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MATERIALS

Physical properties:

 γ_{sat} : Saturated unit weight, γ_n : Unsaturated unit weight, $S_u(c_u)$: Undrained shear strength, E_u : Undrained modulus of elasticity, ν_u : Undrained Poisson ratio, c' : Effective or drained cohesion, ϕ' : Effective or drained internal friction angle, E' : Effective or drained modulus of elasticity, ν' : Effective or drained Poisson ratio,

Table 1. Material Properties-1

ITEM NO	Name	γ_{sat} [kN/m ³]
1	CH	18.8
2	MH	19.2
3	SM	21
4	CH	18.6
5	CH	19.4
6	MH	19.9
7	SM	21
8	CH	18.6
9	CH	18.8
10	MH	19.2
11	SM	21
12	CH	18.6
13	CH	21
14	CH	21
15	CI	21
16	GW	21
17	SM	21

Table 2. Material Properties-2

ITEM NO	Name	γ_n [kN/m ³]	$S_u(c_u)$ [kN/m ²]	E_u [kN/m ²]
1	CH	18.4	76.2	38630.5
2	MH	19.2	101.8	40000
3	SM	21	50	42000
4	CH	18.6	110	40151.3
5	CH	18.4	76.2	38630.5
6	MH	19.2	101.8	40000
7	SM	21	50	42000
8	CH	18.4	110	40000
9	CH	18.4	76.2	38630.5
10	MH	19.2	101.8	40000
11	SM	21	50	42000
12	CH	18.4	110	40000
13	CH	19.8	90	25000
14	CH	23.4	90	25000

Downtown Foundation System				
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 6 / 44				
15	CI	21.2	90	25000
16	GW	19.8	90	25000
17	SM	26.4	90	25000

Table 3. Material Properties-3

ITEM NO	Name	ν_u	c' [kN/m ²]	ϕ' [°]	ν'	E' [kN/m ²]
1	CH	0.5	7.6	26.4	0.3	33479.7
2	MH	0.5	10.2	26.6	0.3	34666.7
3	SM	0.5	0	30	0.25	35000
4	CH	0.5	11	27	0.3	34797.8
5	CH	0.5	7.6	26.4	0.3	33479.8
6	MH	0.5	10.2	26.6	0.3	34666.7
7	SM	0.5	0	30	0.25	35000
8	CH	0.5	11	27	0.3	34666.7
9	CH	0.5	7.6	26.4	0.3	33479.8
10	MH	0.5	10.2	26.6	0.3	34666.7
11	SM	0.5	0	30	0.25	35000
12	CH	0.5	11	27	0.3	34666.7
13	CH	0.5	14	20	0.25	28000
14	CH	0.5	14	20	0.25	28000
15	CI	0.5	14	20	0.25	28000
16	GW	0.5	14	20	0.25	28000
17	SM	0.5	14	20	0.25	28000

BOREHOLES

Table 4. Borehole Properties

ITEM NO	Borehole	X Coordinate [m]	Y Coordinate [m]	Depth [m]	GWT [m]
1	BH1	7.5	13	27	-5
2	BH2	21	8	27	-5
3	BH3	34.5	13	27	-5

SOIL PROFILES

BH1

GWT= -5m

Table 5. BH1 Layer Properties-1

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	Borehole	Drainage Condition
1	CH	0	-9	SK1	Undrained
2	MH	-9	-14	SK1	Undrained
3	SM	-14	-17	SK1	Drained
4	CH	-17	-27	SK1	Undrained

Table 6. BH1 Layer Properties-2

Downtown Foundation System Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 7 / 44					
ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	GWT [m]	Consolidation
1	CH	0	-9	5	Exists
2	MH	-9	-14	5	Exists
3	SM	-14	-17	5	None
4	CH	-17	-27	5	Exists

Table 7. BH1 Layer Properties-3

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	Number of sub-layers	γ_{sat} [kN/m ³]	γ_n [kN/m ³]	$S_u(c_u)$ [kN/m ²]
1	CH	0	-9	9	18.8	18.4	76.2
2	MH	-9	-14	5	19.2	19.2	101.8
3	SM	-14	-17	3	21	21	50
4	CH	-17	-27	10	18.6	18.6	110

Table 8. BH1 Layer Properties-4

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	E_u [kN/m ²]	ν_u	c' [kN/m ²]	ϕ' [°]	ν'	E' [kN/m ²]
1	CH	0	-9	38630.5	0.5	7.6	26.4	0.3	33479.7
2	MH	-9	-14	40000	0.5	10.2	26.6	0.3	34666.7
3	SM	-14	-17	42000	0.5	0	30	0.25	35000
4	CH	-17	-27	40151.3	0.5	11	27	0.3	34797.8

BH2

GWT= -5m

Table 9. BH2 Layer Properties-1

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	Borehole	Drainage Condition
1	CH	0	-8	SK2	Undrained
2	MH	-8	-14	SK2	Undrained
3	SM	-14	-17	SK2	Drained
4	CH	-17	-27	SK2	Undrained

Table 10. BH2 Layer Properties-2

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	GWT [m]	Consolidation
1	CH	0	-8	5	Exists
2	MH	-8	-14	5	Exists
3	SM	-14	-17	5	None
4	CH	-17	-27	5	Exists

Table 11. BH2 Layer Properties-3

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	Number of sub-layers	γ_{sat} [kN/m ³]	γ_n [kN/m ³]	$S_u(c_u)$ [kN/m ²]
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Downtown Foundation System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 8 / 44							
1	CH	0	-8	8	19.4	18.4	76.2
2	MH	-8	-14	6	19.9	19.2	101.8
3	SM	-14	-17	3	21	21	50
4	CH	-17	-27	10	18.6	18.4	110

Table 12. BH2 Layer Properties-4

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	E_u [kN/m ²]	v_u	c' [kN/m ²]	ϕ' [°]	v'	E' [kN/m ²]
1	CH	0	-8	38630.5	0.5	7.6	26.4	0.3	33479.8
2	MH	-8	-14	40000	0.5	10.2	26.6	0.3	34666.7
3	SM	-14	-17	42000	0.5	0	30	0.25	35000
4	CH	-17	-27	40000	0.5	11	27	0.3	34666.7

BH3

GWT= -5m

Table 13. BH3 Layer Properties-1

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	Borehole	Drainage Condition
1	CH	0	-6	SK3	Undrained
2	MH	-6	-14	SK3	Undrained
3	SM	-14	-17	SK3	Drained
4	CH	-17	-27	SK3	Undrained

Table 14. BH3 Layer Properties-2

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	GWT [m]	Consolidation
1	CH	0	-6	5	Exists
2	MH	-6	-14	5	Exists
3	SM	-14	-17	5	None
4	CH	-17	-27	5	Exists

Table 15. BH3 Layer Properties-3

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	Number of sub-layers	γ_{sat} [kN/m ³]	γ_n [kN/m ³]	$S_u(c_u)$ [kN/m ²]
1	CH	0	-6	6	18.8	18.4	76.2
2	MH	-6	-14	8	19.2	19.2	101.8
3	SM	-14	-17	3	21	21	50
4	CH	-17	-27	10	18.6	18.4	110

Table 16. BH3 Layer Properties-4

ITEM NO	Name	Top Elevation [m]	Bottom Elevation [m]	E_u [kN/m ²]	v_u	c' [kN/m ²]	ϕ' [°]	v'	E' [kN/m ²]
1	CH	0	-6	38630.5	0.5	7.6	26.4	0.3	33479.8
2	MH	-6	-14	40000	0.5	10.2	26.6	0.3	34666.7

Downtown Foundation System									
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 9 / 44									
3	SM	-14	-17	42000	0.5	0	30	0.25	35000
4	CH	-17	-27	40000	0.5	11	27	0.3	34666.7

BEARING CAPACITY OF SHALLOW FOUNDATIONS

P: Vertical load,

M_x: Moment around the global Y axis,

M_y: Moment around the global X axis,

V_x: Horizontal load in X direction,

V_y: Horizontal load in Y direction,

β° : Terrain inclination,

η° : Base inclination,

B: Width of the foundation,

L: Length of the foundation,

e_x: Eccentricity of foundation in x direction,

e_y: Eccentricity of foundation in y direction,

B': Effective width of the foundation (short side),

L': Effective length of the foundation (long side),

D_f: Foundation embedment depth,

c': Effective or drained cohesion of soil along depth B below the foundation,

ϕ' : Effective or drained internal friction angle of soil along depth B below the foundation,

N_c, N_q, N _{γ} : Bearing capacity factors for effective stresses,

Su(cu)': Undrained shear strength of soil along depth B below the foundation,

N_c (UU), N_q (UU), N _{γ} (UU): Bearing capacity factors for total stresses in UU conditions,

s_c, s_q, s _{γ} : Shape factors for effective stresses,

s_c (UU), s_q (UU), s _{γ} (UU): Shape factors for total stresses in UU conditions,

d_c, d_q, d _{γ} : Depth factors for effective stresses,

d_c (UU), d_q (UU), d _{γ} (UU): Depth factors for total stresses in UU conditions,

i_c, i_q, i _{γ} : Load inclination factors for effective stresses,

i_c (UU), i_q (UU), i _{γ} (UU): Load inclination factors for total stresses in UU conditions,

g_c, g_q, g _{γ} : Ground factors for effective stresses,

g_c (UU), g_q (UU), g _{γ} (UU): Ground factors for total stresses in UU conditions,

b_c, b_q, b _{γ} : Base factors for effective stresses,

b_c (UU), b_q (UU), b _{γ} (UU): Base factors for total stresses in UU conditions,

γ : Unit volume weight of soil along depth B below the foundation for effective stresses,

γ (UU): Unit weight of soil along depth B below the foundation for total stresses,

q: Effective stress at foundation base level,

q (UU): Total stress at foundation base level,

q_{ult}: Bearing capacity of foundation for effective stresses,

q_{ult} (UU): Bearing capacity of foundation for total stresses in UU conditions,

q_t: Design capacity for effective stresses,

q_t(UU): Design capacity for total stresses in UU conditions,

q_{knet}: Net bearing capacity of foundation for effective stresses,

q_{knet} (UU): Net bearing capacity of foundation for total stresses in UU conditions,

q_{tnet}: Net design capacity for effective stresses,

q_{tnet} (UU): Net design capacity for total stresses in UU conditions,

q_a: Effective contact pressure,

q₀: Contact Pressure,

q_{0net}: Net contact pressure,

γ _{Rv}: Partial factor on bearing resistance,

FS*: Safety factor calculated for effective stresses,
 FS* (UU): Safety factor calculated for total stresses in UU conditions,
 FSnet*: Net safety factor calculated for effective stresses,
 FSnet* (UU): Net safety factor calculated for total stresses in UU conditions,
 Check: Safety check for effective stresses,
 Check (UU): Safety check for total stresses in UU conditions,
Foundation1 Bearing Capacity:

Table 17. Foundation1 Bearing Capacity-1

Foundati on	Method	Analyze	Failure	P [kN]	Mx [kN.m]	My [kN.m]	Vx [kN]	Vy [kN]
Foundatio n1	Terzaghi	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200
Foundatio n1	Meyerhof	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200
Foundatio n1	Vesic	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200
Foundatio n1	Eurocode 7	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200

Table 18. Foundation1 Bearing Capacity-2

Founda tion	Method	β°	η°	B [m]	L [m]	ex [m]	ey [m]	B' [m]	L' [m]	Df [m]
Foundati on1	Terzaghi	0	0	15	20	0.07	0.07	14.87	19.87	3
Foundati on1	Meyerhof	0	0	15	20	0.07	0.07	14.87	19.87	3
Foundati on1	Vesic	0	0	15	20	0.07	0.07	14.87	19.87	3
Foundati on1	Eurocode 7	0	0	15	20	0.07	0.07	14.87	19.87	3

Table 19. Foundation1 Bearing Capacity-3

Founda tion	Method	c' [kN/ m ²]	φ' (botto m) [°]	φ' (top) [°]	Su(cu) [kN]	τ (top) [kN/ m ³]	τ (UU) (top) [kN/ m ³]	τ [kN/ m ³]	τ (UU) [kN/ m ³]	q [kN/ m ²]
Foundati on1	Terzaghi	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2
Foundati on1	Meyerhof	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2
Foundati on1	Vesic	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 11 / 44										
Foundation1	Eurocode 7	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2

Table 20. Foundation1 Bearing Capacity-4

Foundation	Method	q (UU) [kN/m ²]	Nc	Nc (UU)	Nq	Nq (UU)	N _γ	N _γ (UU)	sc	sc (UU)
Foundation1	Terzaghi	55.2	29.75	5.7	14.86	1	13.56	0	1.15	1.15
Foundation1	Meyerhof	55.2	24.35	5.14	12.37	1	9.83	0	1.4	1.15
Foundation1	Vesic	55.2	24.35	5.14	12.37	1	14.95	0	1.38	1.15
Foundation1	Eurocode 7	55.2	24.35	5.14	12.37	1	12.89	0	1.36	1.15

Table 21. Foundation1 Bearing Capacity-5

Foundation	Method	sq	sq (UU)	s _γ	s _γ (UU)	dc	dc (UU)	dq	dq (UU)	d _γ
Foundation1	Terzaghi	-	-	0.85	0.85	-	-	-	-	-
Foundation1	Meyerhof	1.19	1	1.2	1	1.07	1.04	1.03	1	1.03
Foundation1	Vesic	1.37	-	0.7	-	1.08	0.08	1.06	-	1
Foundation1	Eurocode 7	1.33	-	0.78	-	1	-	1	-	1

Table 22. Foundation1 Bearing Capacity-6

Foundation	Method	d _γ (UU)	ic	ic (UU)	iq	iq (UU)	i _γ	i _γ (UU)	gc	gc (UU)
Foundation1	Terzaghi	-	-	-	-	-	-	-	-	-
Foundation1	Meyerhof	1	0.91	0.91	0.91	0.91	0.73	0	-	-
Foundation1	Vesic	-	0.77	0.84	0.79	-	0.7	-	1	0
Foundation1	Eurocode 7	-	0.77	0.94	0.79	-	0.7	-	1	-

Table 23. Foundation1 Bearing Capacity-7

Foundation	Method	gq	gq (UU)	g _γ	g _γ (UU)	bc	bc (UU)	bq	bq (UU)	b _γ
Foundation1	Terzaghi	-	-	-	-	-	-	-	-	-
Foundation1	Meyerhof	-	-	-	-	-	-	-	-	-

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 12 / 44										
Foundation1	Vesic	1	-	1	-	1	0	1	-	1
Foundation1	Eurocode 7	1	-	1	-	1	1	1	-	1

Table 24. Foundation1 Bearing Capacity-8

Foundation	Method	ϕ (UU)	q_{ult} [kN/m ²]	q_{ult} (UU) [kN/m ²]	q_t [kN/m ²]	q_t (UU) [kN/m ²]	q_{knet} [kN/m ²]	q_{knet} (UU) [kN/m ²]	q_{tnet} [kN/m ²]	q_{tnet} (UU) [kN/m ²]
Foundation1	Terzaghi	-	1994.88	590.89	1424.92	422.07	1939.68	535.69	1385.49	382.64
Foundation1	Meyerhof	-	1721	508.98	1229.29	363.56	1665.8	453.78	1189.86	324.13
Foundation1	Vesic	-	1577.48	638.18	1126.77	455.84	1522.28	582.98	1087.34	416.41
Foundation1	Eurocode 7	-	1462.99	508.04	1044.99	362.89	1407.79	452.84	1005.56	323.46

Table 25. Foundation1 Bearing Capacity-9

Foundation	Method	q_a [kN/m ²]	q_0 [kN/m ²]	q_{0net} [kN/m ²]	γR_v	FS*	FS* (UU)	FSnet*	FSnet* (UU)	Check	Check (UU)
Foundation1	Terzaghi	182.83	180	124.8	1.4	11.1	3.3	10.8	3	√	√
Foundation1	Meyerhof	182.83	180	124.8	1.4	9.6	2.8	9.3	2.5	√	√
Foundation1	Vesic	182.83	180	124.8	1.4	8.8	3.5	8.5	3.2	√	√
Foundation1	Eurocode 7	182.83	180	124.8	1.4	8.1	2.8	7.8	2.5	√	√

Existing Foundation Bearing Capacity:

Table 26. Existing Foundation Bearing Capacity-1

Foundation	Method	Analyze	Failure	P [kN]	M _x [kN.m]	M _y [kN.m]	V _x [kN]	V _y [kN]
Existing Foundation	Terzaghi	Effective and Total Stress	General Shear	8000	0	0	0	0
Existing Foundation	Meyerhof	Effective and Total Stress	General Shear	8000	0	0	0	0
Existing Foundation	Vesic	Effective and Total Stress	General Shear	8000	0	0	0	0

Downtown Foundation System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 13 / 44								
Existing Foundation	Eurocode 7	Effective and Total Stress	General Shear	8000	0	0	0	0

Table 27. Existing Foundation Bearing Capacity-2

Foundation	Method	β°	η°	B [m]	L [m]	e_x [m]	e_y [m]	B' [m]	L' [m]	Df [m]
Existing Foundation	Terzaghi	0	0	10	10	0	0	10	10	3
Existing Foundation	Meyerhof	0	0	10	10	0	0	10	10	3
Existing Foundation	Vesic	0	0	10	10	0	0	10	10	3
Existing Foundation	Eurocode 7	0	0	10	10	0	0	10	10	3

Table 28. Existing Foundation Bearing Capacity-3

Foundation	Method	c' [kN/m ²]	ϕ' (bottom) [°]	ϕ' (top) [°]	Su(cu) [kN]	γ (top) [kN/m ³]	γ (UU) (top) [kN/m ³]	γ [kN/m ³]	γ (UU) [kN/m ³]	q [kN/m ²]
Existing Foundation	Terzaghi	8.64	26.5	26.4	86.44	18.4	18.4	11.07	18.91	55.2
Existing Foundation	Meyerhof	8.64	26.5	26.4	86.44	18.4	18.4	11.07	18.91	55.2
Existing Foundation	Vesic	8.64	26.5	26.4	86.44	18.4	18.4	11.07	18.91	55.2
Existing Foundation	Eurocode 7	8.64	26.5	26.4	86.44	18.4	18.4	11.07	18.91	55.2

Table 29. Existing Foundation Bearing Capacity-4

Foundation	Method	q (UU) [kN/m ²]	Nc	Nc (UU)	Nq	Nq (UU)	N γ	N γ (UU)	sc	sc (UU)
Existing Foundation	Terzaghi	55.2	28.09	5.7	14.86	1	12.28	0	1.3	1.3
Existing Foundation	Meyerhof	55.2	23.04	5.14	12.37	1	8.67	0	1.52	1.2

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 14 / 44										
Existing Foundation	Vesic	55.2	23.04	5.14	12.37	1	13.43	0	1.54	1.19
Existing Foundation	Eurocode 7	55.2	23.04	5.14	12.37	1	11.44	0	1.48	1.2

Table 30. Existing Foundation Bearing Capacity-5

Foundation	Method	sq	sq (UU)	sr	sr (UU)	dc	dc (UU)	dq	dq (UU)	dr
Existing Foundation	Terzaghi	-	-	0.8	0.8	-	-	-	-	-
Existing Foundation	Meyerhof	1.26	1	1.26	1	1.1	1.06	1.05	1	1.05
Existing Foundation	Vesic	1.5	-	0.6	-	1.12	0.12	1.09	-	1
Existing Foundation	Eurocode 7	1.44	-	0.7	-	1	-	1	-	1

Table 31. Existing Foundation Bearing Capacity-6

Foundation	Method	dr (UU)	ic	ic (UU)	iq	iq (UU)	ir	ir (UU)	gc	gc (UU)
Existing Foundation	Terzaghi	-	-	-	-	-	-	-	-	-
Existing Foundation	Meyerhof	1	1	1	1	1	1	0	-	-
Existing Foundation	Vesic	-	1	1	1	-	1	-	1	0
Existing Foundation	Eurocode 7	-	1	1	1	-	1	-	1	-

Table 32. Existing Foundation Bearing Capacity-7

Foundation	Method	gq	gq (UU)	gr	gr (UU)	bc	bc (UU)	bq	bq (UU)	br
Existing Foundation	Terzaghi	-	-	-	-	-	-	-	-	-
Existing Foundation	Meyerhof	-	-	-	-	-	-	-	-	-

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 15 / 44										
Existing Foundation	Vesic	1	-	1	-	1	0	1	-	1
Existing Foundation	Eurocode 7	1	-	1	-	1	1	1	-	1

Table 33. Existing Foundation Bearing Capacity-8

Foundation	Method	ϕ (UU)	qult [kN/m ²]	qult (UU) [kN/m ²]	qt [kN/m ²]	qt (UU) [kN/m ²]	qknet [kN/m ²]	qknet (UU) [kN/m ²]	qtnet [kN/m ²]	qtnet (UU) [kN/m ²]
Existing Foundation	Terzaghi	-	1679.69	695.72	1199.78	496.94	1624.49	640.52	1160.35	457.51
Existing Foundation	Meyerhof	-	1869.4	620.35	1335.29	443.11	1814.2	565.15	1295.86	403.68
Existing Foundation	Vesic	-	1904.67	639.26	1360.48	456.61	1849.47	584.06	1321.05	417.18
Existing Foundation	Eurocode 7	-	1725.25	588.36	1232.32	420.26	1670.05	533.16	1192.9	380.83

Table 34. Existing Foundation Bearing Capacity-9

Foundation	Method	qa [kN/m ²]	q0 [kN/m ²]	q0net [kN/m ²]	ϕ Rv	FS*	FS* (UU)	FSnet*	FSnet* (UU)	Check	Check (UU)
Existing Foundation	Terzaghi	80	80	24.8	1.4	21	8.7	20.3	8	√	√
Existing Foundation	Meyerhof	80	80	24.8	1.4	23.4	7.8	22.7	7.1	√	√
Existing Foundation	Vesic	80	80	24.8	1.4	23.8	8	23.1	7.3	√	√
Existing Foundation	Eurocode 7	80	80	24.8	1.4	21.6	7.4	20.9	6.7	√	√

Foundation2 Bearing Capacity:

Table 35. Foundation2 Bearing Capacity-1

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Downtown Foundation System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 16 / 44								
Foundation	Method	Analyze	Failure	P [kN]	Mx [kN.m]	My [kN.m]	Vx [kN]	Vy [kN]
Foundation2	Terzaghi	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200
Foundation2	Meyerhof	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200
Foundation2	Vesic	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200
Foundation2	Eurocode 7	Effective and Total Stress	General Shear	54000	3600	3600	3800	4200

Table 36. Foundation2 Bearing Capacity-2

Foundation	Method	β°	η°	B [m]	L [m]	e_x [m]	e_y [m]	B' [m]	L' [m]	Df [m]
Foundation2	Terzaghi	0	0	15	20	0.07	0.07	14.87	19.87	3
Foundation2	Meyerhof	0	0	15	20	0.07	0.07	14.87	19.87	3
Foundation2	Vesic	0	0	15	20	0.07	0.07	14.87	19.87	3
Foundation2	Eurocode 7	0	0	15	20	0.07	0.07	14.87	19.87	3

Table 37. Foundation2 Bearing Capacity-3

Foundation	Method	c' [kN/m ²]	ϕ' (bottom) [°]	ϕ' (top) [°]	Su(cu) [kN]	τ (top) [kN/m ³]	τ (UU) (top) [kN/m ³]	τ [kN/m ³]	τ (UU) [kN/m ³]	q [kN/m ²]
Foundation2	Terzaghi	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2
Foundation2	Meyerhof	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2
Foundation2	Vesic	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2
Foundation2	Eurocode 7	7.17	27.2	26.4	81.75	18.4	18.4	10.85	19.34	55.2

Table 38. Foundation2 Bearing Capacity-4

Foundation	Method	q (UU) [kN/m ²]	Nc	Nc (UU)	Nq	Nq (UU)	N τ	N τ (UU)	sc	sc (UU)
Foundation2	Terzaghi	55.2	29.75	5.7	14.86	1	13.56	0	1.15	1.15

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 17 / 44										
Foundation2	Meyerhof	55.2	24.35	5.14	12.37	1	9.83	0	1.4	1.15
Foundation2	Vesic	55.2	24.35	5.14	12.37	1	14.95	0	1.38	1.15
Foundation2	Eurocode 7	55.2	24.35	5.14	12.37	1	12.89	0	1.36	1.15

Table 39. Foundation2 Bearing Capacity-5

Foundation	Method	sq	sq (UU)	sr	sr (UU)	dc	dc (UU)	dq	dq (UU)	dr
Foundation2	Terzaghi	-	-	0.85	0.85	-	-	-	-	-
Foundation2	Meyerhof	1.19	1	1.2	1	1.07	1.04	1.03	1	1.03
Foundation2	Vesic	1.37	-	0.7	-	1.08	0.08	1.06	-	1
Foundation2	Eurocode 7	1.33	-	0.78	-	1	-	1	-	1

Table 40. Foundation2 Bearing Capacity-6

Foundation	Method	dr (UU)	ic	ic (UU)	iq	iq (UU)	ir	ir (UU)	gc	gc (UU)
Foundation2	Terzaghi	-	-	-	-	-	-	-	-	-
Foundation2	Meyerhof	1	0.91	0.91	0.91	0.91	0.73	0	-	-
Foundation2	Vesic	-	0.77	0.84	0.79	-	0.7	-	1	0
Foundation2	Eurocode 7	-	0.77	0.94	0.79	-	0.7	-	1	-

Table 41. Foundation2 Bearing Capacity-7

Foundation	Method	gq	gq (UU)	gr	gr (UU)	bc	bc (UU)	bq	bq (UU)	br
Foundation2	Terzaghi	-	-	-	-	-	-	-	-	-
Foundation2	Meyerhof	-	-	-	-	-	-	-	-	-
Foundation2	Vesic	1	-	1	-	1	0	1	-	1
Foundation2	Eurocode 7	1	-	1	-	1	1	1	-	1

Table 42. Foundation2 Bearing Capacity-8

Foundation	Method	br (UU)	qult [kN/m ²]	qult (UU) [kN/m ²]	qt [kN/m ²]	qt (UU) [kN/m ²]	qknet [kN/m ²]	qknet (UU) [kN/m ²]	qtnet [kN/m ²]	qtnet (UU) [kN/m ²]
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Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 18 / 44										
Foundation2	Terzaghi	-	1994.88	590.89	1424.92	422.07	1939.68	535.69	1385.49	382.64
Foundation2	Meyerhof	-	1721	508.98	1229.29	363.56	1665.8	453.78	1189.86	324.13
Foundation2	Vesic	-	1577.48	638.18	1126.77	455.84	1522.28	582.98	1087.34	416.41
Foundation2	Eurocode 7	-	1462.99	508.04	1044.99	362.89	1407.79	452.84	1005.56	323.46

Table 43. Foundation2 Bearing Capacity-9

Foundation	Method	qa [kN/m ²]	q0 [kN/m ²]	q0net [kN/m ²]	αR_v	FS*	FS* (UU)	FSnet*	FSnet* (UU)	Check	Check (UU)
Foundation2	Terzaghi	182.83	180	124.8	1.4	11.1	3.3	10.8	3	✓	✓
Foundation2	Meyerhof	182.83	180	124.8	1.4	9.6	2.8	9.3	2.5	✓	✓
Foundation2	Vesic	182.83	180	124.8	1.4	8.8	3.5	8.5	3.2	✓	✓
Foundation2	Eurocode 7	182.83	180	124.8	1.4	8.1	2.8	7.8	2.5	✓	✓

BEARING CAPACITY OF DEEP FOUNDATIONS

σ'_v : Effective stress at the midpoint of rigid column/soil interaction zone,

$S_u(c_u)$: Undrained shear strength in rigid column/soil interaction zone, Undrained shear strength for column tip resistance,

c' Effective cohesion in rigid column/soil interaction zone,

ϕ' Effective internal friction angle in rigid column/soil interaction zone, Effective internal friction angle for column tip resistance

α : Coefficient of adhesion,

β : Coefficient which depends on soil properties,

L_e : Effective column length in rigid column/soil interaction zone,

A_s : Column lateral surface area in rigid column/soil interaction zone,

f_s : Skin frictional stress in rigid column/soil interaction zone,

Q_s : Shaft resistance in rigid column/soil interaction zone,

Q_{ks} : Characteristic value of the shaft resistance of a rigid column,

N_c : Bearing capacity factor for column tip resistance. Used for total stresses.,

$\sigma'_{0,t}$: Effective stress at column tip,

ϕ' : Effective internal friction angle for column tip resistance,

N_t : Bearing capacity factor for column tip resistance. Used for effective stresses.,

A_b : Cross-sectional area for column tip resistance,

Q_{ku} : Characteristic value of the tip resistance of a rigid column,

W_p : Net self-weight of rigid column,

Q_{ktv} : Characteristic value of compressive resistance of the ground against a rigid column, at the ultimate limit state,

αR_s : Coefficient of shaft frictional resistance in compression,

αR_u : Coefficient of tip resistance strength in compression,

Q_{tk} : Design value of the shaft resistance of a rigid column,

Qt_{ku}: Design value of the base resistance of a rigid column,

Qt_v: Design value of compressive resistance of the ground against a rigid column, at the ultimate limit state,

P_{tv}: Vertical design force acting on a single rigid column,

FS*: Safety factor of a single rigid column Q_{ktv}/P_{tv},

E_g: Group efficiency,

Q_{s,gr}: Shaft resistance in block/soil interaction zone,

Q_{ks,gr}: Characteristic value of the shaft resistance of the block,

Q_{ku,gr}: Characteristic value of the tip resistance of the block,

W_{p,b}: Net self-weight of the block,

Q_{ktv,gr}: Characteristic bearing capacity of the rigid column group,

γ_{Rt}: Coefficient of strength for bearing capacity in compression,

Qt_{v,gr}: Vertical design capacity of the rigid column group,

Foundation1 Bearing Capacity:

Type of rigid column: Yerinde Dökme Betonarme Kazık,

Cap geometry: Rectangle,

Short side of the rigid column cap B= 15,[m]

Long side of the rigid column cap L= 20,[m]

Distance between centers of columns in X direction S_x= 2.52[m],

Distance between centers of columns in Y direction S_y= 2.93[m],

Number of column rows in X direction m=6,

Number of column rows in Y direction n=7,

Diameter of rigid column D= 0.8[m],

Length of rigid column L= 18[m],

Number of columns N= 42,

Vertical load P= 54000[kN],

Moment around the global Y axis M_x= 3600[kN.m],

Moment around the global X axis M_y= 3600[kN.m],

Group Effect: Converse-Labarre and Terzaghi block approach,

Table 44. Foundation1 Shaft Resistance

Column/Soil Interaction	Soil	σ'_v [kN/m ²]	$S_u(c_u)$ [kN/m ²]	c' [kN/m ²]	ϕ' [°]	α	β	Le [m]	As [m ²]	fs [kN/m ²]	Qs [kN]
[-3m] ↕ [-5m]	CH	73.6	76.2	-	-	0.5	-	2	5.03	37.771	189.86
[-5m] ↕ [-9m]	CH	110	76.2	-	-	0.6	-	4	10.05	45.777	460.2
[-9m] ↕ [-14m]	MH	151.5	101.8	-	-	0.61	-	5	12.57	62.094	780.3
[-14m] ↕ [-17m]	SM	191.8	-	0	30	-	0.51	3	7.54	97.485	735.02

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 20 / 44											
[-17m] ↔ [-21m]	CH	226.2	110	-	-	0.72	-	4	10.05	78.87	792.89

$$Q_{ks} = \Sigma Q_s = 2958.26 \text{ [kN]}$$

Table 45. Foundation1 Tip Resistance

$S_u(c_u)$ [kN/m ²]	Nc	$\sigma'_{0,t}$ [kN/m ²]	ϕ' [°]	Nt	Ab [m ²]	Qku [kN]
110	9	-	-	-	0.5	495

$$Q_{ku} = 495 \text{ [kN]}$$

Table 46. Foundation1 Bearing Capacity of a Single Rigid Column

Qku [kN]	Qks [kN]	Wp [kN]	Qktv [kN]	γR_s	γR_u	Qtk [kN]	Qtku [kN]	Qtv [kN]	Ptv [kN]	FS*	Check
495	2958.26	138.67	3314.59	1.5	2	1972.17	247.5	2219.67	1553.93	2.13	✓

$$Q_{ktv} = 3314.59 \text{ [kN]}$$

$$Q_{tv} = 2219.67 \text{ [kN]}$$

Table 47. Foundation1 Group Bearing Capacity with Converse-Labarre Method

N	Qktv [kN]	Eg	Qktv,gr [kN]	γR_s	Qtv,gr [kN]	Ptv,gr [kN]	FS*	Check
42	3314.59	0.67	93158.77	1.5	62105.85	54000	1.73	✓

$$(\text{Converse-Labarre}) Q_{ktv,gr} = 93158.77 \text{ [kN]}$$

Table 48. Foundation1 Shaft Resistance of the Group with Terzaghi Block Approach

Block / Soil Interaction	Soil	σ'_v [kN/m ²]	$S_u(c_u)$ [kN/m ²]	c' [kN/m ²]	ϕ' [°]	α	β	Le [m]	ξ [m]	As [m ²]	fs [kN/m ²]	Qs,gr [kN]
[-3m] ↔ [-5m]	CH	73.6	76.2	-	-	0.5	-	2	63.6	127.2	37.77	4804.44
[-5m] ↔ [-9m]	CH	110	76.2	-	-	0.6	-	4	63.6	254.4	45.78	11645.58
[-9m] ↔ [-14m]	MH	151.5	101.8	-	-	0.61	-	5	63.6	318	62.09	19745.92
[-14m] ↔ [-17m]	SM	191.8	-	0	30	-	0.51	3	63.6	190.8	97.49	18600.18

Downtown Foundation System												
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 21 / 44												
[-17m]	CH	226.2	110	-	-	0.72	-	4	63.6	254.4	78.87	20064.57
↔												
[-21m]												

$$Q_{ks,g} = \Sigma Q_{s,gr} = 74860.68[kN]$$

Table 49. Foundation1 Tip Resistance of the Group with Terzaghi Block Approach

Nc	$\sigma'_{o,t}$ [kN/m ²]	ϕ' [°]	Nt	Ab [m ²]	Q _{ku,gr} [kN]
7.3	-	-	-	246.56	197098

$$Q_{ku,g} = 197098[kN]$$

Table 50. Foundation1 Bearing Capacity of the Group with Terzaghi Block Approach

Q _{ktv} [kN]	N	P _{tv,gr} [kN]	Q _{ks,gr} [kN]	Q _{ku,gr} [kN]	W _{p,b} [kN]	Q _{ktv,g} [kN]	E _g	γR_t	Q _{tv,gr} [kN]	FS*	Check
3314.59	42	54000	74860.68	197098	47929.3	139212.96	1	1.5	92808.64	2.58	√

$$Q_{ktv,g} = 139212.96[kN]$$

$$Q_{tv,g} = 92808.64[kN]$$

COMBINED BEARING CAPACITY

qt: Design bearing capacity of shallow foundation,

Q_{tv}: Design value of compressive resistance of the ground against a rigid column, at the ultimate limit state,

Q_{tv,gr}: Vertical design capacity of the rigid column group,

q_{d,comb}: Design combined bearing capacity,

Table 51. Combined Bearing Capacity (Bearing capacity of shallow foundation is calculated with effective stresses)

Foundation	Method	Rigid Column Type	qt [kN/m ²]	Q _{tv} [kN]	Q _{tv,gr} [kN]	q _{t,comb} [kN/m ²]
Foundation1	Terzaghi	Reinforced Concrete Piles	1424.92	2219.67	62105.85	1631.94
Foundation1	Meyerhof	Reinforced Concrete Piles	1229.29	2219.67	62105.85	1436.3
Foundation1	Vesic	Reinforced Concrete Piles	1126.77	2219.67	62105.85	1333.79
Foundation1	Eurocode 7	Reinforced Concrete Piles	1044.99	2219.67	62105.85	1252.01

Table 52. Combined Bearing Capacity (Bearing capacity of shallow foundation is calculated

with total stresses)

Foundation	Method	Rigid Column Type	qt [kN/m ²]	Q _{tv} [kN]	Q _{tv,gr} [kN]	qt,comb [kN/m ²]
Foundation1	Terzaghi	Reinforced Concrete Piles	422.07	2219.67	62105.85	629.09
Foundation1	Meyerhof	Reinforced Concrete Piles	363.56	2219.67	62105.85	570.58
Foundation1	Vesic	Reinforced Concrete Piles	455.84	2219.67	62105.85	662.86
Foundation1	Eurocode 7	Reinforced Concrete Piles	362.89	2219.67	62105.85	569.91

ELASTIC SETTLEMENTS

h: Thickness of sublayer,

E: Modulus of Elasticity,

v: Poisson's Ratio,

σ'_o : Vertical effective stress,

$\Delta\sigma_v$: Vertical stress increase,

$\Delta\sigma_r$: Radial stress increase in X Direction,

$\Delta\sigma_\theta$: Circumferential stress increase,

$\Delta\sigma_v - v \cdot (\Delta\sigma_r + \Delta\sigma_\theta)$: Difference between vertical and horizontal stress increases,

$\epsilon_i \times H_i$: Sublayer elastic compression amount,

Settlement Point: B(21;5)

Table 53. Point: B(21;5) Elastic Settlement Analysis

Layer	Depth [m]	h [m]	Drainage Condition	E [kN/m ²]	v	σ'_o [kN/m ²]	$\Delta\sigma_v$ [kN/m ²]	$\Delta\sigma_r$ [kN/m ²]	$\Delta\sigma_\theta$ [kN/m ²]	$\Delta\sigma_v - v \cdot (\Delta\sigma_r + \Delta\sigma_\theta)$ [kN/m ²]	$\epsilon_i \times H_i$ [m]
CH	-0.5	1	Undrained	38630.5	0.5	9.2	0	0	0	0	0
CH	-1.5	1	Undrained	38630.5	0.5	27.6	0	0	0	0	0
CH	-2.5	1	Undrained	38630.5	0.5	46	0	0	0	0	0
CH	-3.5	1	Undrained	38630.5	0.5	89.1816	0.0251	9.0265	0	-4.4882	-0.0001
CH	-4.5	1	Undrained	38630.5	0.5	107.15	0.629	25.6559	0	-12.199	-0.0003
CH	-5.5	1	Undrained	38630.5	0.5	119.8601	2.532	38.625	0	-16.7805	-0.0004

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 23 / 44											
CH	-6.5	1	Undrai ned	38630. 5	0.5	127.41 63	5.7836	47.180 8	0	-17.80 68	-0.000 5
CH	-7.5	1	Undrai ned	38630. 5	0.5	134.60 7	9.9102	51.649 5	0	-15.91 45	-0.000 4
MH	-8.5	1	Undrai ned	40000	0.5	142.03 47	14.317 1	52.945 7	0	-12.15 57	-0.000 3
MH	-9.5	1	Undrai ned	40000	0.5	149.90 68	18.533 4	52.047 2	0	-7.490 2	-0.000 2
MH	-10.5	1	Undrai ned	40000	0.5	158.05 66	22.275 9	49.765 4	0	-2.606 8	-0.000 1
MH	-11.5	1	Undrai ned	40000	0.5	166.49 45	25.417 8	46.695 6	0	2.07	0.0001
MH	-12.5	1	Undrai ned	40000	0.5	175.19 63	27.935	43.245 6	0	6.3122	0.0002
MH	-13.5	1	Undrai ned	40000	0.5	184.12 61	29.860 7	39.682 2	0	10.019 6	0.0003
SM	-14.5	1	Draine d	35000	0.25	193.79 68	31.256	25.650 8	-0.715 7	25.022	0.0007
SM	-15.5	1	Draine d	35000	0.25	204.17 53	32.191 3	23.218 2	-1.233 4	26.695 1	0.0008
SM	-16.5	1	Draine d	35000	0.25	214.68 26	32.738	20.893 4	-1.618 4	27.919 2	0.0008
CH	-17.5	1	Undrai ned	40000	0.5	224.09 65	32.960 7	26.773 7	0	19.573 9	0.0005
CH	-18.5	1	Undrai ned	40000	0.5	232.39 69	32.917 8	24.116 9	0	20.859 4	0.0005
CH	-19.5	1	Undrai ned	40000	0.5	240.76 89	32.659 5	21.705	0	21.807	0.0005
CH	-20.5	1	Undrai ned	40000	0.5	249.20 1	32.231 2	19.525 9	0	22.468 3	0.0006
CH	-21.5	1	Undrai ned	40000	0.5	257.68 24	31.670 2	17.564 6	0	22.887 9	0.0006
CH	-22.5	1	Undrai ned	40000	0.5	266.20 5	31.007 7	15.804 4	0	23.105 5	0.0006
CH	-23.5	1	Undrai ned	40000	0.5	274.76 23	30.269 6	14.227 7	0	23.155 8	0.0006
CH	-24.5	1	Undrai ned	40000	0.5	283.34 88	29.477 5	12.817 2	0	23.068 8	0.0006
CH	-25.5	1	Undrai ned	40000	0.5	291.96 03	28.648 7	11.556 6	0	22.870 4	0.0006
CH	-26.5	1	Undrai ned	40000	0.5	300.59 31	27.797 8	10.430 4	0	22.582 6	0.0006

$$Se = \sum \epsilon_i x H_i = 0.0063[m]$$

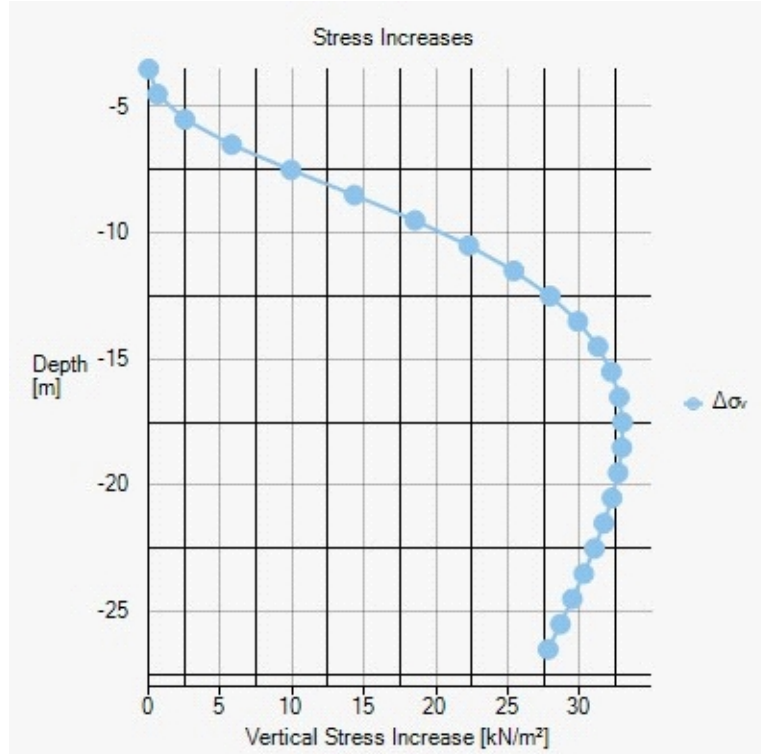


Figure 1. Settlement Point: B(21;5) Stress Increase-Depth Plot

Settlement Point: A(7.5;10)

Table 54. Point: A(7.5;10) Elastic Settlement Analysis

Layer	Depth [m]	h [m]	Drainage Condition	E [kN/m²]	v	σ'_o [kN/m²]	$\Delta\sigma_v$ [kN/m²]	$\Delta\sigma_r$ [kN/m²]	$\Delta\sigma_\theta$ [kN/m²]	$\Delta\sigma_v - v \cdot (\Delta\sigma_r + \Delta\sigma_\theta)$ [kN/m²]	$\epsilon_i \times H_i$ [m]
CH	-0.17	0.33	Undrained	38630.5	0.5	3.0667	0	0	0	0	0
CH	-0.5	0.33	Undrained	38630.5	0.5	9.2	0	0	0	0	0
CH	-0.83	0.33	Undrained	38630.5	0.5	15.3333	0	0	0	0	0
CH	-1.17	0.33	Undrained	38630.5	0.5	21.4667	0	0	0	0	0
CH	-1.5	0.33	Undrained	38630.5	0.5	27.6	0	0	0	0	0
CH	-1.83	0.33	Undrained	38630.5	0.5	33.7333	0	0	0	0	0
CH	-2.17	0.33	Undrained	38630.5	0.5	39.8667	0	0	0	0	0
CH	-2.5	0.33	Undrained	38630.5	0.5	46	0	0	0	0	0

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 25 / 44											
CH	-2.83	0.33	Undrai ned	38630. 5	0.5	52.133 3	0	0	0	0	0
CH-Pile zone	-3.11	0.22	Undrai ned	21470 62.3	0.5	57.244 4	121.26 26	247.46 66	0	-2.470 7	0
CH-Pile zone	-3.33	0.22	Undrai ned	21470 62.3	0.5	61.333 5	124.79 41	236.70 11	0	6.4436	0
CH-Pile zone	-3.56	0.22	Undrai ned	21470 62.3	0.5	65.422 8	124.77 29	228.14 51	0	10.700 4	0
CH-Pile zone	-3.78	0.22	Undrai ned	21470 62.3	0.5	69.512 6	124.72 61	219.65 07	0	14.900 8	0
CH-Pile zone	-4	0.22	Undrai ned	21470 62.3	0.5	73.603 2	124.64 42	211.24 73	0	19.020 5	0
CH-Pile zone	-4.22	0.22	Undrai ned	21470 62.3	0.5	77.694 8	124.51 8	202.94 91	0	23.043 5	0
CH-Pile zone	-4.44	0.22	Undrai ned	21470 62.3	0.5	81.787 3	124.33 94	194.78	0	26.949 4	0
CH-Pile zone	-4.67	0.22	Undrai ned	21470 62.3	0.5	85.881 2	124.10 26	186.78 76	0	30.708 8	0
CH-Pile zone	-4.89	0.22	Undrai ned	21470 62.3	0.5	89.976 3	123.80 08	178.96 66	0	34.317 5	0
CH-Pile zone	-5.22	0.44	Undrai ned	21470 62.3	0.5	94.033	123.21 51	167.58 69	0	39.421 7	0
CH-Pile zone	-5.67	0.44	Undrai ned	21470 62.3	0.5	98.054 7	122.16 84	153.14 45	0	45.596 1	0
CH-Pile zone	-6.11	0.44	Undrai ned	21470 62.3	0.5	102.08 29	120.80 73	139.61 65	0	50.999 1	0
CH-Pile zone	-6.56	0.44	Undrai ned	21470 62.3	0.5	106.11 74	119.13 47	127.04 95	0	55.609 9	0
CH-Pile zone	-7	0.44	Undrai ned	21470 62.3	0.5	110.15 78	117.16 67	115.46 06	0	59.436 4	0
CH-Pile zone	-7.44	0.44	Undrai ned	21470 62.3	0.5	114.20 34	114.92 99	104.84 2	0	62.508 9	0
CH-Pile zone	-7.89	0.44	Undrai ned	21470 62.3	0.5	118.25 33	112.45 78	95.166	0	64.874 8	0
CH-Pile zone	-8.33	0.44	Undrai ned	21470 62.3	0.5	122.30 65	109.78 79	86.389 9	0	66.593	0
CH-Pile zone	-8.78	0.44	Undrai ned	21470 62.3	0.5	126.36 21	106.95 92	78.461	0	67.728 7	0
MH- Pile zone	-9.5	1	Undrai ned	21483 35.4	0.5	133.15 49	102.12 22	67.229 8	0	68.507 3	0
MH- Pile zone	-10.5	1	Undrai ned	21483 35.4	0.5	142.68 23	95.177 8	54.615 7	0	67.87	0
MH- Pile zone	-11.5	1	Undrai ned	21483 35.4	0.5	152.20 11	88.238 4	44.791	0	65.842 9	0

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 26 / 44											
MH-Pile zone	-12.5	1	Undrained	2148335.4	0.5	161.7062	81.5363	37.1490	0	62.9618	0
MH-Pile zone	-13.5	1	Undrained	2148335.4	0.5	171.1947	75.2176	31.1884	0	59.6234	0
SM-Pile zone	-14.5	1	Drained	2143687.3	0.25	181.5658	69.3612	15.0741	-4.542	66.7281	0
SM-Pile zone	-15.5	1	Drained	2143687.3	0.25	192.8199	63.9973	12.6401	-4.2995	61.9122	0
SM-Pile zone	-16.5	1	Drained	2143687.3	0.25	204.0585	59.1242	10.7403	-4.0562	57.4531	0
CH-Pile zone	-17.2	0.4	Undrained	2148476	0.5	211.4371	55.9938	18.1160	0	46.9358	0
CH-Pile zone	-17.6	0.4	Undrained	2148476	0.5	214.9649	54.3042	17.2326	0	45.6879	0
CH-Pile zone	-18	0.4	Undrained	2148476	0.5	218.4909	52.6838	16.4161	0	44.4757	0
CH-Pile zone	-18.4	0.4	Undrained	2148476	0.5	222.0151	51.1302	15.6596	0	43.3004	0
CH-Pile zone	-18.8	0.4	Undrained	2148476	0.5	225.5377	49.641	14.9574	0	42.1622	0
CH-Pile zone	-19.2	0.4	Undrained	2148476	0.5	229.0588	48.2135	14.3042	0	41.0614	0
CH-Pile zone	-19.6	0.4	Undrained	2148476	0.5	232.5785	46.8454	13.6952	0	39.9978	0
CH-Pile zone	-20	0.4	Undrained	2148476	0.5	236.0969	45.534	13.1264	0	38.9708	0
CH-Pile zone	-20.4	0.4	Undrained	2148476	0.5	239.6141	44.2769	12.5939	0	37.98	0
CH-Pile zone	-20.8	0.4	Undrained	2148476	0.5	243.1302	43.0717	12.0944	0	37.0245	0
CH	-21.3	0.6	Undrained	40151.3	0.5	247.5239	41.6345	11.5121	0	35.8784	0.0005
CH	-21.9	0.6	Undrained	40151.3	0.5	252.7946	40.0057	10.8684	0	34.5715	0.0005
CH	-22.5	0.6	Undrained	40151.3	0.5	258.0636	38.4744	10.2775	0	33.3357	0.0005
CH	-23.1	0.6	Undrained	40151.3	0.5	263.3311	37.0338	9.7331	0	32.1673	0.0005
CH	-23.7	0.6	Undrained	40151.3	0.5	268.5975	35.6774	9.2299	0	31.0624	0.0005
CH	-24.3	0.6	Undrained	40151.3	0.5	273.8627	34.399	8.7631	0	30.0174	0.0004
CH	-24.9	0.6	Undrained	40151.3	0.5	279.1272	33.1931	8.3289	0	29.0286	0.0004
CH	-25.5	0.6	Undrained	40151.3	0.5	284.3909	32.0543	7.9239	0	28.0924	0.0004

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 27 / 44											
CH	-26.1	0.6	Undrai ned	40151. 3	0.5	289.65 42	30.977 9	7.5451	0	27.205 3	0.0004
CH	-26.7	0.6	Undrai ned	40151. 3	0.5	294.91 7	29.959 3	7.1901	0	26.364 3	0.0004

$$Se = \sum \epsilon_i \times H_i = 0.0045[m]$$

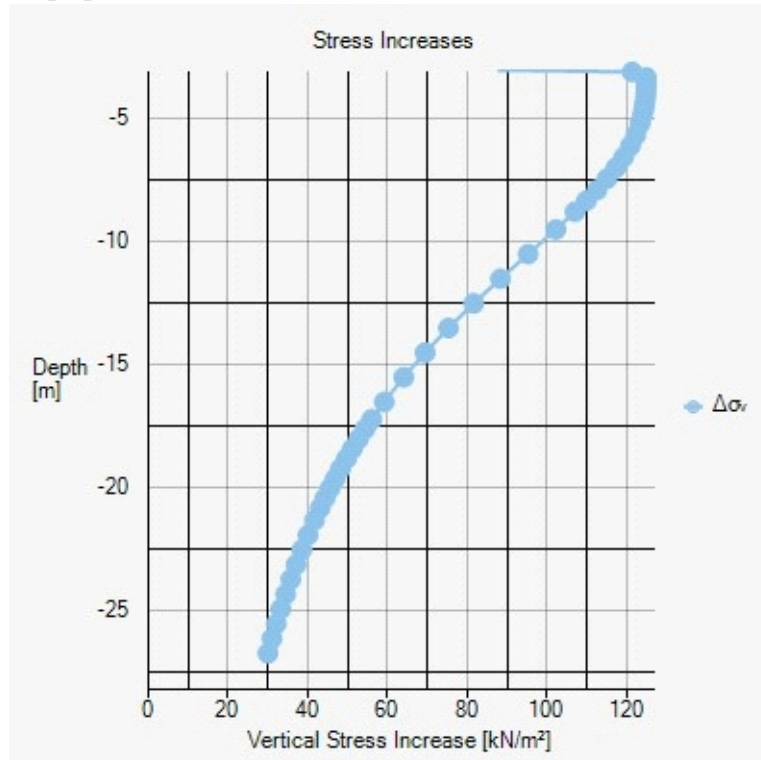


Figure 2. Settlement Point: A(7.5;10) Stress Increase-Depth Plot

Settlement Point: C(34.5;10)

Table 55. Point: C(34.5;10) Elastic Settlement Analysis

Layer	Depth [m]	h [m]	Drainage Condition	E [kN/m²]	ν	σ'_o [kN/m²]	$\Delta\sigma_v$ [kN/m²]	$\Delta\sigma_r$ [kN/m²]	$\Delta\sigma_\theta$ [kN/m²]	$\Delta\sigma_v - v. (\Delta\sigma_r + \Delta\sigma_\theta)$ [kN/m²]	$\epsilon_i \times H_i$ [m]
CH	-0.5	1	Undrai ned	38630. 5	0.5	9.2	0	0	0	0	0
CH	-1.5	1	Undrai ned	38630. 5	0.5	27.6	0	0	0	0	0
CH	-2.5	1	Undrai ned	38630. 5	0.5	46	0	0	0	0	0
CH	-3.5	1	Undrai ned	38630. 5	0.5	64.400 4	124.78 02	230.27 9	0	9.6407	0.0002
CH	-4.5	1	Undrai ned	38630. 5	0.5	82.810 7	124.28 58	192.76 35	0	27.904	0.0007

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 28 / 44											
CH	-5.5	1	Undrained	38630.5	0.5	96.5458	122.5974	158.4567	0	43.369	0.0011
MH	-6.5	1	Undrained	40000	0.5	105.8128	119.3604	128.567	0	55.0769	0.0014
MH	-7.5	1	Undrained	40000	0.5	115.3094	114.6331	103.5817	0	62.8422	0.0016
MH	-8.5	1	Undrained	40000	0.5	124.8272	108.7437	83.3204	0	67.0835	0.0017
MH	-9.5	1	Undrained	40000	0.5	134.3549	102.1222	67.2298	0	68.5073	0.0017
MH	-10.5	1	Undrained	40000	0.5	143.8823	95.1778	54.6157	0	67.87	0.0017
MH	-11.5	1	Undrained	40000	0.5	153.4011	88.2384	44.791	0	65.8429	0.0016
MH	-12.5	1	Undrained	40000	0.5	162.9062	81.5363	37.149	0	62.9618	0.0016
MH	-13.5	1	Undrained	40000	0.5	172.3947	75.2176	31.1884	0	59.6234	0.0015
SM	-14.5	1	Drained	35000	0.25	182.7658	69.3612	15.0741	-4.542	66.7281	0.0019
SM	-15.5	1	Drained	35000	0.25	194.0199	63.9973	12.6401	-4.2995	61.9122	0.0018
SM	-16.5	1	Drained	35000	0.25	205.2585	59.1242	10.7403	-4.0562	57.4531	0.0016
CH	-17.5	1	Undrained	40000	0.5	215.2832	54.72	17.4469	0	45.9965	0.0011
CH	-18.5	1	Undrained	40000	0.5	224.0959	50.7519	15.4792	0	43.0123	0.0011
CH	-19.5	1	Undrained	40000	0.5	232.8987	47.182	13.8436	0	40.2602	0.001
CH	-20.5	1	Undrained	40000	0.5	241.6932	43.9708	12.466	0	37.7378	0.0009
CH	-21.5	1	Undrained	40000	0.5	250.481	41.0803	11.2912	0	35.4346	0.0009
CH	-22.5	1	Undrained	40000	0.5	259.2636	38.4744	10.2775	0	33.3357	0.0008
CH	-23.5	1	Undrained	40000	0.5	268.0421	36.1206	9.3934	0	31.4239	0.0008
CH	-24.5	1	Undrained	40000	0.5	276.8176	33.9892	8.615	0	29.6818	0.0007
CH	-25.5	1	Undrained	40000	0.5	285.5909	32.0543	7.9239	0	28.0924	0.0007
CH	-26.5	1	Undrained	40000	0.5	294.3628	30.2927	7.306	0	26.6397	0.0007

$$Se = \sum \epsilon_i x H_i = 0.0288[m]$$

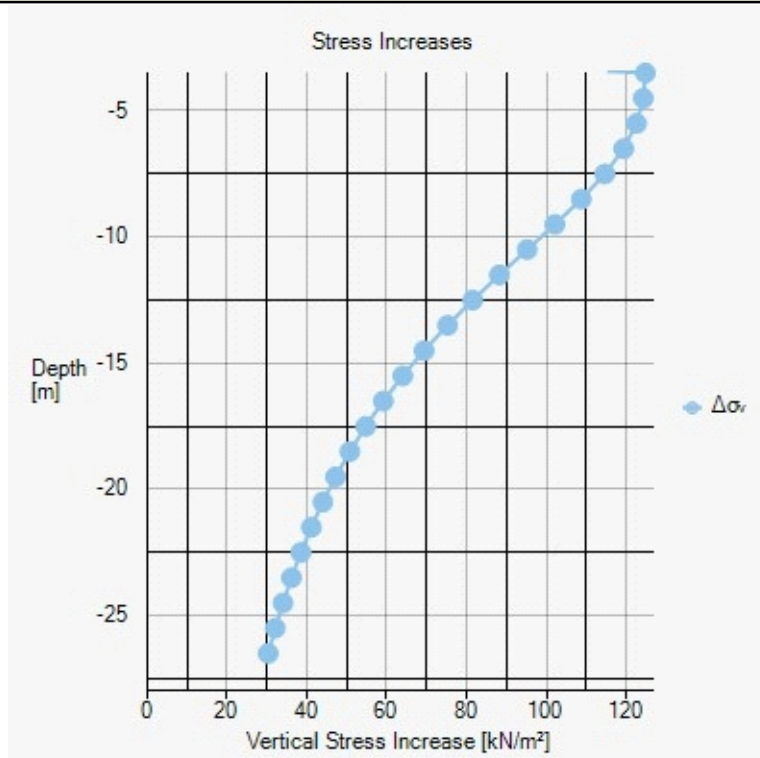


Figure 3. Settlement Point: C(34.5;10) Stress Increase-Depth Plot

Settlement Point: D(34.5;5)

Table 56. Point: D(34.5;5) Elastic Settlement Analysis

Layer	Depth [m]	h [m]	Drainage Condition	E [kN/m²]	ν	σ'_o [kN/m²]	$\Delta\sigma_v$ [kN/m²]	$\Delta\sigma_r$ [kN/m²]	$\Delta\sigma_\theta$ [kN/m²]	$\Delta\sigma_v - v. (\Delta\sigma_r + \Delta\sigma_\theta)$ [kN/m²]	$\epsilon_i \times H_i$ [m]
CH	-0.5	1	Undrained	38630.5	0.5	9.2	0	0	0	0	0
CH	-1.5	1	Undrained	38630.5	0.5	27.6	0	0	0	0	0
CH	-2.5	1	Undrained	38630.5	0.5	46	0	0	0	0	0
CH	-3.5	1	Undrained	38630.5	0.5	64.4006	124.7609	226.9615	0	11.2802	0.0003
CH	-4.5	1	Undrained	38630.5	0.5	82.8147	123.8228	183.8978	0	31.8739	0.0008
CH	-5.5	1	Undrained	38630.5	0.5	96.5626	120.8593	146.459	0	47.6298	0.0012
MH	-6.5	1	Undrained	40000	0.5	105.8525	115.7649	115.9753	0	57.7773	0.0014
MH	-7.5	1	Undrained	40000	0.5	115.3792	109.1261	92.1228	0	63.0647	0.0016

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 30 / 44											
MH	-8.5	1	Undrained	40000	0.5	124.9294	101.6835	73.8259	0	64.7705	0.0016
MH	-9.5	1	Undrained	40000	0.5	134.4874	94.0438	59.8820	0	64.1028	0.0016
MH	-10.5	1	Undrained	40000	0.5	144.0396	86.6129	49.2356	0	61.9951	0.0015
MH	-11.5	1	Undrained	40000	0.5	153.5763	79.6241	41.0491	0	59.0995	0.0015
MH	-12.5	1	Undrained	40000	0.5	163.092	73.1883	34.6897	0	55.8435	0.0014
MH	-13.5	1	Undrained	40000	0.5	172.5848	67.3397	29.6899	0	52.4947	0.0013
SM	-14.5	1	Drained	35000	0.25	182.9549	62.0667	14.8589	-3.7802	59.2971	0.0017
SM	-15.5	1	Drained	35000	0.25	194.2042	57.3341	12.8082	-3.6197	55.0369	0.0016
SM	-16.5	1	Drained	35000	0.25	205.435	53.0953	11.1573	-3.4542	51.1695	0.0015
CH	-17.5	1	Undrained	40000	0.5	215.4502	49.3007	17.6821	0	40.4596	0.001
CH	-18.5	1	Undrained	40000	0.5	224.2524	45.9014	15.8510	0	37.9759	0.0009
CH	-19.5	1	Undrained	40000	0.5	233.0441	42.8517	14.2948	0	35.7043	0.0009
CH	-20.5	1	Undrained	40000	0.5	241.8276	40.115	12.9575	0	33.6312	0.0008
CH	-21.5	1	Undrained	40000	0.5	250.6046	37.6394	11.7964	0	31.7408	0.0008
CH	-22.5	1	Undrained	40000	0.5	259.3769	35.4058	10.7791	0	30.0162	0.0008
CH	-23.5	1	Undrained	40000	0.5	268.1458	33.3815	9.8803	0	28.4414	0.0007
CH	-24.5	1	Undrained	40000	0.5	276.9123	31.541	9.0807	0	27.0007	0.0007
CH	-25.5	1	Undrained	40000	0.5	285.6772	29.8623	8.3648	0	25.6799	0.0006
CH	-26.5	1	Undrained	40000	0.5	294.4414	28.3264	7.7204	0	24.4662	0.0006

$$Se = \sum \epsilon_i x H_i = 0.0268[m]$$

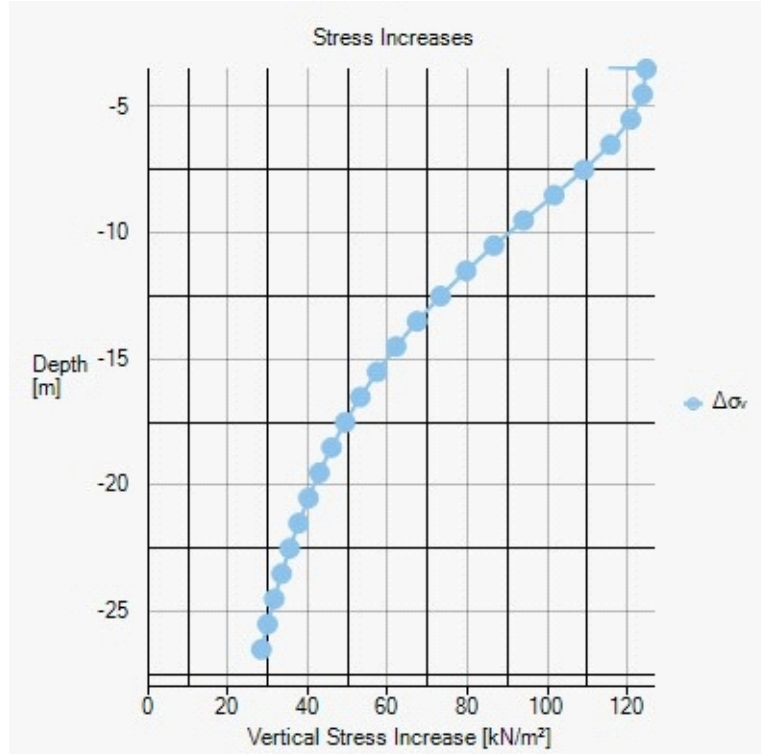


Figure 4. Settlement Point: D(34.5;5) Stress Increase-Depth Plot

Settlement Point: A(5;-5)

Table 57. Point: A(5;-5) Elastic Settlement Analysis

Layer	Depth [m]	h [m]	Drainage Condition	E [kN/m²]	v	σ' _o [kN/m²]	Δσ _v [kN/m²]	Δσ _r [kN/m²]	Δσ _θ [kN/m²]	Δσ _{v-v.} (Δσ _r + Δσ _θ) [kN/m²]	ε _i x H _i [m]
CH	-0.5	1	Undrained	38630.5	0.5	9.2	0	0	0	0	0
CH	-1.5	1	Undrained	38630.5	0.5	27.6	0	0	0	0	0
CH	-2.5	1	Undrained	38630.5	0.5	46	0	0	0	0	0
CH	-3.5	1	Undrained	38630.5	0.5	64.4	0	0	0	0	0
CH	-4.5	1	Undrained	38630.5	0.5	82.8	0.0078	1.6112	0	-0.7978	0
CH	-5.5	1	Undrained	38630.5	0.5	96.5	0.1884	4.4027	0	-2.0131	-0.0001
MH	-6.5	1	Undrained	40000	0.5	105.7	0.7043	6.1825	0	-2.3871	-0.0001
MH	-7.5	1	Undrained	40000	0.5	115.1	1.4736	6.9286	0	-1.9908	0

Downtown Foundation System											
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 32 / 44											
MH	-8.5	1	Undrained	40000	0.5	124.5	2.3016	6.9108	0	-1.1538	0
MH	-9.5	1	Undrained	40000	0.5	133.9	3.0369	6.4517	0	-0.1889	0
MH	-10.5	1	Undrained	40000	0.5	143.3	3.6092	5.7928	0	0.7128	0
MH	-11.5	1	Undrained	40000	0.5	152.7	4.0082	5.0808	0	1.4678	0
MH	-12.5	1	Undrained	40000	0.5	162.1	4.2515	4.3947	0	2.0541	0.0001
MH	-13.5	1	Undrained	40000	0.5	171.5	4.3704	3.7695	0	2.4856	0.0001
SM	-14.5	1	Drained	35000	0.25	181.8	4.3915	2.2364	-0.2852	3.9037	0.0001
SM	-15.5	1	Drained	35000	0.25	193	4.3422	1.8727	-0.3093	3.9513	0.0001
SM	-16.5	1	Drained	35000	0.25	204.2	4.2432	1.5619	-0.3201	3.9327	0.0001
CH	-17.5	1	Undrained	40000	0.5	214.2	4.1106	1.9945	0	3.1134	0.0001
CH	-18.5	1	Undrained	40000	0.5	223	3.9567	1.7036	0	3.1049	0.0001
CH	-19.5	1	Undrained	40000	0.5	231.8	3.7905	1.4582	0	3.0614	0.0001
CH	-20.5	1	Undrained	40000	0.5	240.6	3.6186	1.2513	0	2.9929	0.0001
CH	-21.5	1	Undrained	40000	0.5	249.4	3.4457	1.0768	0	2.9073	0.0001
CH	-22.5	1	Undrained	40000	0.5	258.2	3.2753	0.9293	0	2.8106	0.0001
CH	-23.5	1	Undrained	40000	0.5	267	3.1095	0.8046	0	2.7072	0.0001
CH	-24.5	1	Undrained	40000	0.5	275.8	2.9498	0.6987	0	2.6005	0.0001
CH	-25.5	1	Undrained	40000	0.5	284.6	2.7972	0.6087	0	2.4928	0.0001
CH	-26.5	1	Undrained	40000	0.5	293.4	2.6521	0.532	0	2.3861	0.0001

$$Se = \sum \epsilon_i x H_i = 0.0013[m]$$

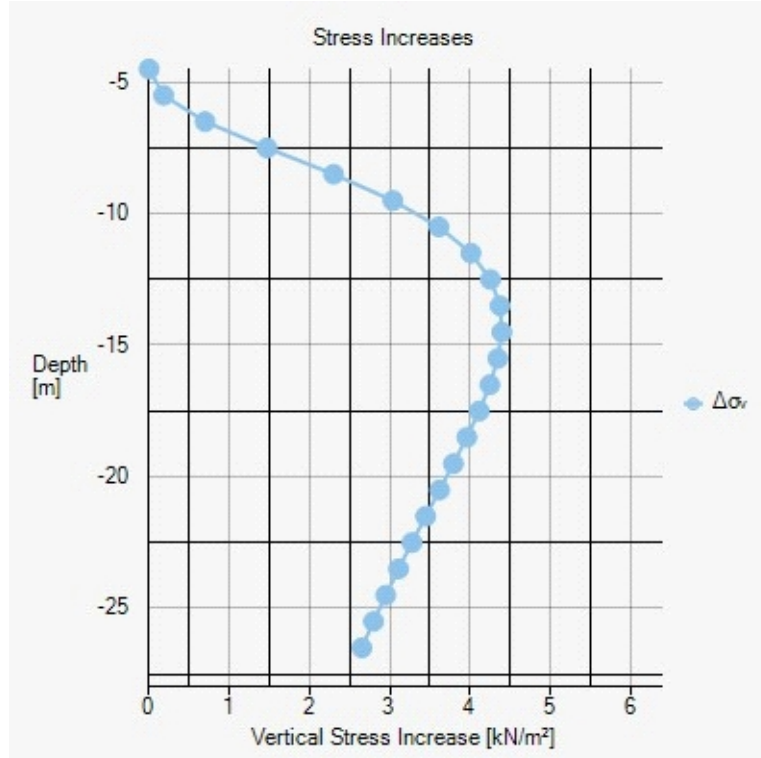


Figure 5. Settlement Point: A(5;-5) Stress Increase-Depth Plot

CONSOLIDATION SETTLEMENTS

h : Thickness of sublayer,
 e_0 : Natural void ratio,
 C_c : Compression index,
 C_r : Recompression index,
 OCR : Overconsolidation ratio,
 σ'_{p} : Pre-consolidation pressure,
 σ'_o : Vertical effective stress,
 $\Delta\sigma_v$: Stress increase,
 S_{ci} : Sublayer consolidation compression amount,

Settlement Point: B(21;5)

Table 58. Nokta: B(21;5) Konsolidasyon Oturma Analizi

Layer	Depth [m]	h [m]	e_0	C_c	C_r	OCR	σ'_{p} [kN/m ²]	σ'_o [kN/m ²]	$\Delta\sigma$ [kN/m ²]	S_{ci} [m]
CH	-0.5	1	0.79	0.414	0.059	34.6	318.3	9.2	0	0
CH	-1.5	1	0.79	0.414	0.059	12.2	336.7	27.6	0	0
CH	-2.5	1	0.79	0.414	0.059	7.72	355.1	46	0	0
CH	-3.5	1	0.79	0.414	0.059	4.47	398.2816	89.1816	0.0251	0
CH	-4.5	1	0.79	0.414	0.059	3.88	416.25	107.15	0.629	0.0001
CH	-5.5	1	0.79	0.414	0.059	3.58	428.9601	119.8601	2.532	0.0003

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 34 / 44										
CH	-6.5	1	0.79	0.414	0.059	3.43	436.5163	127.4163	5.7836	0.0006
CH	-7.5	1	0.79	0.414	0.059	3.3	443.707	134.607	9.9102	0.001
MH	-8.5	1	0.83	0.45	0.064	3.98	565.1347	142.0347	14.3171	0.0015
MH	-9.5	1	0.83	0.45	0.064	3.82	573.0068	149.9068	18.5334	0.0018
MH	-10.5	1	0.83	0.45	0.064	3.68	581.1566	158.0566	22.2759	0.002
MH	-11.5	1	0.83	0.45	0.064	3.54	589.5945	166.4945	25.4178	0.0022
MH	-12.5	1	0.83	0.45	0.064	3.42	598.2963	175.1963	27.935	0.0022
MH	-13.5	1	0.83	0.45	0.064	3.3	607.2261	184.1261	29.8607	0.0023
SM	-14.5	1	0.49					193.7968	31.256	0
SM	-15.5	1	0.49					204.1753	32.1913	0
SM	-16.5	1	0.49					214.6826	32.738	0
CH	-17.5	1	0.95	0.37	0.054	2.16	483.0965	224.0965	32.9607	0.0017
CH	-18.5	1	0.95	0.37	0.054	2.11	491.3969	232.3969	32.9178	0.0016
CH	-19.5	1	0.95	0.37	0.054	2.08	499.7689	240.7689	32.6595	0.0015
CH	-20.5	1	0.95	0.37	0.054	2.04	508.201	249.201	32.2312	0.0015
CH	-21.5	1	0.95	0.37	0.054	2.01	516.6824	257.6824	31.6702	0.0014
CH	-22.5	1	0.95	0.37	0.054	1.97	525.205	266.205	31.0077	0.0013
CH	-23.5	1	0.95	0.37	0.054	1.94	533.7623	274.7623	30.2696	0.0013
CH	-24.5	1	0.95	0.37	0.054	1.91	542.3488	283.3488	29.4775	0.0012
CH	-25.5	1	0.95	0.37	0.054	1.89	550.9603	291.9603	28.6487	0.0011
CH	-26.5	1	0.95	0.37	0.054	1.86	559.5931	300.5931	27.7978	0.0011

Sc=ΣS_i² i= 0.0277[m]

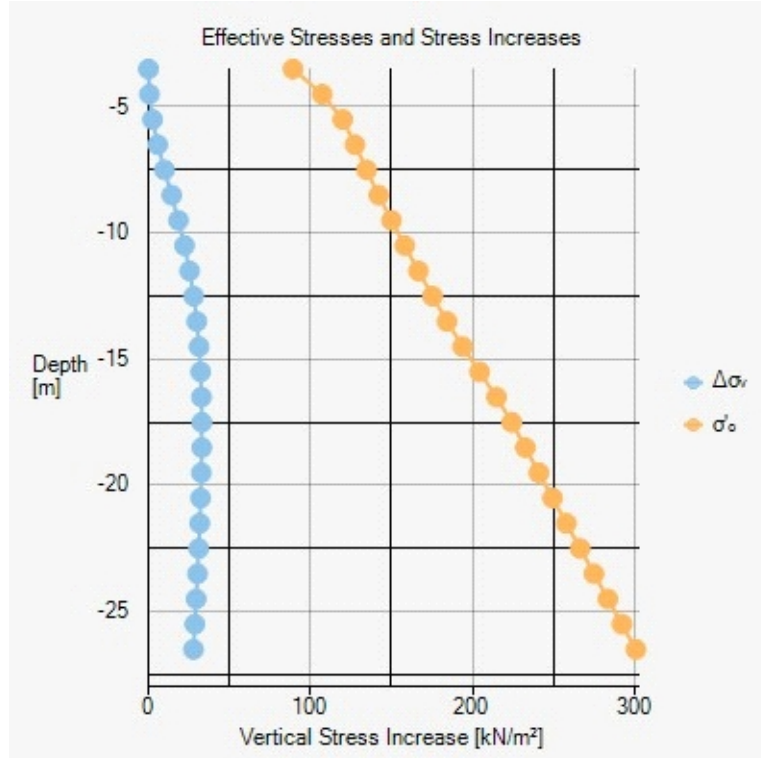


Figure 6. Settlement Point: B(21;5) Effective Stresses and Stress Increases

Settlement Point: A(7.5;10)

Table 59. Nokta: A(7.5;10) Konsolidasyon Oturma Analizi

Layer	Depth [m]	h [m]	e ₀	C _c	C _r	OCR	σ' _z [kN/m ²]	σ' ₀ [kN/m ²]	Δσ [kN/m ²]	S _i [m]
CH	-0.17	0.33	0.91	0.414	0.059	104.21	319.5667	3.0667	0	0
CH	-0.5	0.33	0.91	0.414	0.059	35.4	325.7	9.2	0	0
CH	-0.83	0.33	0.91	0.414	0.059	21.64	331.8333	15.3333	0	0
CH	-1.17	0.33	0.91	0.414	0.059	15.74	337.9667	21.4667	0	0
CH	-1.5	0.33	0.91	0.414	0.059	12.47	344.1	27.6	0	0
CH	-1.83	0.33	0.91	0.414	0.059	10.38	350.2333	33.7333	0	0
CH	-2.17	0.33	0.91	0.414	0.059	8.94	356.3667	39.8667	0	0
CH	-2.5	0.33	0.91	0.414	0.059	7.88	362.5	46	0	0
CH	-2.83	0.33	0.91	0.414	0.059	7.07	368.6333	52.1333	0	0
CH-Pile zone	-3.11	0.22	0.91					57.2444	121.2620	0
CH-Pile zone	-3.33	0.22	0.91					61.3335	124.7940	0

Downtown Foundation System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 36 / 44							
CH-Pile zone	-3.56	0.22	0.91		65.4228	124.7720	9
CH-Pile zone	-3.78	0.22	0.91		69.5126	124.7260	1
CH-Pile zone	-4	0.22	0.91		73.6032	124.6440	2
CH-Pile zone	-4.22	0.22	0.91		77.6948	124.5180	
CH-Pile zone	-4.44	0.22	0.91		81.7873	124.3390	4
CH-Pile zone	-4.67	0.22	0.91		85.8812	124.1020	6
CH-Pile zone	-4.89	0.22	0.91		89.9763	123.8000	8
CH-Pile zone	-5.22	0.44	0.91		94.033	123.2150	1
CH-Pile zone	-5.67	0.44	0.91		98.0547	122.1680	4
CH-Pile zone	-6.11	0.44	0.91		102.0829	120.8070	3
CH-Pile zone	-6.56	0.44	0.91		106.1174	119.1340	7
CH-Pile zone	-7	0.44	0.91		110.1578	117.1660	7
CH-Pile zone	-7.44	0.44	0.91		114.2034	114.9290	9
CH-Pile zone	-7.89	0.44	0.91		118.2533	112.4570	8
CH-Pile zone	-8.33	0.44	0.91		122.3065	109.7870	9
CH-Pile zone	-8.78	0.44	0.91		126.3621	106.9590	2
MH-Pile zone	-9.5	1	0.83		133.1549	102.1220	2
MH-Pile zone	-10.5	1	0.83		142.6823	95.17780	
MH-Pile zone	-11.5	1	0.83		152.2011	88.23840	
MH-Pile zone	-12.5	1	0.83		161.7062	81.53630	
MH-Pile zone	-13.5	1	0.83		171.1947	75.21760	
SM-Pile zone	-14.5	1	0.49		181.5658	69.36120	
SM-Pile zone	-15.5	1	0.49		192.8199	63.99730	
SM-Pile zone	-16.5	1	0.49		204.0585	59.12420	

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 37 / 44										
CH-Pile zone	-17.2	0.4	0.89					211.4371	55.99380	
CH-Pile zone	-17.6	0.4	0.89					214.9649	54.30420	
CH-Pile zone	-18	0.4	0.89					218.4909	52.68380	
CH-Pile zone	-18.4	0.4	0.89					222.0151	51.13020	
CH-Pile zone	-18.8	0.4	0.89					225.5377	49.6410	
CH-Pile zone	-19.2	0.4	0.89					229.0588	48.21350	
CH-Pile zone	-19.6	0.4	0.89					232.5785	46.84540	
CH-Pile zone	-20	0.4	0.89					236.0969	45.5340	
CH-Pile zone	-20.4	0.4	0.89					239.6141	44.27690	
CH-Pile zone	-20.8	0.4	0.89					243.1302	43.07170	
CH	-21.3	0.6	0.89	0.378	0.054	1.97	486.6239	247.5239	41.6345	0.0012
CH	-21.9	0.6	0.89	0.378	0.054	1.95	491.8946	252.7946	40.0057	0.0011
CH	-22.5	0.6	0.89	0.378	0.054	1.93	497.1636	258.0636	38.4744	0.001
CH	-23.1	0.6	0.89	0.378	0.054	1.91	502.4311	263.3311	37.0338	0.001
CH	-23.7	0.6	0.89	0.378	0.054	1.89	507.6975	268.5975	35.6774	0.0009
CH	-24.3	0.6	0.89	0.378	0.054	1.87	512.9627	273.8627	34.399	0.0009
CH	-24.9	0.6	0.89	0.378	0.054	1.86	518.2272	279.1272	33.1931	0.0008
CH	-25.5	0.6	0.89	0.378	0.054	1.84	523.4909	284.3909	32.0543	0.0008
CH	-26.1	0.6	0.89	0.378	0.054	1.83	528.7542	289.6542	30.9779	0.0008
CH	-26.7	0.6	0.89	0.378	0.054	1.81	534.017	294.917	29.9593	0.0007

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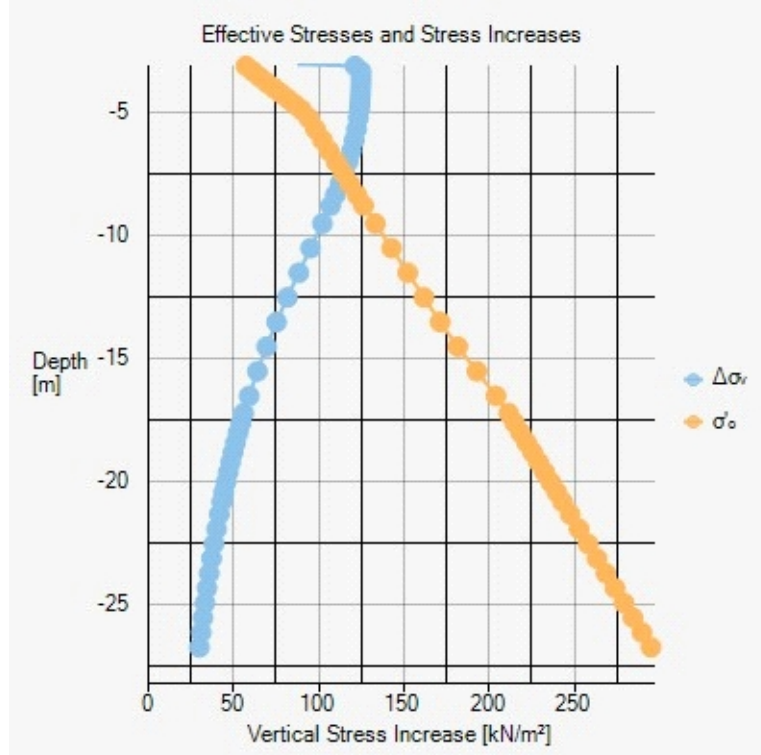


Figure 7. Settlement Point: A(7.5;10) Effective Stresses and Stress Increases

Settlement Point: C(34.5;10)

Table 60. Nokta: C(34.5;10) Konsolidasyon Oturma Analizi

Layer	Depth [m]	h [m]	e ₀	C _c	C _r	OCR	σ' _o [kN/m²]	σ' _o [kN/m²]	Δσ [kN/m²]	S _i [m]
CH	-0.5	1	0.91	0.414	0.059	34.6	318.3	9.2	0	0
CH	-1.5	1	0.91	0.414	0.059	12.2	336.7	27.6	0	0
CH	-2.5	1	0.91	0.414	0.059	7.72	355.1	46	0	0
CH	-3.5	1	0.91	0.414	0.059	5.8	373.5004	64.4004	124.7802	0.0145
CH	-4.5	1	0.91	0.414	0.059	4.73	391.9107	82.8107	124.2858	0.0123
CH	-5.5	1	0.91	0.414	0.059	4.2	405.6458	96.5458	122.5974	0.011
MH	-6.5	1	0.83	0.45	0.064	4.92	520.2128	105.8128	119.3604	0.0115
MH	-7.5	1	0.83	0.45	0.064	4.59	529.7094	115.3094	114.6331	0.0105
MH	-8.5	1	0.83	0.45	0.064	4.32	539.2272	124.8272	108.7437	0.0095
MH	-9.5	1	0.83	0.45	0.064	4.08	548.7549	134.3549	102.1222	0.0086
MH	-10.5	1	0.83	0.45	0.064	3.88	558.2823	143.8823	95.17783	0.0077

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 39 / 44										
MH	-11.5	1	0.83	0.45	0.064	3.7	567.8011	153.4011	88.2384	0.0069
MH	-12.5	1	0.83	0.45	0.064	3.54	577.3062	162.9062	81.5363	0.0062
MH	-13.5	1	0.83	0.45	0.064	3.4	586.7947	172.3947	75.2176	0.0055
SM	-14.5	1	0.49					182.7658	69.3612	0
SM	-15.5	1	0.49					194.0199	63.9973	0
SM	-16.5	1	0.49					205.2585	59.1242	0
CH	-17.5	1	0.95	0.378	0.054	2.18	469.0832	215.2832	54.72	0.0027
CH	-18.5	1	0.95	0.378	0.054	2.13	477.8959	224.0959	50.7519	0.0025
CH	-19.5	1	0.95	0.378	0.054	2.09	486.6987	232.8987	47.182	0.0022
CH	-20.5	1	0.95	0.378	0.054	2.05	495.4932	241.6932	43.9708	0.002
CH	-21.5	1	0.95	0.378	0.054	2.01	504.281	250.481	41.0803	0.0018
CH	-22.5	1	0.95	0.378	0.054	1.98	513.0636	259.2636	38.4744	0.0017
CH	-23.5	1	0.95	0.378	0.054	1.95	521.8421	268.0421	36.1206	0.0015
CH	-24.5	1	0.95	0.378	0.054	1.92	530.6176	276.8176	33.9892	0.0014
CH	-25.5	1	0.95	0.378	0.054	1.89	539.3909	285.5909	32.0543	0.0013
CH	-26.5	1	0.95	0.378	0.054	1.86	548.1628	294.3628	30.2927	0.0012

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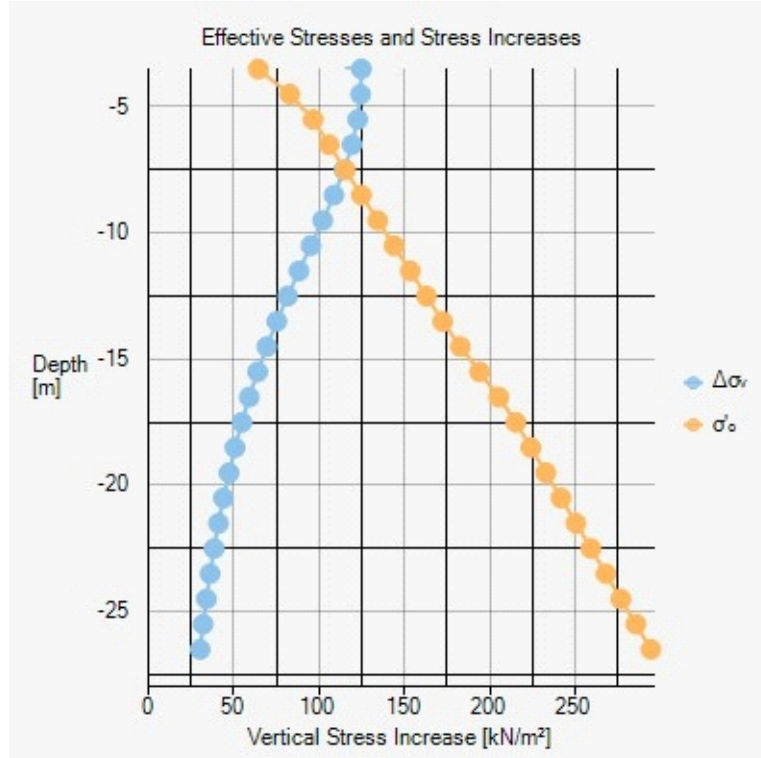


Figure 8. Settlement Point: C(34.5;10) Effective Stresses and Stress Increases

Settlement Point: D(34.5;5)

Table 61. Nokta: D(34.5;5) Konsolidasyon Oturma Analizi

Layer	Depth [m]	h [m]	e ₀	C _c	C _r	OCR	σ' _o [kN/m ²]	σ' _o [kN/m ²]	Δσ [kN/m ²]	S _i [m]
CH	-0.5	1	0.91	0.414	0.059	34.6	318.3	9.2	0	0
CH	-1.5	1	0.91	0.414	0.059	12.2	336.7	27.6	0	0
CH	-2.5	1	0.91	0.414	0.059	7.72	355.1	46	0	0
CH	-3.5	1	0.91	0.414	0.059	5.8	373.5006	64.4006	124.7609	0.0145
CH	-4.5	1	0.91	0.414	0.059	4.73	391.9147	82.8147	123.8228	0.0123
CH	-5.5	1	0.91	0.414	0.059	4.2	405.6626	96.5626	120.8593	0.0109
MH	-6.5	1	0.83	0.45	0.064	4.91	520.2525	105.8525	115.7649	0.0112
MH	-7.5	1	0.83	0.45	0.064	4.59	529.7792	115.3792	109.1261	0.0101
MH	-8.5	1	0.83	0.45	0.064	4.32	539.3294	124.9294	101.6835	0.009
MH	-9.5	1	0.83	0.45	0.064	4.08	548.8874	134.4874	94.0438	0.0081
MH	-10.5	1	0.83	0.45	0.064	3.88	558.4396	144.0396	86.6129	0.0072

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 41 / 44										
MH	-11.5	1	0.83	0.45	0.064	3.7	567.9763	153.5763	79.624	0.0063
MH	-12.5	1	0.83	0.45	0.064	3.54	577.492	163.092	73.1883	0.0056
MH	-13.5	1	0.83	0.45	0.064	3.4	586.9848	172.5848	67.3397	0.005
SM	-14.5	1	0.49					182.9549	62.0667	0
SM	-15.5	1	0.49					194.2042	57.3341	0
SM	-16.5	1	0.49					205.435	53.0953	0
CH	-17.5	1	0.95	0.378	0.054	2.18	469.2502	215.4502	49.3007	0.0025
CH	-18.5	1	0.95	0.378	0.054	2.13	478.0524	224.2524	45.9014	0.0022
CH	-19.5	1	0.95	0.378	0.054	2.09	486.8441	233.0441	42.8517	0.002
CH	-20.5	1	0.95	0.378	0.054	2.05	495.6276	241.8276	40.11	0.0018
CH	-21.5	1	0.95	0.378	0.054	2.01	504.4046	250.6046	37.639	0.0017
CH	-22.5	1	0.95	0.378	0.054	1.98	513.1769	259.3769	35.4058	0.0015
CH	-23.5	1	0.95	0.378	0.054	1.95	521.9458	268.1458	33.3815	0.0014
CH	-24.5	1	0.95	0.378	0.054	1.92	530.7123	276.9123	31.541	0.0013
CH	-25.5	1	0.95	0.378	0.054	1.89	539.4772	285.6772	29.8623	0.0012
CH	-26.5	1	0.95	0.378	0.054	1.86	548.2414	294.4414	28.3264	0.0011

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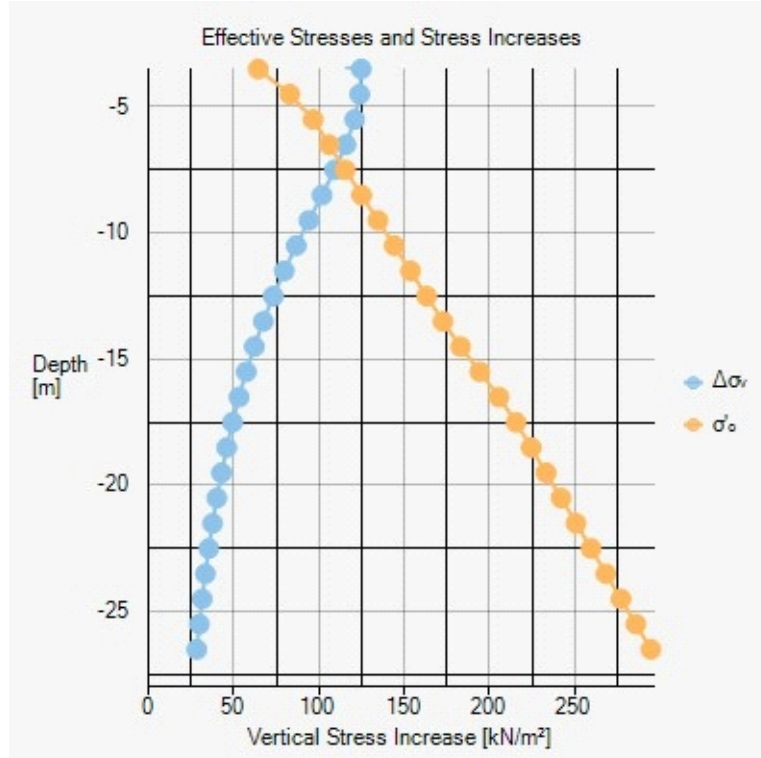


Figure 9. Settlement Point: D(34.5;5) Effective Stresses and Stress Increases

Settlement Point: A(5;-5)

Table 62. Nokta: A(5;-5) Konsolidasyon Oturma Analizi

Layer	Depth [m]	h [m]	e_0	C_c	C_r	OCR	σ'_{v0} [kN/m²]	σ'_v [kN/m²]	$\Delta\sigma$ [kN/m²]	S_{σ} [m]
CH	-0.5	1	0.91	0.414	0.059	34.6	318.3	9.2	0	0
CH	-1.5	1	0.91	0.414	0.059	12.2	336.7	27.6	0	0
CH	-2.5	1	0.91	0.414	0.059	7.72	355.1	46	0	0
CH	-3.5	1	0.91	0.414	0.059	5.8	373.5	64.4	0	0
CH	-4.5	1	0.91	0.414	0.059	4.73	391.9	82.8	0.0078	0
CH	-5.5	1	0.91	0.414	0.059	4.2	405.6	96.5	0.1884	0
MH	-6.5	1	0.83	0.45	0.064	4.92	520.1	105.7	0.7043	0.0001
MH	-7.5	1	0.83	0.45	0.064	4.6	529.5	115.1	1.4736	0.0002
MH	-8.5	1	0.83	0.45	0.064	4.33	538.9	124.5	2.3016	0.0003
MH	-9.5	1	0.83	0.45	0.064	4.09	548.3	133.9	3.0369	0.0003
MH	-10.5	1	0.83	0.45	0.064	3.89	557.7	143.3	3.6092	0.0004
MH	-11.5	1	0.83	0.45	0.064	3.71	567.1	152.7	4.0082	0.0004
MH	-12.5	1	0.83	0.45	0.064	3.56	576.5	162.1	4.2515	0.0004
MH	-13.5	1	0.83	0.45	0.064	3.42	585.9	171.5	4.3704	0.0004
SM	-14.5	1	0.49					181.8	4.3915	0
SM	-15.5	1	0.49					193	4.3422	0
SM	-16.5	1	0.49					204.2	4.2432	0
CH	-17.5	1	0.95	0.378	0.054	2.18	468	214.2	4.1106	0.0002
CH	-18.5	1	0.95	0.378	0.054	2.14	476.8	223	3.9567	0.0002

Downtown Foundation System										
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 43 / 44										
CH	-19.5	1	0.95	0.378	0.054	2.09	485.6	231.8	3.7905	0.0002
CH	-20.5	1	0.95	0.378	0.054	2.05	494.4	240.6	3.6186	0.0002
CH	-21.5	1	0.95	0.378	0.054	2.02	503.2	249.4	3.4457	0.0002
CH	-22.5	1	0.95	0.378	0.054	1.98	512	258.2	3.2753	0.0002
CH	-23.5	1	0.95	0.378	0.054	1.95	520.8	267	3.1095	0.0001
CH	-24.5	1	0.95	0.378	0.054	1.92	529.6	275.8	2.9498	0.0001
CH	-25.5	1	0.95	0.378	0.054	1.89	538.4	284.6	2.7972	0.0001
CH	-26.5	1	0.95	0.378	0.054	1.87	547.2	293.4	2.6521	0.0001

$$S_c = \sum S_i = 0.0041[m]$$

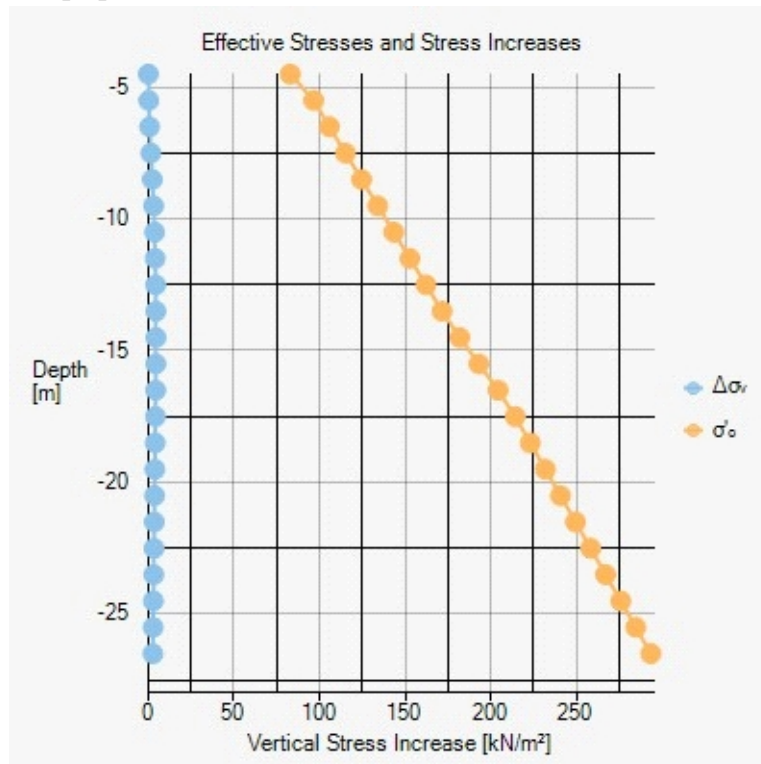


Figure 10. Settlement Point: A(5;-5) Effective Stresses and Stress Increases

TOTAL SETTLEMENTS

Settlement Point: B(21;5)

Se: Elastic settlement,
Sc: Consolidation settlement,
ΣS: Total settlement,

$$S_e = 0.006[m]$$

$$S_c = 0.0276[m]$$

$$\Sigma S = S_e + S_c = 0.0336[m]$$

Settlement Point: A(7.5;10)

Se: Elastic settlement,
Sc: Consolidation settlement,
ΣS: Total settlement,

Se= 0.005[m]

Sc= 0.0092[m]

$\Sigma S = Se + Sc = 0.0142[m]$

Settlement Point: C(34.5;10)

Se: Elastic settlement,

Sc: Consolidation settlement,

ΣS : Total settlement,

Se= 0.0289[m]

Sc= 0.1224[m]

$\Sigma S = Se + Sc = 0.1513[m]$

Settlement Point: D(34.5;5)

Se: Elastic settlement,

Sc: Consolidation settlement,

ΣS : Total settlement,

Se= 0.0269[m]

Sc= 0.117[m]

$\Sigma S = Se + Sc = 0.1439[m]$

Settlement Point: A(5;-5)

Se: Elastic settlement,

Sc: Consolidation settlement,

ΣS : Total settlement,

Se= 0.001[m]

Sc= 0.0041[m]

$\Sigma S = Se + Sc = 0.0051[m]$