

VBOP- P34.
Sheet pile wall
User-defined section properties
Calculation basis:
No ep redistribution
Active ep according to: DIN 4085
Equivalent ep coefficient $k_{eq} [l] = 0.200$
Passive ep according to: DIN 4085 (new)
Section length of 20.10 m fixed and toe bedded
Subgrade support $f_d = 832.93 \text{ kN/m} <$
Earth pressure $e_d = 840.97 \text{ kN/m}$
Req. section length = 20.10

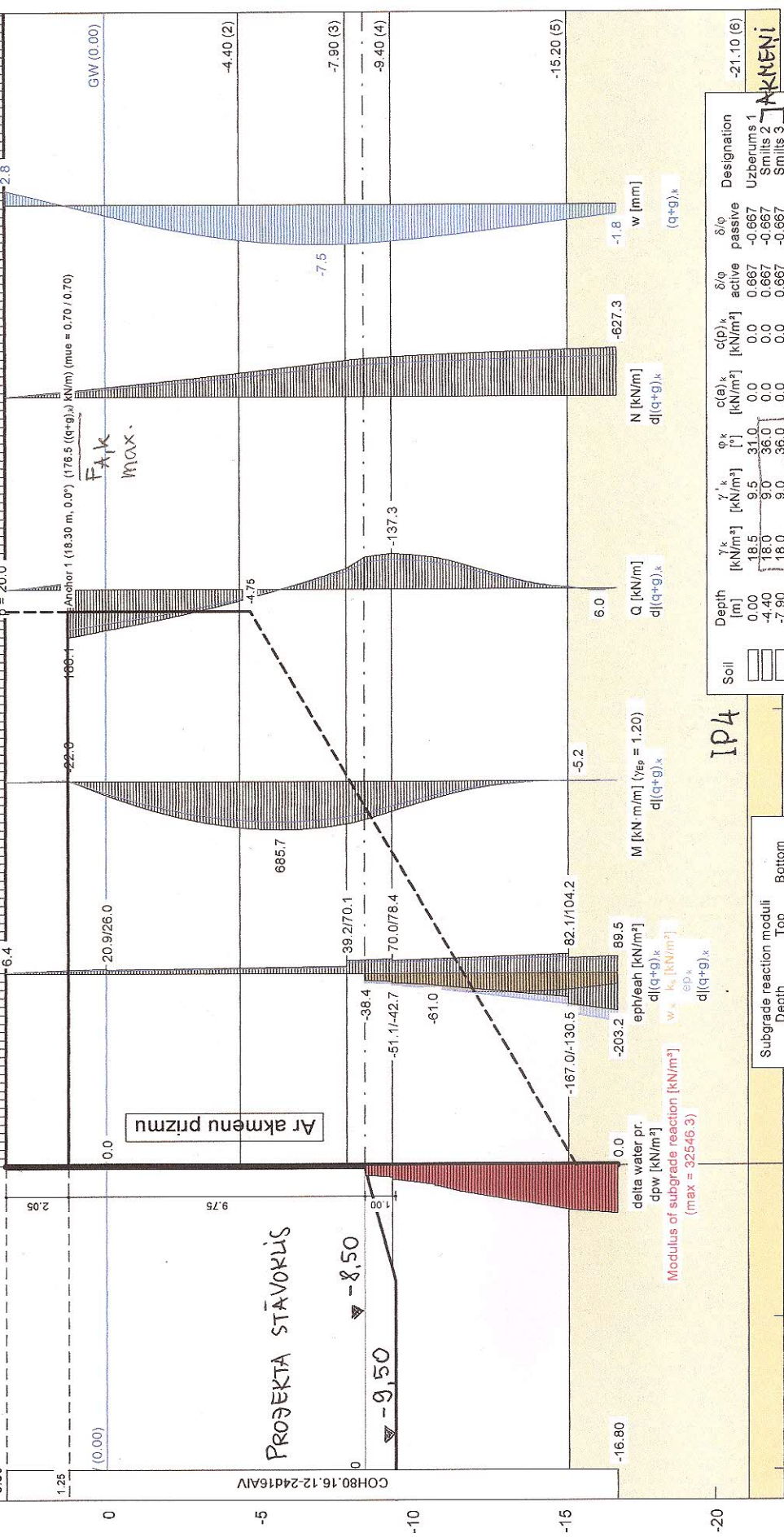
Req. embedment depth = 8.30
 $\gamma_g = 1.20$
 $\gamma_Q = 1.20$
 $\gamma_{Ep} = 1.20$
 $\gamma_{Ep} \text{ (Moment)} = 1.20$
Sum V met/μ = 0.15
File: P34-IP4-1stipribas.vrb
Date: 12/21/2012

Design values:
User-defined section properties
 $\sigma_t = 0.87 \text{ kN/cm}^2$
to -30.00 m : COH80.16.12-24d16AIV
 $E = 2400.00 \text{ kN/cm}^2$
 $I = 96941.18.00 \text{ cm}^4/\text{m}$
 $W = 121178.00 \text{ cm}^3/\text{m}$
 $A = 3282.00 \text{ cm}^2/\text{m}$
 $\sigma_d = N_d / A + M_d / W$
 $N_d = 368.21 \text{ kN/m}$
 $M_d = 685.72 \text{ kN m/m}$
 $\sigma_d = 0.68 \text{ kN/cm}^2$

SAMAZINATI KOEF.!!!

STIPRIBAS KRITERIJS

$F_{A,d} = 176.5 \text{ kN/m} \times 1.7 \text{ m} \times 1.35 \times 1.15 = 466 \text{ kN} < 620 \text{ kN} = F_{R,d}$



IP4

Subgrade reaction moduli	
Depth [m]	Top Bottom [kN/m³]
0.00 - 0.90	10000.0 10000.0
0.90 - 6.70	10000.0 30000.0
6.70 - 12.60	30000.0 40000.0
12.60 - 20.10	40000.0 50000.0
20.10 - 21.50	50000.0 50000.0

Soil	Depth [m]	γ_k [kN/m³]	γ'_k [kN/m³]	ϕ_k [°]	$c(a)_k$ [kN/m²]	$\alpha(p)_k$ [kN/m²]	δ/ϕ active	δ/ϕ passive	Designation
1	0.00 - 4.40	18.5	9.5	31.0	0.0	0.0	0.667	0.667	Uzberums 1
2	4.40 - 7.90	18.0	9.0	36.0	0.0	0.0	0.667	0.667	Smilts 2
3	7.90 - 9.40	18.0	9.0	36.0	0.0	0.0	0.667	0.667	Smilts 3
4	9.40 - 15.20	17.6	8.6	15.0	17.0	17.0	0.500	0.500	Smilts 4
5	15.20 - 21.10	18.5	9.5	18.0	20.0	20.0	0.500	0.500	Smilts 5
6	21.10 - 28.60	18.9	9.9	23.0	15.0	15.0	0.500	0.500	Smilts 6
7	28.60 - 32.00	19.1	10.1	17.0	30.0	30.0	0.500	0.500	Smilts 7
8	> 32.00	19.9	10.9	32.0	0.0	0.0	0.667	0.667	Smilts 8

PI-2

VBOP- P34.
Sheet pile wall
User-defined section properties
Calculation basis:
No ep redistribution
Active ep according to: DIN 4085
Equivalent ep coefficient $k_{eq} [i] = 0.200$
Passive ep according to: DIN 4085 (new)
Section length of 20.10 m fixed and toe bedded
Subgrade support $p_d = 692.96 \text{ kN/m} <$
Earth pressure $p_d = 767.19 \text{ kN/m}$
Req. section length = 20.10

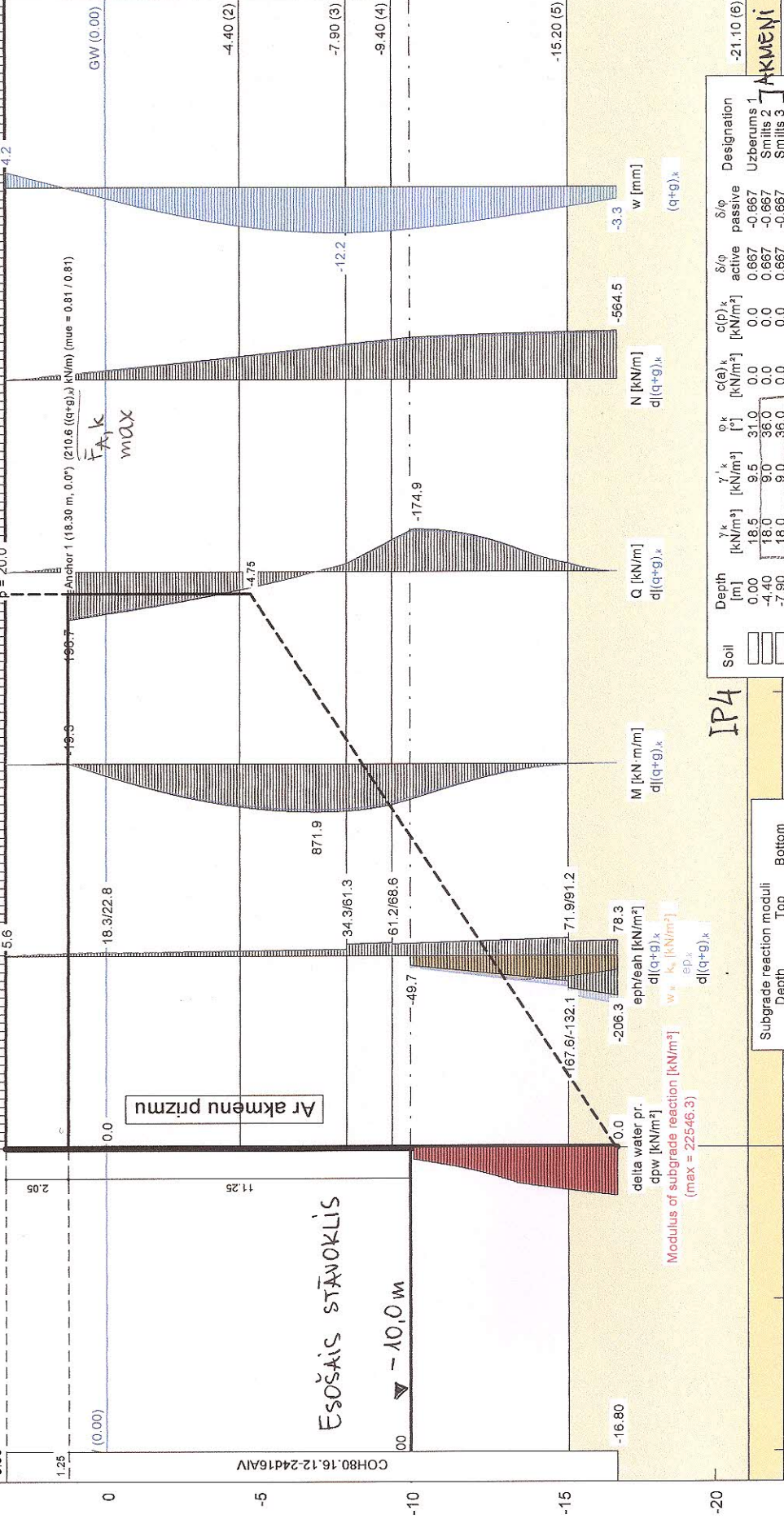
Req. embedment depth = 6.80
 $\gamma_g = 1.05$
 γ_g (Water pressure) = 1.00
 $\gamma_q = 1.00$
 $\gamma_{ep} = 1.20$
Sum V met/μ = 0.14
File: P34-IP4-2stipribas.vrb
Date: 1/23/2013

Design values:
User-defined section properties
 $\sigma_c = 0.87 \text{ kN/cm}^2$
to -30.00 m : COH80.16.12-24d16AIV
 $E = 2400.00 \text{ kN/cm}^2$
 $I = 9694118.00 \text{ cm}^4/\text{m}$
 $W = 121178.00 \text{ cm}^3/\text{m}$
 $A = 3282.00 \text{ cm}^2/\text{m}$
 $\sigma_d = N_d / A + M_d / W$
 $N_d = 371.24 \text{ kN/m}$
 $M_d = 871.95 \text{ kN.m/m}$
 $\sigma_d = 0.83 \text{ kN/cm}^2$

SAMAZINATI KOEF.!!!

STIPRIBAS KRITERIJS

$F_{Ad} = 210.6 \text{ kN/m} \times 1.7 \text{ m} \times 1.35 \times 1.15 = 556 \text{ kN} < 620 \text{ kN} = F_{rd}$



IP4

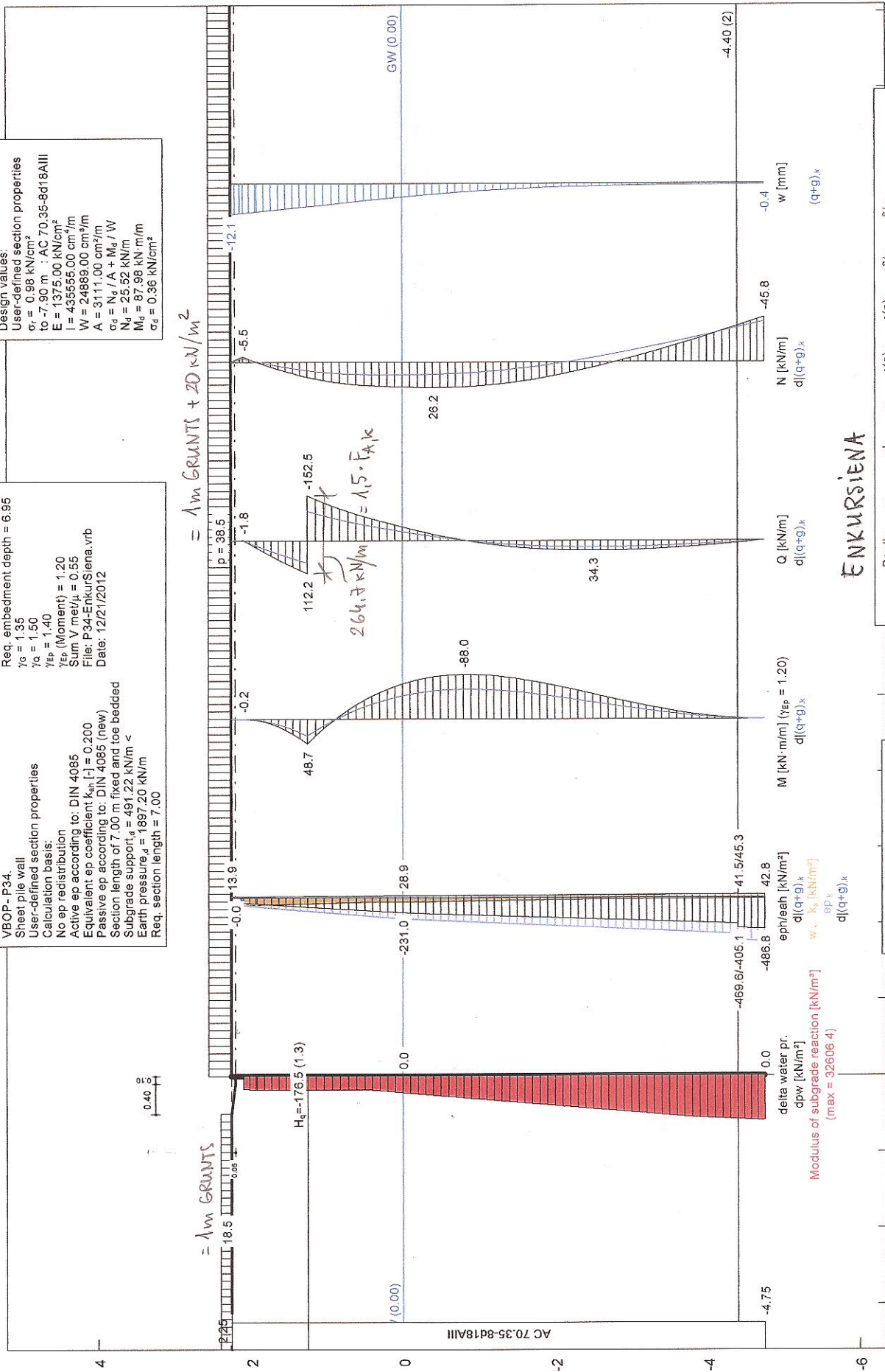
Subgrade reaction moduli	
Depth [m]	Top Bottom [kN/m³]
0.00 - 5.20	10000.0 20000.0
5.20 - 11.10	20000.0 30000.0
11.10 - 18.60	30000.0 40000.0
18.60 - 20.00	40000.0 50000.0

Soil	Depth [m]	γ_k [kN/m³]	γ'_k [kN/m³]	ϕ_k [°]	$c(a)_k$ [kN/m²]	$c(p)_k$ [kN/m²]	δ/ϕ active	δ/ϕ passive	Designation
	0.00	18.5	9.5	31.0	0.0	0.0	0.667	0.667	Uzberums 1
	-4.40	18.0	9.0	36.0	0.0	0.0	0.667	-0.667	Smilts 2
	-7.90	18.0	9.0	36.0	0.0	0.0	0.667	-0.667	Smilts 3
	-9.40	17.6	8.6	15.0	17.0	17.0	0.500	-0.500	Smilts 4
	-15.20	18.5	9.5	18.0	20.0	20.0	0.500	-0.500	Smilts 5
	-21.10	18.9	9.9	23.0	15.0	15.0	0.500	-0.500	Smilts 6
	-28.60	19.1	10.1	17.0	30.0	30.0	0.500	-0.500	Smilts 7
	-28.60	19.9	10.9	32.0	0.0	0.0	0.667	-0.667	Smilts 8

Design values:
 User-defined section properties
 $\sigma_r = 0.98 \text{ kN/cm}^2$
 $\sigma_r = 7.90 \text{ m} : \text{AC 70.35-8d18AllI}$
 $E = 1375.00 \text{ kN/cm}^2$
 $I = 435555.00 \text{ cm}^4/\text{m}$
 $W = 24899.00 \text{ cm}^3/\text{m}$
 $A = 3111.00 \text{ cm}^2/\text{m}$
 $\sigma_d = N_d / A + M_d / W$
 $N_d = 25.52 \text{ kN/m}$
 $M_d = 87.98 \text{ kN/m}$
 $\sigma_d = 0.36 \text{ kN/cm}^2$

VBOP - P34
 Sheet pile wall
 User-defined section properties
 Calculation basis:
 No ep redistribution
 Active ep according to: DIN 4085
 Equivalent ep coefficient $k_{eh} [\cdot] = 0.200$
 Passive ep according to: DIN 4085 (new)
 Section length of 7.00 m fixed and toe bedded
 Earth pressure $e_d = 491.22 \text{ kN/m} <$
 Req. section length = 7.00

Req. embedment depth = 6.95
 $\gamma_{\phi} = 1.35$
 $\gamma_{\phi} = 1.50$
 $\gamma_{\phi} = 1.40$
 $\gamma_{\phi} (\text{Moment}) = 1.20$
 Sum V, $\text{met}/\mu = 0.55$
 File: P34-Enkursiena.vrb
 Date: 12/21/2012



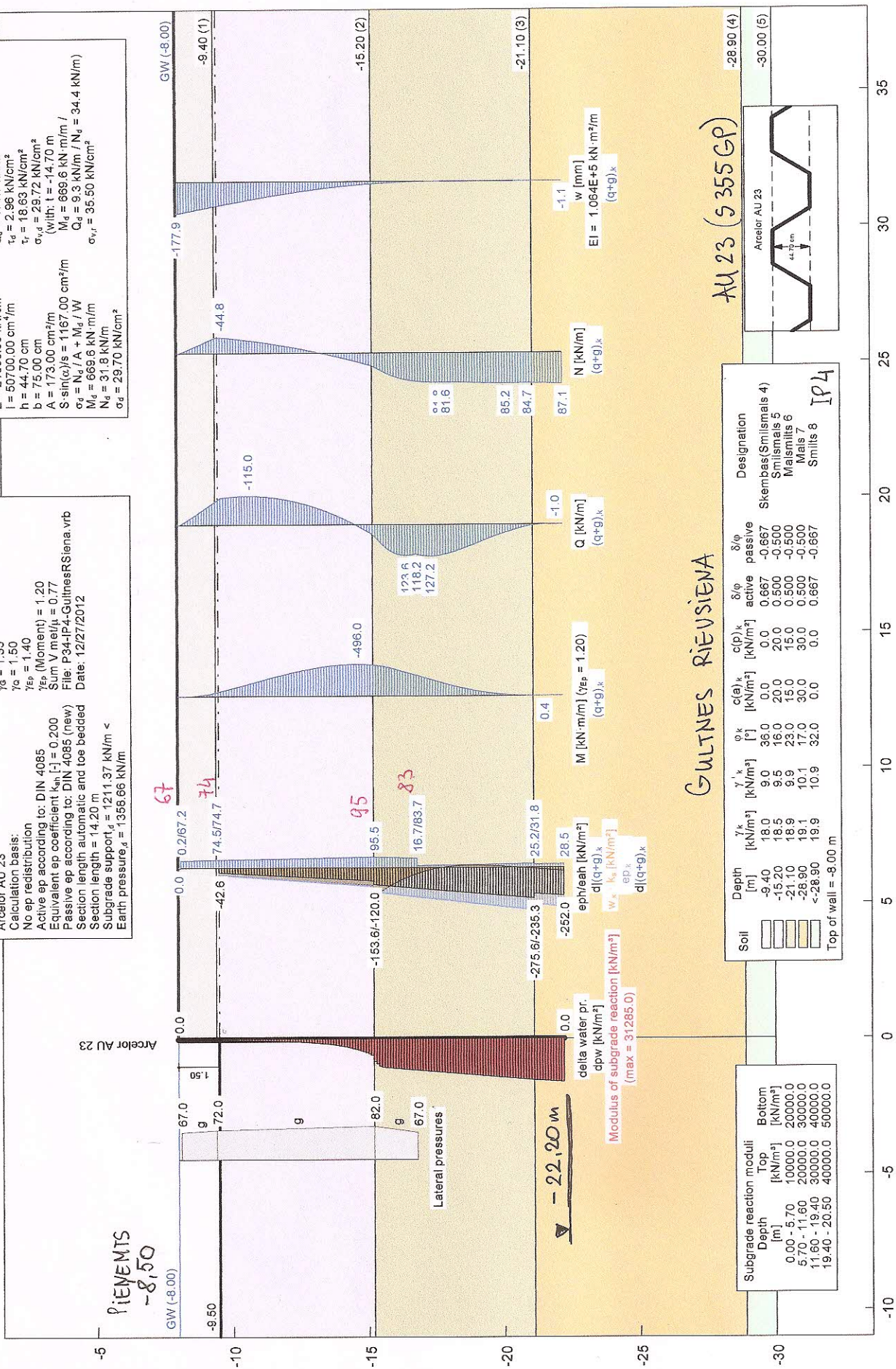
Soil	Depth [m]	γ'_{ϕ} [kN/m ³]	γ'_{ϕ} [°]	ϕ'_{ϕ} [°]	$c(\phi)_{\phi}$ [kN/m ²]	$\delta(\phi)_{\phi}$	Designation
	0.00	18.5	9.5	31.0	0.0	0.667	Uzberums 1
	-4.40	19.3	10.3	31.0	0.0	-0.667	Smilts 2
	<-4.40	20.0	11.0	33.0	0.0	-0.667	Smilts 3

Subgrade reaction moduli	Top	Bottom
Depth [m]	0.00 - 1.70	10000.0
	1.70 - 5.90	10000.0
	5.90 - 9.60	30000.0

PA-4

IPA

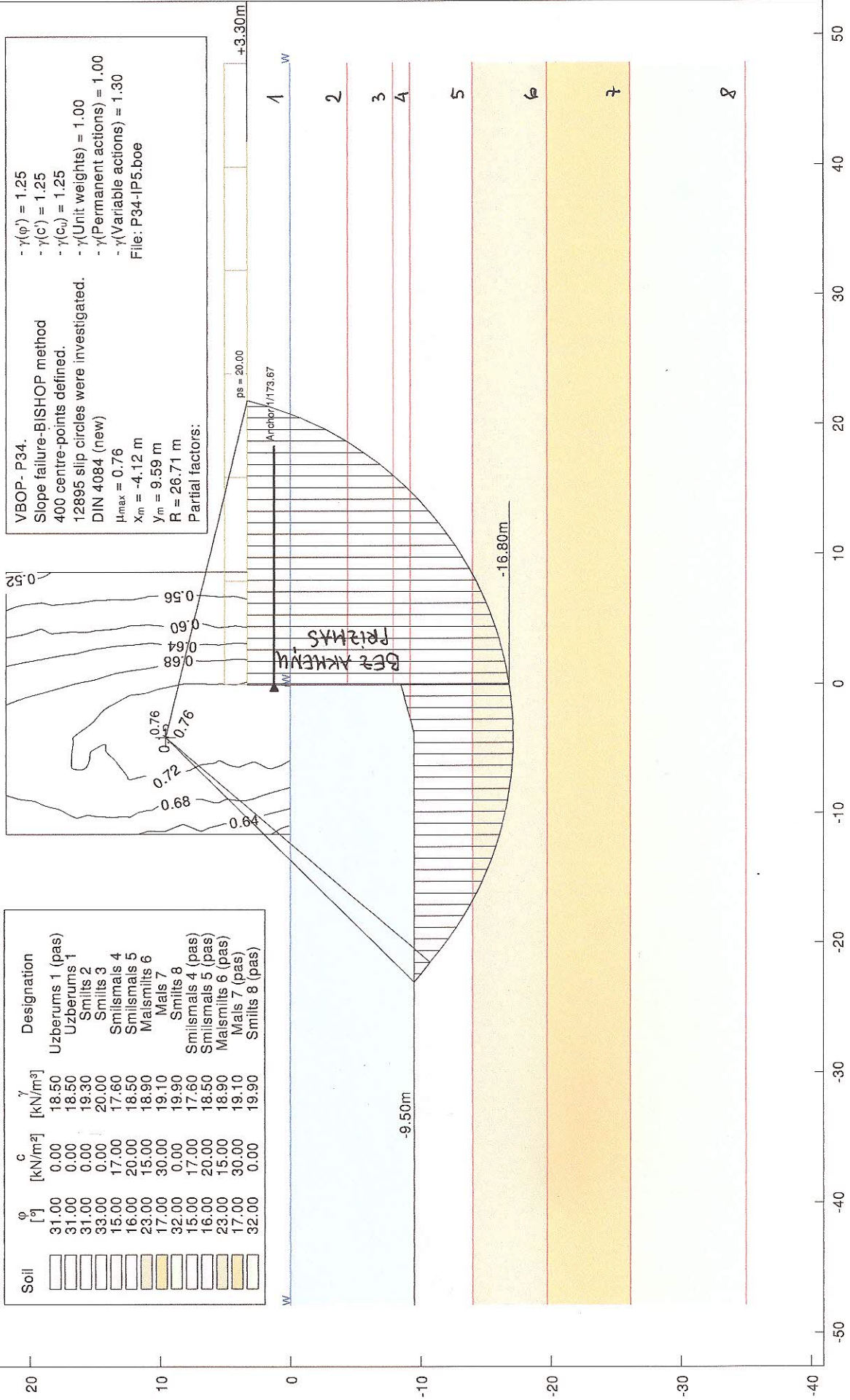
Design values:
 Chosen: Arcelor AU 23
 $E = 210\,000 \text{ kN/cm}^2$
 $I = 507\,000 \text{ cm}^4/\text{m}$
 $h = 44.70 \text{ cm}$
 $b = 75.00 \text{ cm}$
 $A = 179.00 \text{ cm}^2/\text{m}$
 $S \sin(\alpha)/y = 1\,157.00 \text{ cm}^2/\text{m}$
 $\sigma_d = N_d / A + M_d / W$
 $\sigma_d = 669.6 \text{ kN/m}^2$
 $N_d = 31.9 \text{ kN/cm}^2$
 $\sigma_d' = 29.70 \text{ kN/cm}^2$
 $\sigma_t = 32.27 \text{ kN/cm}^2$
 $\tau_t = (Q_d \cdot S \cdot \sin(\alpha) \cdot b) / (I \cdot s)$
 $Q_d = 171.7 \text{ kN/m}$
 $\tau_d = 2.66 \text{ kN/cm}^2$
 $\tau_t = 18.63 \text{ kN/cm}^2$
 $\sigma_{x,d} = 29.72 \text{ kN/cm}^2$
 (with: $t = -14.70 \text{ m}$)
 $Q_d = 669.6 \text{ kN} \cdot \text{m/m}$
 $Q_d = 9.3 \text{ kN/m} / N_d = 34.4 \text{ kN/m}$
 $\sigma_{x,r} = 35.50 \text{ kN/cm}^2$



IP5

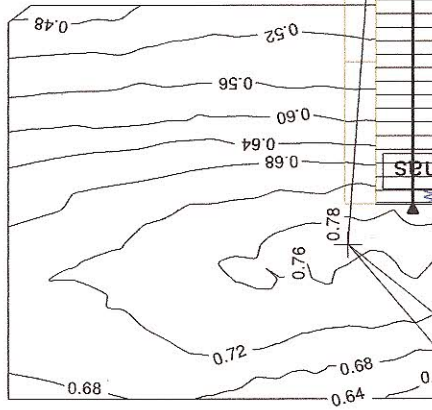
Soil	ϕ [°]	c [kN/m ²]	γ [kN/m ³]	Designation
	31.00	0.00	18.50	Uzberums 1 (pas)
	31.00	0.00	18.50	Uzberums 1
	31.00	0.00	19.30	Smilts 2
	33.00	0.00	20.00	Smilts 3
	15.00	17.00	17.60	Smilsmals 4
	16.00	20.00	18.50	Smilsmals 5
	23.00	15.00	18.90	Smilsmals 6
	17.00	30.00	19.10	Mals 7
	32.00	0.00	19.90	Smilts 8
	15.00	17.00	17.60	Smilsmals 4 (pas)
	16.00	20.00	18.50	Smilsmals 5 (pas)
	23.00	15.00	18.90	Malsmits 6 (pas)
	17.00	30.00	19.10	Mals 7 (pas)
	32.00	0.00	19.90	Smilts 8 (pas)

VBOP- P34.
 Slope failure-BISHOP method
 400 centre-points defined.
 12895 slip circles were investigated.
 DIN 4084 (new)
 $\mu_{\max} = 0.76$
 $x_m = -4.12$ m
 $y_m = 9.59$ m
 $R = 26.71$ m
 Partial factors:
 $\gamma(\phi) = 1.25$
 $\gamma(c) = 1.25$
 $\gamma(c_u) = 1.25$
 $\gamma(\text{Unit weights}) = 1.00$
 $\gamma(\text{Permanent actions}) = 1.00$
 $\gamma(\text{Variable actions}) = 1.30$
 File: P34-IP5.boe



IP4

Soil	ϕ [°]	c [kN/m²]	γ [kN/m³]	Designation
	31.00	0.00	18.50	Uzberums 1 (pas)
	31.00	0.00	18.50	Uzberums 1
	31.00	0.00	19.30	Smilts 2
	33.00	0.00	20.00	Smilts 3
	15.00	17.00	17.60	Smilsmāls 4
	16.00	20.00	18.50	Smilsmāls 5
	23.00	15.00	18.90	Mālsmitls 6
	17.00	30.00	19.10	Māls 7
	32.00	0.00	19.90	Smilts 8
	15.00	17.00	17.60	Smilsmāls 4 (pas)
	16.00	20.00	18.50	Smilsmāls 5 (pas)
	23.00	15.00	18.90	Mālsmitls 6 (pas)
	17.00	30.00	19.10	Māls 7 (pas)
	32.00	0.00	19.90	Smilts 8 (pas)



VBOP- P34.
 Slope failure-BISHOP method
 576 centre-points defined.
 17940 slip circles were investigated.
 DIN 4084 (new)
 $\mu_{max} = 0.78$
 $x_m = -2.31$ m
 $y_m = 4.89$ m
 $R = 21.81$ m
 Partial factors:
 $\gamma(\phi) = 1.25$
 $\gamma(c) = 1.25$
 $\gamma(c_u) = 1.25$
 $\gamma(\text{Unit weights}) = 1.00$
 $\gamma(\text{Permanent actions}) = 1.00$
 $\gamma(\text{Variable actions}) = 1.30$
 File: P34-IP4.boe

