	5.000	0.000	0.000	-0.000	5.000
-8.600	Max	24.027	24.027	0.000	0.000	-0.587	24.027
-8.700	Min	24.306	24.306	0.000	0.000	-0.587	24.306
-8.700	Max	24.306	24.306	0.000	0.000	-0.587	24.306
-8.700	Min	24.306	24.306	0.000	0.000	-1.058	24.306
-8.700	Max	24.306	24.306	0.000	0.000	-1.058	24.306
-9.200	Min	25.703	25.703	0.000	0.000	-1.058	25.703
-9.200	Max	25.703	25.703	0.000	0.000	-1.058	25.703
-9.300	Min	25.982	25.982	0.000	0.000	-1.058	25.982
-9.300	Max	25.982	25.982	0.000	0.000	-1.058	25.982
-9.300	Min	25.982	25.982	0.000	0.000	-1.691	25.982
-9.300	Max	25.982	25.982	0.000	0.000	-1.691	25.982
-9.800	Min	27.379	27.379	0.000	0.000	-1.691	27.379
-9.800	Max	27.379	27.379	0.000	0.000	-1.691	27.379
-9.900	Min	27.659	27.659	0.000	0.000	-1.691	27.659
-9.900	Max	27.659	27.659	0.000	0.000	-1.691	27.659
-9.900	Min	27.659	27.659	0.000	0.000	-2.493	27.659
-9.900	Max	27.659	27.659	0.000	0.000	-2.493	27.659
-10.400	Min	29.056	29.056	0.000	0.000	-2.493	29.056
-10.400	Max	29.056	29.056	0.000	0.000	-2.493	29.056
-10.500	Min	29.335	29.335	0.000	0.000	-2.493	29.335
-10.500	Max	29.335	29.335	0.000	0.000	-2.493	29.335
-10.500	Min	29.335	29.335	0.000	0.000	-3.461	29.335
-10.500	Max	29.335	29.335	0.000	0.000	-3.461	29.335
-11.000	Min	30.732	30.732	0.000	0.000	-3.461	30.732
-11.000	Max	30.732	30.732	0.000	0.000	-3.461	30.732
-11.100	Min	31.011	31.011	0.000	0.000	-3.461	31.011
-11.100	Max	31.011	31.011	0.000	0.000	-3.461	31.011
-11.100	Min	31.011	31.011	0.000	0.000	-4.596	31.011
-11.100	Max	31.011	31.011	0.000	0.000	-4.596	31.011
-11.600	Min	32.408	32.408	0.000	0.000	-4.596	32.408
-11.600	Max	32.408	32.408	0.000	0.000	-4.596	32.408

y [m]		Da [kN/m²]	Du [kN/m²]	Do [kN/m²]	Dw [kN/m²]	Ew [kN/m²]	Dr [kN/m²]
0.000	Min	0.000	5.000	0.000	0.000	-0.000	5.000
-11.700	Min	32.688	32.688	0.000	0.000	-4.596	32.688
-11.700	Max	32.688	32.688	0.000	0.000	-4.596	32.688
-11.700	Min	32.688	32.688	0.000	0.000	-5.893	32.688
-11.700	Max	32.688	32.688	0.000	0.000	-5.893	32.688
-12.000	Min	33.526	33.526	0.000	0.000	-5.893	33.526
-12.000	Max	33.526	33.526	0.000	0.000	-5.893	33.526

Legende:
Da: Aktiver Erddruck (Kennwertniveau)
Du: Umgelagerter Erddruck
Do: Nicht umgelagerter Erddruck
Dw: Wasserdruck
Ew: Erdwiderstand
Dr: Resultierender Erddruck

ABSTÜTZUNGEN (Maximalwerte)

y [m]	horizontale Komponente [kN/m]	Kraft [kN/m]
-5.900	373.5	373.5

GRENZWERTE DER WANDDRÜCKE, VERSCHIEBUNGEN UND SCHNITTKRÄFTE

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
0.000	Min	5.000	-0.2	0.0	0.0
0.000	Max	5.000	-0.2	0.0	0.0
-0.500	Min	10.000	-0.2	-3.7	-0.8
-0.500	Max	10.000	-0.2	-3.7	-0.8
-1.000	Min	15.000	-0.2	-10.0	-4.2
-1.000	Max	15.000	-0.2	-10.0	-4.2
-1.500	Min	20.000	-0.1	-18.7	-11.2
-1.500	Max	20.000	-0.1	-18.7	-11.2
-1.790	Min	22.897	-0.1	-25.0	-17.6
-1.790	Max	22.897	-0.1	-25.0	-17.6

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
-2.290	Min	29.294	-0.1	-38.0	-33.2
-2.290	Max	29.294	-0.1	-38.0	-33.2
-2.790	Min	35.690	-0.0	-54.3	-56.1
-2.790	Max	35.690	-0.0	-54.3	-56.1
-3.290	Min	42.087	-0.0	-73.7	-88.0
-3.290	Max	42.087	-0.0	-73.7	-88.0
-3.790	Min	48.484	0.0	-96.3	-130.3
-3.790	Max	48.484	0.0	-96.3	-130.3
-4.290	Min	54.881	0.0	-122.2	-184.8
-4.290	Max	54.881	0.0	-122.2	-184.8
-4.790	Min	61.278	0.0	-151.2	-253.1
-4.790	Max	61.278	0.0	-151.2	-253.1
-5.290	Min	67.675	0.0	-183.5	-336.6
-5.290	Max	67.675	0.0	-183.5	-336.6
-5.790	Min	74.072	0.0	-218.9	-437.1
-5.790	Max	74.072	0.0	-218.9	-437.1
-5.900	Min	75.483	-0.0	-227.2	-461.7
-5.900	Max	75.483	-0.0	-227.2	-461.7
-5.900	Min	75.483	-0.0	146.4	-461.7
-5.900	Max	75.483	-0.0	146.4	-461.7
-6.000	Min	76.763	-0.0	138.8	-447.4
-6.000	Max	76.763	-0.0	138.8	-447.4
-6.000	Min	16.763	-0.0	138.8	-447.4
-6.000	Max	16.763	-0.0	138.8	-447.4
-6.300	Min	17.601	-0.0	133.6	-406.5
-6.300	Max	17.601	-0.0	133.6	-406.5
-6.300	Min	17.601	-0.0	133.6	-406.5
-6.300	Max	17.601	-0.0	133.6	-406.5
-6.800	Min	18.998	-0.1	124.5	-342.0
-6.800	Max	18.998	-0.1	124.5	-342.0

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
-6.900	Min	19.277	-0.1	122.6	-329.6
-6.900	Max	19.277	-0.1	122.6	-329.6
-6.900	Min	19.277	-0.1	122.6	-329.6
-6.900	Max	19.277	-0.1	122.6	-329.6
-7.400	Min	20.674	-0.2	112.6	-270.8
-7.400	Max	20.674	-0.2	112.6	-270.8
-7.500	Min	20.954	-0.2	110.5	-259.6
-7.500	Max	20.954	-0.2	110.5	-259.6
-7.500	Min	20.954	-0.2	110.7	-259.6
-7.500	Max	20.954	-0.2	110.7	-259.6
-8.000	Min	22.351	-0.3	99.9	-206.9
-8.000	Max	22.351	-0.3	99.9	-206.9
-8.100	Min	22.630	-0.3	97.6	-197.1
-8.100	Max	22.630	-0.3	97.6	-197.1
-8.100	Min	22.630	-0.3	98.0	-197.1
-8.100	Max	22.630	-0.3	98.0	-197.1
-8.600	Min	24.027	-0.4	86.3	-151.0
-8.600	Max	24.027	-0.4	86.3	-151.0
-8.700	Min	24.306	-0.5	83.9	-142.4
-8.700	Max	24.306	-0.5	83.9	-142.4
-8.700	Min	24.306	-0.5	84.5	-142.4
-8.700	Max	24.306	-0.5	84.5	-142.4
-9.200	Min	25.703	-0.6	72.0	-103.3
-9.200	Max	25.703	-0.6	72.0	-103.3
-9.300	Min	25.982	-0.6	69.5	-96.2
-9.300	Max	25.982	-0.6	69.5	-96.2
-9.300	Min	25.982	-0.6	70.5	-96.2
-9.300	Max	25.982	-0.6	70.5	-96.2
-9.800	Min	27.379	-0.7	57.1	-64.3
-9.800	Max	27.379	-0.7	57.1	-64.3
-9.900	Min	27.659	-0.8	54.4	-58.7

y [m]		Dr [kN/m²]	Dx [mm]	Vx [kN/m]	Mz [kNm/m]
-9.900	Max	27.659	-0.8	54.4	-58.7
-9.900	Min	27.659	-0.8	55.9	-58.7
-9.900	Max	27.659	-0.8	55.9	-58.7
-10.400	Min	29.056	-0.9	41.7	-34.3
-10.400	Max	29.056	-0.9	41.7	-34.3
-10.500	Min	29.335	-0.9	38.8	-30.2
-10.500	Max	29.335	-0.9	38.8	-30.2
-10.500	Min	29.335	-0.9	40.9	-30.2
-10.500	Max	29.335	-0.9	40.9	-30.2
-11.000	Min	30.732	-1.1	25.8	-13.5
-11.000	Max	30.732	-1.1	25.8	-13.5
-11.100	Min	31.011	-1.1	22.7	-11.1
-11.100	Max	31.011	-1.1	22.7	-11.1
-11.100	Min	31.011	-1.1	25.5	-11.1
-11.100	Max	31.011	-1.1	25.5	-11.1
-11.600	Min	32.408	-1.2	9.7	-2.3
-11.600	Max	32.408	-1.2	9.7	-2.3
-11.700	Min	32.688	-1.2	6.4	-1.5
-11.700	Max	32.688	-1.2	6.4	-1.5
-11.700	Min	32.688	-1.2	9.9	-1.5
-11.700	Max	32.688	-1.2	9.9	-1.5
-12.000	Min	33.526	-1.3	-0.0	-0.0
-12.000	Max	33.526	-1.3	-0.0	-0.0

Legende:
Dr: Resultierender Erddruck
Dx: Deformationen
Vx: Querkräfte
Mz: Momente

```
GRENZWERTE DER RESULTATE FÜR DIE WANDBEMESSUNG
-----------------------------------------------------------------------
Extremal- und zugehörige Schnittkräfte:
- Maximales Mz=     0.0 [kNm/m]     (zugehörige  Vx=     0.0 [kN/m])
- Minimales Mz=  -461.7 [kNm/m]     (zugehörige  Vx=   146.4 [kN/m])
- Maximale  Vx=   146.4 [kN/m]      (zugehöriges Mz=  -461.7 [kNm/m])
- Minimale  Vx=  -227.2 [kN/m]      (zugehöriges Mz=  -461.7 [kNm/m])

Belastungsnullpunkt              =      0.000 [m]     (ab Sohle)
Erforderliche Kote UK_Wand       =    -12.000 [m]
Max. resultierende Vertikalkraft =      0.000 [kN/m]
Min. resultierende Vertikalkraft =   -140.365 [kN/m]
```

INDICE

EINGABEDATEN BAUGRUNDMODELL

BODENSCHICHTGRENZEN ϕ=30.00 [°] γ=20.00 [kN/m³] c=0.00 [kN/m²]

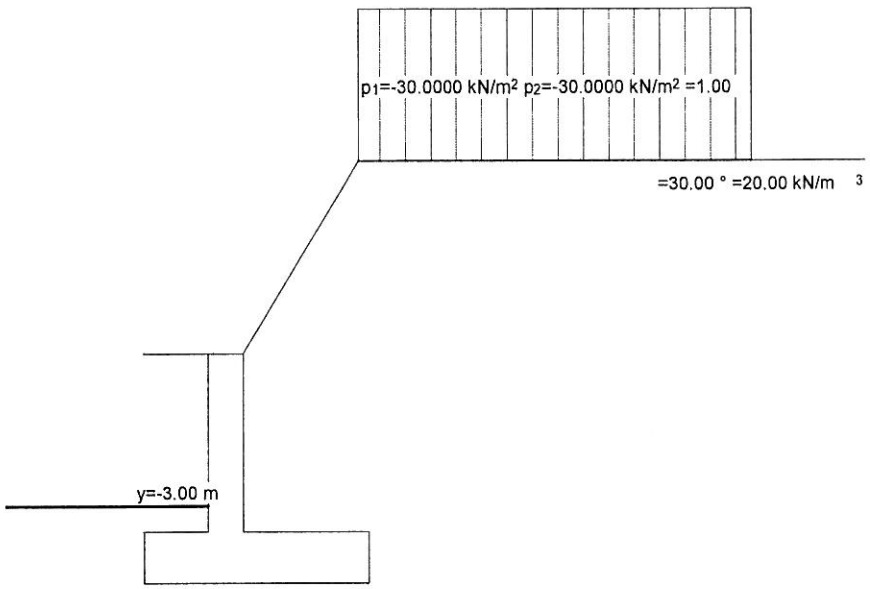
	x [m]	y [m]		x [m]	y [m]		x [m]	y [m]
1	0.00	0.00	2	2.29	3.80	3	10.44	3.80

TALSEITIGES TERRAIN

y [m]	Horizontal
-3.00	

Lasten

Mstb. 1 :149.3



EINGABEDATEN LASTEN

FLÄCHENLAST BODEN

x_1 [m]	y_1 [m]	x_2 [m]	y_2 [m]	p_1 [kN/m²]	p_2 [kN/m²]	Richtung
2.29	3.80	10.12	3.80	-30.00	-30.00	Y

Lastfaktoren: A:1.00 ψ

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

G R E N Z W E R T E

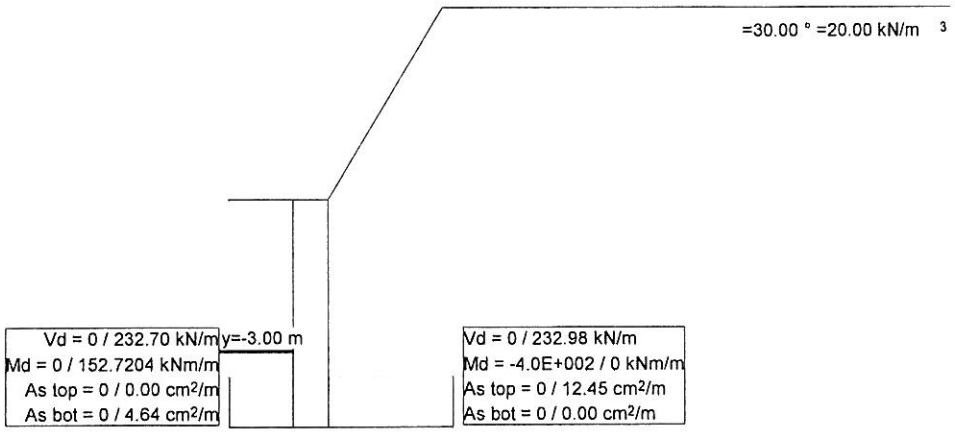
y [m]	Nd (-)	[kN/m] (+)	Vd (-)	[kN/m] (+)
0.00	0.00	0.00	-33.31	0.00
-0.33	-8.75	0.00	-49.50	0.00
-0.67	-17.50	0.00	-67.15	0.00
-1.00	-26.25	0.00	-86.17	0.00
-1.31	-34.45	0.00	-102.33	0.00
-1.63	-42.66	0.00	-123.68	0.00
-1.94	-50.86	0.00	-146.29	0.00
-2.25	-59.06	0.00	-165.20	0.00
-2.56	-67.27	0.00	-190.00	0.00
-2.88	-75.47	0.00	-215.98	0.00
-3.19	-83.67	0.00	-237.51	0.00
-3.50	-91.88	0.00	-265.60	0.00
Fundament talseitig:				
-4.50	-	-	0.00	232.70
Fundament bergseitig:				
-4.50	-	-	0.00	232.98

y [m]	Md (-)	[kNm/m] (+)	As (-)	[cm²/m] (+)
0.00	0.0000	12.6730	0.00	0.55
-0.33	0.0000	26.0979	0.00	1.01
-0.67	0.0000	45.1132	0.00	1.72
-1.00	0.0000	70.1871	0.00	2.71
-1.31	0.0000	99.5937	0.00	3.91
-1.63	0.0000	135.0831	0.00	5.39
-1.94	0.0000	176.9530	0.00	7.18
-2.25	0.0000	225.5915	0.00	9.28
-2.56	0.0000	281.3286	0.00	11.74
-2.88	0.0000	344.4355	0.00	14.55
-3.19	0.0000	415.2899	0.00	17.75
-3.50	0.0000	494.2134	0.00	21.37
Fundament talseitig:				
-4.50	0.0000	152.7204	0.00	4.64
Fundament bergseitig:				
-4.50	-404.5248	0.0000	12.45	0.00

SICHERHEITEN:
Kippen = 3.20
Gleiten = 1.46
Grundbruch = 2.42
Verdrehung = 0.48

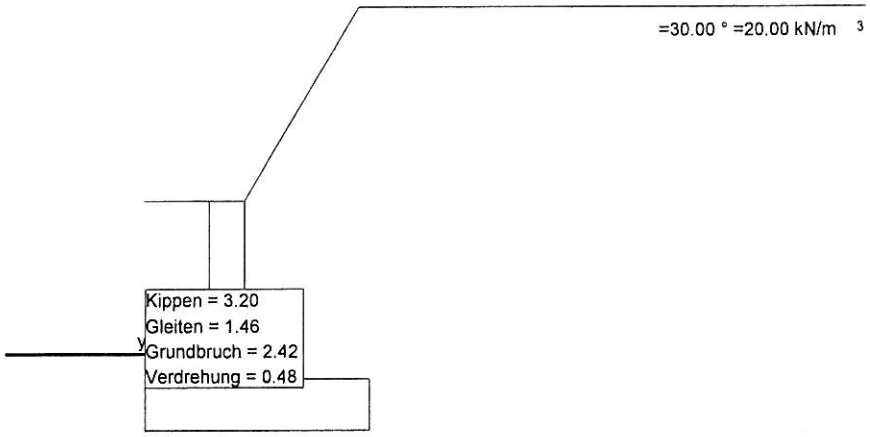
Grenzwerte Fundamentresultate

Mstb. 1 :149.3



Grenzwerte Sicherheiten

Mstb. 1 :149.3



RESULTATE

Gefährdungsbild: Standard-Gefährdungsbild

MAUERDRÜCKE

Wirkungspunkt Y-Koord [m]	Wirkungspunkt X-Koord [m]	aktiver Erddruck hor [kN/m²]	aktiver Erddruck ver [kN/m²]	Neigung [ø]	erh D/ akt D [-]	erhöhter Erddruck hor [kN/m²]	erhöhter Erddruck ver [kN/m²]
0.8514	0.5145	20.8042	29.1954	54.5268	1.0000	20.8042	29.1954
0.5167	0.6672	20.8042	29.1954	54.5268	1.0000	20.8042	29.1954
0.5167	0.6672	27.2465	38.2361	54.5268	1.0000	27.2465	38.2361
0.1820	0.8199	27.2465	38.2361	54.5268	1.0000	27.2465	38.2361
0.1820	0.8199	30.4761	42.7682	54.5268	1.0000	30.4761	42.7682
-0.1528	0.9727	30.4761	42.7682	54.5268	1.0000	30.4761	42.7682
-0.1528	0.9727	33.4475	46.9381	54.5268	1.0000	33.4475	46.9381
-0.4875	1.1254	33.4475	46.9381	54.5268	1.0000	33.4475	46.9381
-0.4875	1.1254	36.2759	50.9074	54.5268	1.0000	36.2759	50.9074
-0.8222	1.2781	36.2759	50.9074	54.5268	1.0000	36.2759	50.9074
-0.8222	1.2781	38.9443	54.6520	54.5268	1.0000	38.9443	54.6520
-1.1569	1.4309	38.9443	54.6520	54.5268	1.0000	38.9443	54.6520
-1.1569	1.4309	41.5282	58.2781	54.5268	1.0000	41.5282	58.2781
-1.4917	1.5836	41.5282	58.2781	54.5268	1.0000	41.5282	58.2781
-1.4917	1.5836	44.0381	61.8004	54.5268	1.0000	44.0381	61.8004
-1.8264	1.7363	44.0381	61.8004	54.5268	1.0000	44.0381	61.8004
-1.8264	1.7363	46.4933	65.2459	54.5268	1.0000	46.4933	65.2459
-2.1611	1.8891	46.4933	65.2459	54.5268	1.0000	46.4933	65.2459
-2.1611	1.8891	48.9052	68.6305	54.5268	1.0000	48.9052	68.6305
-2.4958	2.0418	48.9052	68.6305	54.5268	1.0000	48.9052	68.6305
-2.4958	2.0418	51.2829	71.9672	54.5268	1.0000	51.2829	71.9672
-2.8306	2.1945	51.2829	71.9672	54.5268	1.0000	51.2829	71.9672
-2.8306	2.1945	53.5996	75.2184	54.5268	1.0000	53.5996	75.2184
-3.1653	2.3473	53.5996	75.2184	54.5268	1.0000	53.5996	75.2184
-3.1653	2.3473	55.9593	78.5299	54.5268	1.0000	55.9593	78.5299
-3.5000	2.5000	55.9593	78.5299	54.5268	1.0000	55.9593	78.5299
-3.5000	2.5000	51.9436	18.9068	20.0009	1.0000	51.9436	18.9068
-4.5000	2.5000	51.9436	18.9068	20.0009	1.0000	51.9436	18.9068

MAUERBEANSPRUCHNUNG

Wirkungspunkt Y-Koord [m]	Wirkungspunkt X-Koord [m]	Schnittkräfte Nd [kN/m]	Schnittkräfte Vd [kN/m]	Schnittkräfte Md [kNm/m]	Bewehrung Talseite [cm²/m]	Bewehrung Bergseite [cm²/m]
0.0000	-0.3500	-0.0	-33.3	12.7	0.00	0.55
-0.3333	-0.3500	-8.8	-49.5	26.1	0.00	1.01
-0.6667	-0.3500	-17.5	-67.1	45.1	0.00	1.72
-1.0000	-0.3500	-26.3	-86.2	70.2	0.00	2.71
-1.3125	-0.3500	-34.5	-102.3	99.6	0.00	3.91
-1.6250	-0.3500	-42.7	-123.7	135.1	0.00	5.39
-1.9375	-0.3500	-50.9	-146.3	177.0	0.00	7.18
-2.2500	-0.3500	-59.1	-165.2	225.6	0.00	9.28
-2.5625	-0.3500	-67.3	-190.0	281.3	0.00	11.74
-2.8750	-0.3500	-75.5	-216.0	344.4	0.00	14.55
-3.1875	-0.3500	-83.7	-237.5	415.3	0.00	17.75
-3.5000	-0.3500	-91.9	-265.6	494.2	0.00	21.37

FUNDAMENTBEANSPRUCHUNG

- Fundamentfussbreiten:
  Talseite: 1.275 [m]
  Bergseite: 2.500 [m]

- Lage und Grösse der resultierenden Fundationskraft:

Y-Koord [m]	X-Koord [m]	horizontal [kN/m]	vertikal [kN/m]
-4.5088	0.0452	-229.0	-580.2

- Mittlere Bodenkennwerte im Gleitsicherheitsnachweis (Bemessungsniveau):
  phi= 30.00 [°] c= 0.00 [kN/m²]

- Statischer Grundbruchnachweis nach Brinch Hansen (Bemessungsniveau):

Mittlere Bodenkennwerte u.Belastung				Bruchlinie		Reduz.
phi [°]	c [kN/m²]	gamma [kN/m3]	Üb.druck [kN/m²]	Länge [m]	Höhe [m]	Breite [m]
30.00	0.00	20.00	30.00	17.33	6.41	4.04

Tragfähigkeitsfaktoren:

	Nc	Ng	Nq
Grundfaktor	30.140	18.084	18.401
Korrekturfaktoren:			
Einbindetiefe	1.143	1.000	1.103
Lastneigung	0.295	0.199	0.333
Geländeneigung	1.000	1.000	1.000
Fundamentneigung	1.000	1.000	1.000
korrigierte Faktoren	10.153	3.590	6.761

- Weitere Fundationsresultate:

		Talseite	Bergseite	
Bodenpressungen	[kN/m²]:	167.44	91.88	keine klaffende Fuge
Setzungen	[mm] :	-14.50	-12.33	
Querkräfte Vd	[kN/m] :	232.70	232.98	
Momente Md	[kNm/m]:	152.72	-404.52	
Bewehrung oben	[cm²/m]:	0.00	12.45	
Bewehrung unten	[cm²/m]:	4.64	0.00	

- Nachweis der Aussenmittigkeit der Last (DIN 1054):
  Totale Fundationsbreite : b = 4.475 [m]
  Exzentrizität der Result. bez. Fundationsmitte : e = -0.217 [m]
  Ergebnis : e <= b/6 -> keine klaffende Fuge

- Sicherheiten und Verdrehung:

Kippen	Gleiten	Grundbruch	Winkelverdrehung (o/oo)
3.205	1.463	2.422	0.48

G R E N Z W E R T E

y [m]	Nd (-)	[kN/m] (+)	Vd (-)	[kN/m] (+)
0.00	0.00	0.00	-33.31	0.00
-0.33	-8.75	0.00	-49.50	0.00
-0.67	-17.50	0.00	-67.15	0.00
-1.00	-26.25	0.00	-86.17	0.00
-1.31	-34.45	0.00	-102.33	0.00
-1.63	-42.66	0.00	-123.68	0.00
-1.94	-50.86	0.00	-146.29	0.00
-2.25	-59.06	0.00	-165.20	0.00
-2.56	-67.27	0.00	-190.00	0.00
-2.88	-75.47	0.00	-215.98	0.00
-3.19	-83.67	0.00	-237.51	0.00
-3.50	-91.88	0.00	-265.60	0.00
Fundament talseitig:				
-4.50	-	-	0.00	232.70
Fundament bergseitig:				
-4.50	-	-	0.00	232.98

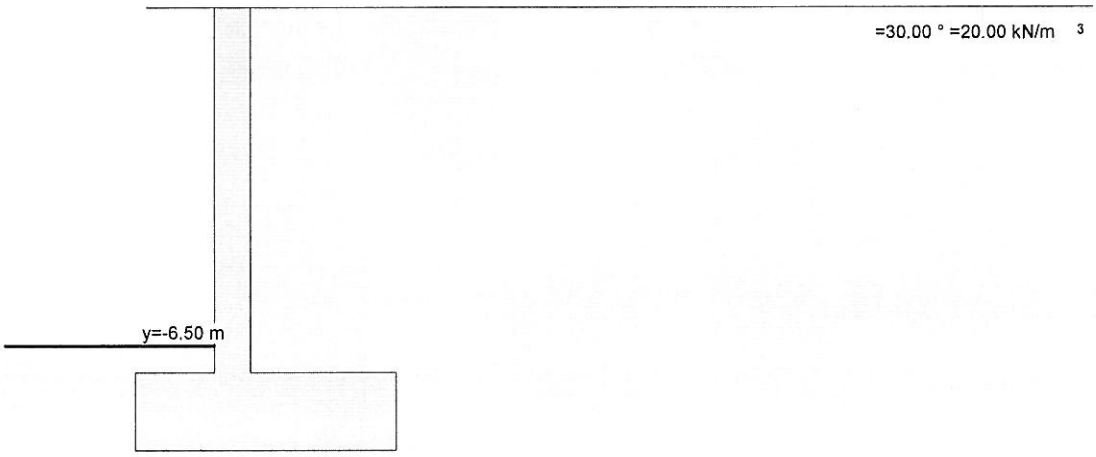
y [m]	Md (-)	[kNm/m] (+)	As²/m][cm (-)	(+)
0.00	0.0000	12.6730	0.00	0.55
-0.33	0.0000	26.0979	0.00	1.01
-0.67	0.0000	45.1132	0.00	1.72
-1.00	0.0000	70.1871	0.00	2.71
-1.31	0.0000	99.5937	0.00	3.91
-1.63	0.0000	135.0831	0.00	5.39
-1.94	0.0000	176.9530	0.00	7.18
-2.25	0.0000	225.5915	0.00	9.28

y [m]	Md [kNm/m] (-)	(+)	As [cm²/m] (-)	(+)
-2.56	0.0000	281.3286	0.00	11.74
-2.88	0.0000	344.4355	0.00	14.55
-3.19	0.0000	415.2899	0.00	17.75
-3.50	0.0000	494.2134	0.00	21.37
Fundament talseitig:				
-4.50	0.0000	152.7204	0.00	4.64
Fundament bergseitig:				
-4.50	-404.5248	0.0000	12.45	0.00

SICHERHEITEN:
Kippen = 3.20
Gleiten = 1.46
Grundbruch = 2.42
Verdrehung = 0.48

INDICE

Baugrundmodell Mstb. 1 :145.2



EINGABEDATEN BAUGRUNDMODELL

BODENSCHICHTGRENZEN ϕ=30.00 [°] γ=20.00 [kN/m³] c=0.00 [kN/m²]

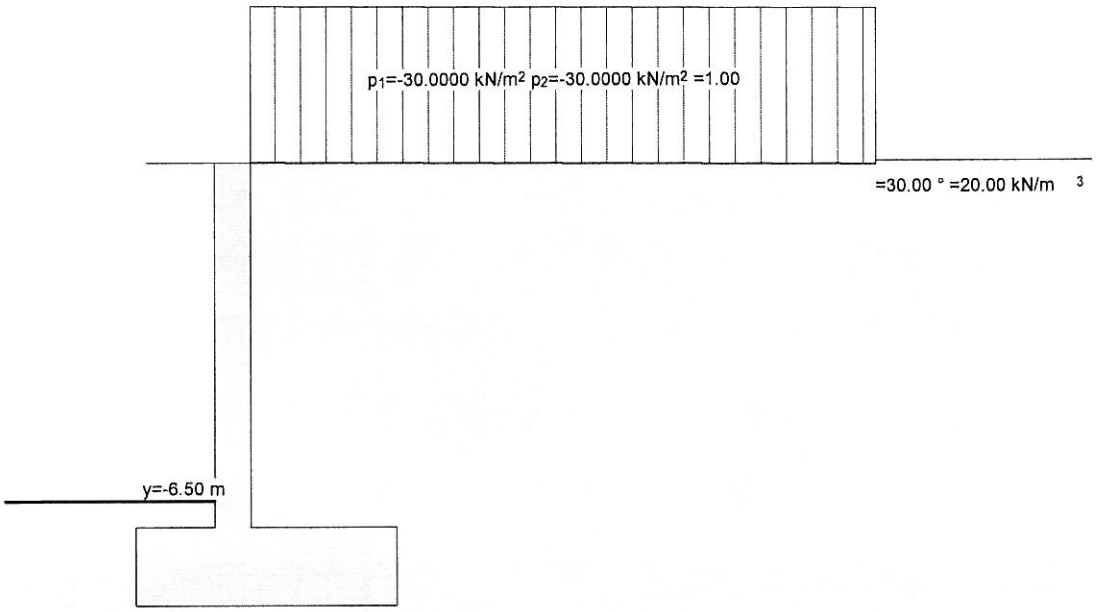
	x [m]	y [m]		x [m]	y [m]
1	0.00	0.00	2	14.21	0.00

TALSEITIGES TERRAIN

y [m]	Horizontal
-6.50	

Lasten

Mstb. 1 :145.2



EINGABEDATEN LASTEN

FLÄCHENLAST BODEN

x_1 [m]	y_1 [m]	x_2 [m]	y_2 [m]	p_1 [kN/m²]	p_2 [kN/m²]	Richtung
0.00	0.00	12.02	-0.06	-30.00	-30.00	Y

Lastfaktoren: A:1.00 ψ

GEFÄHRDUNGSBILDER

A : Standard-Gefährdungsbild

DARSTELLUNGSKONVENTIONEN FÜR LASTFAKTOREN

Beispiel: A:1.50 γ_Q/ψ, dabei bedeuten:

A : Gefährdungsbild A gemäss obiger Liste
1.50 : Lastfaktor gem. Programmeinstellung (siehe Berechnungsoptionen)
1.50 : Lokal veränderter Lastfaktor
γ_Q : Leiteinwirkung
ψ : Begleiteinwirkung

RESULTATE

Gefährdungsbild: Standard-Gefährdungsbild

MAUERDRÜCKE

Wirkungspunkt Y-Koord [m]	Wirkungspunkt X-Koord [m]	aktiver Erddruck hor [kN/m²]	aktiver Erddruck ver [kN/m²]	Neigung [ø]	erh D/ akt D [-]	erhöhter Erddruck hor [kN/m²]	erhöhter Erddruck ver [kN/m²]
0.0000	0.0000	14.8566	3.8416	14.4978	1.0000	14.8566	3.8416
-0.2500	0.0000	14.8566	3.8416	14.4978	1.0000	14.8566	3.8416
-0.2500	0.0000	11.1086	2.9863	15.0469	1.0000	11.1086	2.9863
-0.5000	0.0000	11.1086	2.9863	15.0469	1.0000	11.1086	2.9863
-0.5000	0.0000	13.3555	4.3127	17.8961	1.0000	13.3555	4.3127
-0.7500	0.0000	13.3555	4.3127	17.8961	1.0000	13.3555	4.3127

Wirkungspunkt Y-Koord [m]	Wirkungspunkt X-Koord [m]	aktiver Erddruck hor [kN/m²]	aktiver Erddruck ver [kN/m²]	Neigung [ø]	erh D/ akt D [-]	erhöhter Erddruck hor [kN/m²]	erhöhter Erddruck ver [kN/m²]
-0.7500	0.0000	13.3555	4.8213	19.8494	1.0000	13.3555	4.8213
-1.0000	0.0000	13.3555	4.8213	19.8494	1.0000	13.3555	4.8213
-1.0000	0.0000	14.6071	5.3168	20.0009	1.0000	14.6071	5.3168
-1.2372	0.0000	14.6071	5.3168	20.0009	1.0000	14.6071	5.3168
-1.2372	0.0000	15.9326	5.7993	20.0009	1.0000	15.9326	5.7993
-1.4743	0.0000	15.9326	5.7993	20.0009	1.0000	15.9326	5.7993
-1.4743	0.0000	17.2581	6.2817	20.0009	1.0000	17.2581	6.2817
-1.7115	0.0000	17.2581	6.2817	20.0009	1.0000	17.2581	6.2817
-1.7115	0.0000	18.5836	6.7642	20.0009	1.0000	18.5836	6.7642
-1.9487	0.0000	18.5836	6.7642	20.0009	1.0000	18.5836	6.7642
-1.9487	0.0000	24.6890	41.0893	59.0000	1.0000	24.6890	41.0893
-2.5801	0.3500	24.6890	41.0893	59.0000	1.0000	24.6890	41.0893
-2.5801	0.3500	29.0608	48.3653	59.0000	1.0000	29.0608	48.3653
-3.2115	0.7000	29.0608	48.3653	59.0000	1.0000	29.0608	48.3653
-3.2115	0.7000	33.3495	55.5029	59.0000	1.0000	33.3495	55.5029
-3.8429	1.0500	33.3495	55.5029	59.0000	1.0000	33.3495	55.5029
-3.8429	1.0500	37.6024	62.5808	59.0000	1.0000	37.6024	62.5808
-4.4743	1.4000	37.6024	62.5808	59.0000	1.0000	37.6024	62.5808
-4.4743	1.4000	41.8377	69.6297	59.0000	1.0000	41.8377	69.6297
-5.1057	1.7500	41.8377	69.6297	59.0000	1.0000	41.8377	69.6297
-5.1057	1.7500	46.0637	76.6629	59.0000	1.0000	46.0637	76.6629
-5.7372	2.1000	46.0637	76.6629	59.0000	1.0000	46.0637	76.6629
-5.7372	2.1000	50.2841	83.6868	59.0000	1.0000	50.2841	83.6868
-6.3686	2.4500	50.2841	83.6868	59.0000	1.0000	50.2841	83.6868
-6.3686	2.4500	54.5036	90.7093	59.0000	1.0000	54.5036	90.7093
-7.0000	2.8000	54.5036	90.7093	59.0000	1.0000	54.5036	90.7093
-7.0000	2.8000	51.6744	18.8088	20.0009	1.0000	51.6744	18.8088
-8.5000	2.8000	51.6744	18.8088	20.0009	1.0000	51.6744	18.8088

MAUERBEANSPRUCHNUNG

Wirkungspunkt Y-Koord [m]	Wirkungspunkt X-Koord [m]	Schnittkräfte Nd [kN/m]	Schnittkräfte Vd [kN/m]	Schnittkräfte Md [kNm/m]	Bewehrung Talseite [cm²/m]	Bewehrung Bergseite [cm²/m]
0.0000	-0.3500	-0.0	-0.0	0.0	0.00	0.00
-0.3333	-0.3500	-10.6	-7.2	0.6	0.00	0.00
-0.6667	-0.3500	-21.0	-12.7	3.3	0.00	0.00
-1.0000	-0.3500	-32.2	-19.8	7.9	0.00	0.00
-1.6667	-0.3500	-55.5	-35.5	24.1	0.00	0.23
-2.3333	-0.3500	-75.8	-57.4	53.7	0.00	1.25
-3.0000	-0.3500	-93.3	-83.3	100.9	0.00	3.11
-3.6667	-0.3500	-110.8	-119.5	167.9	0.00	5.90
-4.3333	-0.3500	-128.3	-154.4	257.9	0.00	9.78
-5.0000	-0.3500	-145.8	-193.2	373.6	0.00	14.93
-5.6667	-0.3500	-163.3	-236.0	518.1	0.00	21.52
-6.3333	-0.3500	-180.8	-292.4	694.6	0.00	29.78
-7.0000	-0.3500	-198.3	-344.0	905.8	0.00	39.95

FUNDAMENTBEANSPRUCHUNG

- Fundamentfussbreiten:
  Talseite: 1.500 [m]
  Bergseite: 2.800 [m]

- Lage und Grösse der resultierenden Fundationskraft:

Y-Koord [m]	X-Koord [m]	horizontal [kN/m]	vertikal [kN/m]
-8.5175	-0.3335	-306.8	-838.2

- Mittlere Bodenkennwerte im Gleitsicherheitsnachweis (Bemessungsniveau):
  phi= 30.00 [°] c= 0.00 [kN/m²]

- Statischer Grundbruchnachweis nach Brinch Hansen (Bemessungsniveau):

Mittlere Bodenkennwerte u.Belastung				Bruchlinie		Reduz.
phi [°]	c [kN/m²]	gamma [kN/m3]	Üb.druck [kN/m²]	Länge [m]	Höhe [m]	Breite [m]
30.00	0.00	20.00	40.00	16.01	5.92	3.73

Tragfähigkeitsfaktoren:

	Nc	Ng	Nq
Grundfaktor	30.140	18.084	18.401
Korrekturfaktoren:			
Einbindetiefe	1.197	1.000	1.142
Lastneigung	0.327	0.228	0.364
Geländeneigung	1.000	1.000	1.000
Fundamentneigung	1.000	1.000	1.000
korrigierte Faktoren	11.814	4.116	7.650

- Weitere Fundationsresultate:

		Talseite	Bergseite	
Bodenpressungen	[kN/m²]:	295.09	40.19	keine klaffende Fuge
Setzungen	[mm] :	-23.46	-15.29	
Querkräfte Vd	[kN/m] :	471.05	401.38	
Momente Md	[kNm/m]:	374.79	-701.35	
Bewehrung oben	[cm²/m]:	0.00	14.13	
Bewehrung unten	[cm²/m]:	7.49	0.00	

- Nachweis der Aussenmittigkeit der Last (DIN 1054):
  Totale Fundationsbreite : b = 5.000 [m]
  Exzentrizität der Result. bez. Fundationsmitte : e = -0.634 [m]
  Ergebnis : e <= b/6 -> keine klaffende Fuge

- Sicherheiten und Verdrehung:

Kippen	Gleiten	Grundbruch	Winkelverdrehung (o/oo)
2.555	1.577	2.047	1.63

G R E N Z W E R T E

y [m]	Nd [kN/m] (-)	Nd [kN/m] (+)	Vd [kN/m] (-)	Vd [kN/m] (+)
0.00	0.00	0.00	0.00	0.00
-0.33	-10.64	0.00	-7.24	0.00
-0.67	-21.03	0.00	-12.74	0.00
-1.00	-32.24	0.00	-19.75	0.00
-1.67	-55.48	0.00	-35.53	0.00
-2.33	-75.83	0.00	-57.40	0.00
-3.00	-93.33	0.00	-83.27	0.00
-3.67	-110.83	0.00	-119.55	0.00
-4.33	-128.33	0.00	-154.35	0.00
-5.00	-145.83	0.00	-193.18	0.00
-5.67	-163.33	0.00	-236.00	0.00
-6.33	-180.83	0.00	-292.36	0.00
-7.00	-198.33	0.00	-343.98	0.00
Fundament talseitig:				
-8.50	-	-	0.00	471.05
Fundament bergseitig:				
-8.50	-	-	0.00	401.38

y [m]	Md [kNm/m] (-)	Md [kNm/m] (+)	As [cm²/m] (-)	As [cm²/m] (+)
0.00	0.0000	0.0000	0.00	0.00
-0.33	0.0000	0.5552	0.00	0.00
-0.67	0.0000	3.2724	0.00	0.00
-1.00	0.0000	7.8876	0.00	0.00
-1.67	0.0000	24.1359	0.00	0.23
-2.33	0.0000	53.6828	0.00	1.25
-3.00	0.0000	100.8640	0.00	3.11

y [m]	Md [kNm/m] (-)	(+)	As [cm²/m] (-)	(+)
-3.67	0.0000	167.8964	0.00	5.90
-4.33	0.0000	257.8670	0.00	9.78
-5.00	0.0000	373.6211	0.00	14.93
-5.67	0.0000	518.1139	0.00	21.52
-6.33	0.0000	694.5603	0.00	29.78
-7.00	0.0000	905.7616	0.00	39.95
Fundament talseitig:				
-8.50	0.0000	374.7947	0.00	7.49
Fundament bergseitig:				
-8.50	-701.3482	0.0000	14.13	0.00

SICHERHEITEN:
Kippen = 2.56
Gleiten = 1.58
Grundbruch = 2.05
Verdrehung = 1.63

Grenzwerte Sicherheiten

Mstb. 1 :145.2