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PROJECT

Face: Sol Cephe; A-AB1 Section

Owner of Structure: Michael Reynolds

Project Author: Daniel Carter

STANDARDS

Excavation Support Structures: Kazı Destek Yapıları Tasarım ve Uygulama Esasları (Design and Application Principles of Excavation Support Structures)

Steel Strand Anchors: BS5896 Super Tendon

Reinforced Concrete Structures: TS500

Reinforcement Steel for Reinforced Concrete: TS-708 Betonarme İçin Donatı Çeliği (Reinforcement Steel for Reinforced Concrete)

Steel Structures: Çelik Yapıların Tasarım, Hesap ve Yapım Esaslarına Dair Yönetmelik (Regulation on Design, Calculation, and Construction Principles of Steel Structures)

Steel Material: TS EN 10025-2

ANALYSIS PROPERTIES

Active Earth Pressure: Coulomb

Passive Earth Pressure: Coulomb

Pressures Acting on Wall: Displacement Dependent Pressures

Earthquake Effect: No Seismic Effect

PARTIAL FACTORS

Anchor force factor $\gamma_{G,d_{st}}$: 1,35

Anchor strength reduction factor γ_{R_e} : 1,4

Nail force factor $\gamma_{G,d_{st}}$: 1,35

Nail strength reduction factor γ_{R_e} : 1,4

Strength reduction factor for steel rupture control γ_{R_e} : 1,4

Internal force factor $\gamma_{G,d_{st}}$: 1,35

IDEALIZED PROFILE AND SOIL PROPERTIES

γ_n : Unsaturated unit weight

γ_{sat} : Saturated unit weight

c' : Effective or drained cohesion

ϕ' : Effective or drained internal friction angle

$S_u(c_u)$: Undrained shear strength

Table 1. Soil Properties

Layer	Top Elevation [m]	Bottom Elevation [m]	Drainage Condition	γ_n [kN/m ³]	γ_{sat} [kN/m ³]	c' [kN/m ²]	ϕ' [°]	$S_u(c_u)$ [kN/m ²]
Killi Kum	1	4	Drained	19	19	5	32	
Kil1	4	7	Undrained	19,8	19,8			100
Kil2	7	11	Drained	19,8	19,8	12	28	
KilSonn	11	18,8	Drained	19,8	19,8	17,5	28,8	

COEFFICIENTS OF EARTH PRESSURES

δ : angle of internal friction between the soil and the structure

ν : Effective or drained Poisson ratio

OCR: Overconsolidation ratio

K_r : Coefficient of earth pressure at rest

K_a : Coefficient of active earth pressure

K_p : Coefficient of passive earth pressure

Table 2. Coefficients of Earth Pressures

Layer	ϕ' [°]	δ [°]	ν'	OCR	K_r	K_a	K_p
Killi Kum	32	15	0,25	1	0,47	0,28	5,54
Kil1		15		3	0,87	2,44	2,44
Kil2	28	15	0,25	4	1	0,33	4,48
KilSonn	28,8	15	0,25	4	1	0,32	4,67

SOIL STIFFNESS

E_{oed} : Oedometer module

E' : Effective or drained modulus of elasticity

E_u : Undrained modulus of elasticity

k_h : Lateral modulus of subgrade reaction

Table 3. Soil Stiffness

Layer	E' [kN/m ²]	ν'	E_u [kN/m ²]	E_{oed} [kN/m ²]	k_h [kN/m ³]
Killi Kum	12000	0,25		14400	25852,893
Kil1	16000		19200	19200	11030,727
Kil2	20000	0,25		24000	20574,853
KilSonn	20000	0,25		24000	22350,612

WALL PROPERTIES

Wall type: Reinforced Concrete Bored Pile Wall

Wall height: 17[m]

Pile diameter: 0,65[m]

Distance between pile centres: 0,8[m]

Concrete: C25

Steel: S420a

CONSTRUCTION STAGE: 3rd Steel Strand Anchor

Excavation depth= 10,5[m]

Excavation level= -11,5[m]

GWT= -21[m]

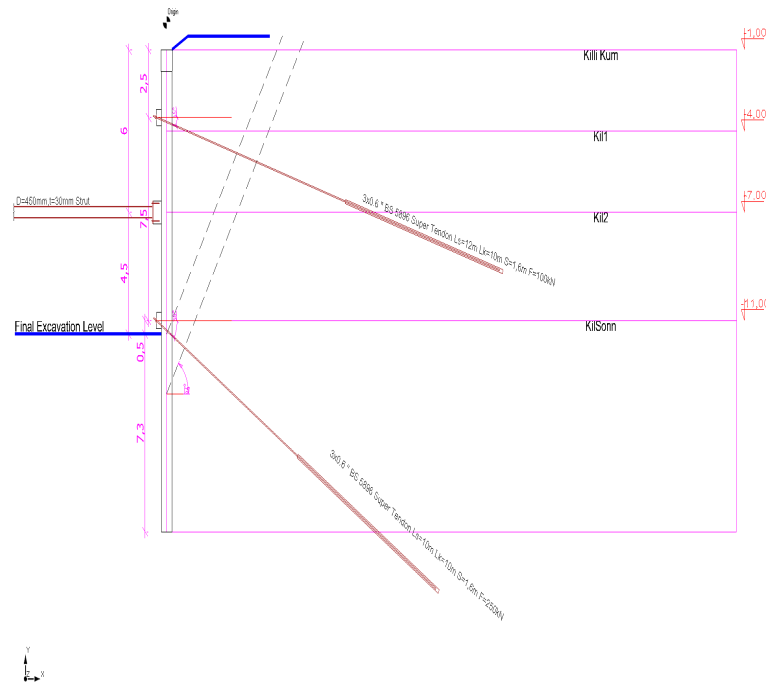


Figure 1. Construction Stage (3rd Steel Strand Anchor)

ANCHORS (3rd Steel Strand Anchor)

z: Depth. Vertical distance from wall top elevation to anchorage elevation

S: Horizontal spacing

L_s : Anchor unbonded length

L_k : Anchor bond length

L: Anchor length

n: Represents the number of steel strands in prestressed tendon systems or the number of reinforcing bars in soil nail systems.

d_i : Strand/reinforcement diameter. Represents the diameter of a steel strand or a reinforced concrete bar.

d_s : Combined diameter of bars/strands. For multiple strands or bars, it represents their nominal combined diameter.

d: Represents the grout diameter in strand systems and the nail diameter in soil nail systems.

Table 4. Anchorage General Properties (3rd Steel Strand Anchor)

Name	Type	z [m]	S [m]	L_s [m]	L_k [m]	n	d_i	d_s [m]	d [m]
Ankraj1	Steel Strand	2,5	1,6	12	10	3	0.6 "	0,047	0,15
Ankraj3	Steel Strand	10	1,6	10	10	3	0.6 "	0,047	0,15

E: Modulus of Elasticity

F_p : Prestress force

Table 5. Anchor Mechanical Properties

Downtown Excavation Support System Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 7 / 58				
Name	Type	Prestressing Application	E [kN/m ²]	F _p [kN]
Ankraj1	Steel Strand	None	210000000	100
Ankraj3	Steel Strand	Exists	210000000	250

SUPPORTS (3rd Steel Strand Anchor)

z: Vertical distance from wall top elevation to support elevation

L: Support length

S: Horizontal spacing

D: Profile outer diameter

t: Profile wall thickness

Table 6. Support General Properties (3rd Steel Strand Anchor)

Support Name	Type	Application of Support	z [m]	L [m]	S [m]	D [mm]	t [mm]	Steel Class
Destek1	Steel Pipe	None	6	8,5	4	450	30	TS EN 10025-2 S235

EARTH PRESSURES (3rd Steel Strand Anchor)

z: Depth

σ_{pf} : Passive pressure in front of the wall

σ_{rf} : Pressure in front of the wall at rest

σ_{af} : Active pressure in front of the wall

σ_{pb} : Passive pressure behind the wall

σ_{rb} : Pressure behind the wall at rest

σ_{ab} : Active pressure behind the wall

σ_f : Displacement-dependent pressure in front of the wall

σ_b : Displacement-dependent pressure behind the wall

Table 7. Earth Pressures (3rd Steel Strand Anchor)

z [m]	σ_{pf} [kN/m ²]	σ_{rf} [kN/m ²]	σ_{af} [kN/m ²]	σ_{pb} [kN/m ²]	σ_{rb} [kN/m ²]	σ_{ab} [kN/m ²]	σ_f [kN/m ²]	σ_b [kN/m ²]
-1	0	0	0	0	0	0	0	0
-1,12	0	0	0	17,241	2,959	1,896	0	6,943
-1,12	0	0	0	17,241	2,959	1,896	0	6,943
-1,24	0	0	0	33,504	4,94	2,813	0	7,356
-1,24	0	0	0	33,504	4,94	2,813	0	7,356
-1,36	0	0	0	49,427	6,581	3,391	0	7,427
-1,36	0	0	0	49,427	6,581	3,391	0	7,427
-1,48	0	0	0	65,157	8,028	3,775	0	7,3
-1,48	0	0	0	65,157	8,028	3,775	0	7,3
-1,6	0	0	0	80,765	9,354	4,037	0	7,042
-1,6	0	0	0	80,765	9,354	4,037	0	7,042
-1,71	0	0	0	96,293	10,599	4,22	0	6,69
-1,71	0	0	0	96,293	10,599	4,22	0	6,69
-1,83	0	0	0	111,767	11,792	4,349	0	6,26

Downtown Excavation Support System									
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 8 / 58									
-1,83	0	0	0	111,767	11,792	4,349	0	6,26	
-1,95	0	0	0	127,205	12,948	4,441	0	5,762	
-1,95	0	0	0	127,205	12,948	4,441	0	5,762	
-2,07	0	0	0	136,199	14,079	4,894	0	5,195	
-2,07	0	0	0	136,199	14,079	4,894	0	5,195	
-2,19	0	0	0	148,355	15,192	5,554	0	5,554	
-2,19	0	0	0	148,355	15,192	5,554	0	5,554	
-2,31	0	0	0	160,498	16,293	6,201	0	6,201	
-2,31	0	0	0	160,498	16,293	6,201	0	6,201	
-2,43	0	0	0	172,633	17,385	6,84	0	6,84	
-2,43	0	0	0	172,633	17,385	6,84	0	6,84	
-2,55	0	0	0	184,761	18,471	7,472	0	7,472	
-2,55	0	0	0	184,761	18,471	7,472	0	7,472	
-2,67	0	0	0	196,884	19,551	8,099	0	8,099	
-2,67	0	0	0	196,884	19,551	8,099	0	8,099	
-2,79	0	0	0	209,004	20,628	8,722	0	8,722	
-2,79	0	0	0	209,004	20,628	8,722	0	8,722	
-2,9	0	0	0	221,121	21,703	9,343	0	9,343	
-2,9	0	0	0	221,121	21,703	9,343	0	9,343	
-3,02	0	0	0	233,235	22,775	9,961	0	9,961	
-3,02	0	0	0	233,235	22,775	9,961	0	9,961	
-3,14	0	0	0	245,348	23,845	10,578	0	10,578	
-3,14	0	0	0	245,348	23,845	10,578	0	10,578	
-3,26	0	0	0	257,46	24,915	11,194	0	11,194	
-3,26	0	0	0	257,46	24,915	11,194	0	11,194	
-3,38	0	0	0	269,571	25,983	11,809	0	11,809	
-3,38	0	0	0	269,571	25,983	11,809	0	11,809	
-3,5	0	0	0	281,681	27,05	12,422	0	12,422	
-3,5	0	0	0	281,681	27,05	12,422	0	12,422	
-3,6	0	0	0	291,853	27,946	12,938	0	12,938	
-3,6	0	0	0	291,853	27,946	12,938	0	12,938	
-3,7	0	0	0	302,024	28,842	13,452	0	13,452	
-3,7	0	0	0	302,024	28,842	13,452	0	13,452	
-3,8	0	0	0	312,195	29,737	13,967	0	13,967	
-3,8	0	0	0	312,195	29,737	13,967	0	13,967	
-3,9	0	0	0	322,366	30,633	14,481	0	14,481	
-3,9	0	0	0	322,366	30,633	14,481	0	14,481	
-4	0	0	0	332,537	31,527	14,995	0	14,995	
-4	0	0	0	118,733	54,096	4,733	0	29,692	
-4,12	0	0	0	123,487	56,156	4,735	0	29,695	
-4,12	0	0	0	123,487	56,156	4,735	0	29,695	
-4,24	0	0	0	128,24	58,215	4,736	0	29,676	
-4,24	0	0	0	128,24	58,215	4,736	0	29,676	
-4,36	0	0	0	132,994	60,274	4,738	0	29,655	
-4,36	0	0	0	132,994	60,274	4,738	0	29,655	
-4,48	0	0	0	137,747	62,333	4,739	0	29,65	
-4,48	0	0	0	137,747	62,333	4,739	0	29,65	

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 9 / 58								
-4,6	0	0	0	142,5	64,392	4,74	0	29,674
-4,6	0	0	0	142,5	64,392	4,74	0	29,674
-4,72	0	0	0	147,253	66,45	4,741	0	29,743
-4,72	0	0	0	147,253	66,45	4,741	0	29,743
-4,84	0	0	0	152,006	68,509	4,742	0	29,866
-4,84	0	0	0	152,006	68,509	4,742	0	29,866
-4,96	0	0	0	156,758	70,567	4,742	0	30,053
-4,96	0	0	0	156,758	70,567	4,742	0	30,053
-5,08	0	0	0	161,511	72,625	4,743	0	30,311
-5,08	0	0	0	161,511	72,625	4,743	0	30,311
-5,2	0	0	0	166,263	74,684	4,743	0	30,644
-5,2	0	0	0	166,263	74,684	4,743	0	30,644
-5,32	0	0	0	171,016	76,742	4,744	0	31,058
-5,32	0	0	0	171,016	76,742	4,744	0	31,058
-5,44	0	0	0	175,768	78,8	4,744	0	31,553
-5,44	0	0	0	175,768	78,8	4,744	0	31,553
-5,56	0	0	0	180,521	80,858	4,745	0	32,129
-5,56	0	0	0	180,521	80,858	4,745	0	32,129
-5,68	0	0	0	185,273	82,916	4,745	0	32,784
-5,68	0	0	0	185,273	82,916	4,745	0	32,784
-5,8	0	0	0	190,026	84,974	4,746	0	33,513
-5,8	0	0	0	190,026	84,974	4,746	0	33,513
-5,92	0	0	0	194,778	87,032	4,746	0	34,311
-5,92	0	0	0	194,778	87,032	4,746	0	34,311
-6,04	0	0	0	199,53	89,09	4,746	0	35,168
-6,04	0	0	0	199,53	89,09	4,746	0	35,168
-6,16	0	0	0	204,282	91,148	4,746	0	36,074
-6,16	0	0	0	204,282	91,148	4,746	0	36,074
-6,28	0	0	0	209,035	93,206	4,747	0	37,015
-6,28	0	0	0	209,035	93,206	4,747	0	37,015
-6,4	0	0	0	213,787	95,264	4,747	0	37,975
-6,4	0	0	0	213,787	95,264	4,747	0	37,975
-6,52	0	0	0	218,539	97,322	4,747	0	38,935
-6,52	0	0	0	218,539	97,322	4,747	0	38,935
-6,64	0	0	0	223,291	99,38	4,747	0	39,873
-6,64	0	0	0	223,291	99,38	4,747	0	39,873
-6,76	0	0	0	228,043	101,437	4,747	0	40,762
-6,76	0	0	0	228,043	101,437	4,747	0	40,762
-6,88	0	0	0	232,796	103,495	4,748	0	41,576
-6,88	0	0	0	232,796	103,495	4,748	0	41,576
-7	0	0	0	237,548	105,553	4,748	0	-12,464
-7	0	0	0	557,979	121,148	28,078	0	28,078
-7,1	0	0	0	566,555	123,128	28,7	0	28,7
-7,1	0	0	0	566,555	123,128	28,7	0	28,7
-7,2	0	0	0	575,131	125,108	29,322	0	29,322
-7,2	0	0	0	575,131	125,108	29,322	0	29,322
-7,3	0	0	0	583,706	127,088	29,943	0	29,943

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 10 / 58								
-7,3	0	0	0	583,706	127,088	29,943	0	29,943
-7,4	0	0	0	592,282	129,068	30,565	0	30,565
-7,4	0	0	0	592,282	129,068	30,565	0	30,565
-7,5	0	0	0	600,858	131,048	31,187	0	31,187
-7,5	0	0	0	600,858	131,048	31,187	0	31,187
-7,62	0	0	0	610,863	133,358	31,912	0	31,912
-7,62	0	0	0	610,863	133,358	31,912	0	31,912
-7,73	0	0	0	620,868	135,668	32,638	0	32,638
-7,73	0	0	0	620,868	135,668	32,638	0	32,638
-7,85	0	0	0	630,873	137,978	33,363	0	33,363
-7,85	0	0	0	630,873	137,978	33,363	0	33,363
-7,97	0	0	0	640,878	140,289	34,088	0	34,088
-7,97	0	0	0	640,878	140,289	34,088	0	34,088
-8,08	0	0	0	650,883	142,599	34,814	0	34,814
-8,08	0	0	0	650,883	142,599	34,814	0	34,814
-8,2	0	0	0	660,887	144,909	35,539	0	35,539
-8,2	0	0	0	660,887	144,909	35,539	0	35,539
-8,32	0	0	0	670,892	147,219	36,264	0	36,264
-8,32	0	0	0	670,892	147,219	36,264	0	36,264
-8,43	0	0	0	680,897	149,529	36,99	0	36,99
-8,43	0	0	0	680,897	149,529	36,99	0	36,99
-8,55	0	0	0	690,902	151,839	37,715	0	37,715
-8,55	0	0	0	690,902	151,839	37,715	0	37,715
-8,67	0	0	0	700,907	154,149	38,44	0	38,44
-8,67	0	0	0	700,907	154,149	38,44	0	38,44
-8,78	0	0	0	710,912	156,459	39,166	0	39,166
-8,78	0	0	0	710,912	156,459	39,166	0	39,166
-8,9	0	0	0	720,917	158,769	39,891	0	39,891
-8,9	0	0	0	720,917	158,769	39,891	0	39,891
-9,02	0	0	0	730,922	161,079	40,617	0	40,617
-9,02	0	0	0	730,922	161,079	40,617	0	40,617
-9,13	0	0	0	740,927	163,389	41,342	0	41,342
-9,13	0	0	0	740,927	163,389	41,342	0	41,342
-9,25	0	0	0	750,932	165,699	42,067	0	42,067
-9,25	0	0	0	750,932	165,699	42,067	0	42,067
-9,37	0	0	0	760,937	168,009	42,793	0	42,793
-9,37	0	0	0	760,937	168,009	42,793	0	42,793
-9,48	0	0	0	770,942	170,319	43,518	0	43,518
-9,48	0	0	0	770,942	170,319	43,518	0	43,518
-9,6	0	0	0	780,947	172,629	44,243	0	44,243
-9,6	0	0	0	780,947	172,629	44,243	0	44,243
-9,72	0	0	0	790,952	174,939	44,968	0	44,968
-9,72	0	0	0	790,952	174,939	44,968	0	44,968
-9,83	0	0	0	800,957	177,249	45,694	0	45,694
-9,83	0	0	0	800,957	177,249	45,694	0	45,694
-9,95	0	0	0	810,961	179,559	46,419	0	46,419
-9,95	0	0	0	810,961	179,559	46,419	0	46,419

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 11 / 58								
-10,07	0	0	0	820,966	181,869	47,144	0	47,144
-10,07	0	0	0	820,966	181,869	47,144	0	47,144
-10,18	0	0	0	830,971	184,179	47,87	0	47,87
-10,18	0	0	0	830,971	184,179	47,87	0	47,87
-10,3	0	0	0	840,976	186,489	48,595	0	48,595
-10,3	0	0	0	840,976	186,489	48,595	0	48,595
-10,42	0	0	0	850,981	188,799	49,32	0	49,32
-10,42	0	0	0	850,981	188,799	49,32	0	49,32
-10,53	0	0	0	860,986	191,109	50,046	0	50,046
-10,53	0	0	0	860,986	191,109	50,046	0	50,046
-10,65	0	0	0	870,991	193,419	50,771	0	50,771
-10,65	0	0	0	870,991	193,419	50,771	0	50,771
-10,77	0	0	0	880,996	195,729	51,496	0	51,496
-10,77	0	0	0	880,996	195,729	51,496	0	51,496
-10,88	0	0	0	891,001	198,039	52,222	0	52,222
-10,88	0	0	0	891,001	198,039	52,222	0	52,222
-11	0	0	0	901,006	200,35	52,947	0	52,947
-11	0	0	0	960,751	200,35	45,36	0	45,36
-11,1	0	0	0	969,689	202,33	45,963	0	45,963
-11,1	0	0	0	969,689	202,33	45,963	0	45,963
-11,2	0	0	0	978,626	204,31	46,566	0	46,566
-11,2	0	0	0	978,626	204,31	46,566	0	46,566
-11,3	0	0	0	987,564	206,29	47,17	0	47,17
-11,3	0	0	0	987,564	206,29	47,17	0	47,17
-11,4	0	0	0	996,501	208,27	47,773	0	47,773
-11,4	0	0	0	996,501	208,27	47,773	0	47,773
-11,5	0	0	0	1005,439	210,25	48,376	0	48,376
-11,5	0	0	0	1005,439	210,25	48,376	0	48,376
-11,62	-13,877	-2,357	0	1016,079	212,607	49,094	-13,877	52,051
-11,62	-13,877	-2,357	0	1016,079	212,607	49,094	-13,877	52,051
-11,74	-27,754	-4,714	0	1026,719	214,964	49,813	-27,754	58,181
-11,74	-27,754	-4,714	0	1026,719	214,964	49,813	-27,754	58,181
-11,86	-41,631	-7,071	0	1037,359	217,321	50,531	-41,631	64,39
-11,86	-41,631	-7,071	0	1037,359	217,321	50,531	-41,631	64,39
-11,98	-55,508	-9,429	0	1047,998	219,678	51,249	-55,508	70,648
-11,98	-55,508	-9,429	0	1047,998	219,678	51,249	-55,508	70,648
-12,1	-69,386	-11,786	0	1058,638	222,035	51,967	-69,386	76,923
-12,1	-69,386	-11,786	0	1058,638	222,035	51,967	-69,386	76,923
-12,21	-83,263	-14,143	0	1069,278	224,393	52,686	-83,263	83,183
-12,21	-83,263	-14,143	0	1069,278	224,393	52,686	-83,263	83,183
-12,33	-97,14	-16,5	0	1079,918	226,75	53,404	-97,14	89,397
-12,33	-97,14	-16,5	0	1079,918	226,75	53,404	-97,14	89,397
-12,45	-111,017	-18,857	0	1090,558	229,107	54,122	-111,017	95,533
-12,45	-111,017	-18,857	0	1090,558	229,107	54,122	-111,017	95,533
-12,57	-124,894	-21,214	0	1101,198	231,464	54,84	-124,894	101,562
-12,57	-124,894	-21,214	0	1101,198	231,464	54,84	-124,894	101,562
-12,69	-138,771	-23,571	0	1111,838	233,821	55,558	-138,771	107,459

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 12 / 58								
-12,69	-138,771	-23,571	0	1111,838	233,821	55,558	-138,771	107,459
-12,81	-152,648	-25,929	0	1122,478	236,178	56,277	-148,907	113,2
-12,81	-152,648	-25,929	0	1122,478	236,178	56,277	-148,907	113,2
-12,93	-166,525	-28,286	0	1133,118	238,535	56,995	-148,057	118,764
-12,93	-166,525	-28,286	0	1133,118	238,535	56,995	-148,057	118,764
-13,05	-180,402	-30,643	0	1143,758	240,893	57,713	-147,4	124,136
-13,05	-180,402	-30,643	0	1143,758	240,893	57,713	-147,4	124,136
-13,17	-194,279	-33	0	1154,398	243,25	58,431	-146,947	129,303
-13,17	-194,279	-33	0	1154,398	243,25	58,431	-146,947	129,303
-13,29	-208,157	-35,357	0	1165,038	245,607	59,15	-146,706	134,258
-13,29	-208,157	-35,357	0	1165,038	245,607	59,15	-146,706	134,258
-13,4	-222,034	-37,714	0	1175,677	247,964	59,868	-146,683	138,995
-13,4	-222,034	-37,714	0	1175,677	247,964	59,868	-146,683	138,995
-13,52	-235,911	-40,071	0	1186,317	250,321	60,586	-146,879	143,514
-13,52	-235,911	-40,071	0	1186,317	250,321	60,586	-146,879	143,514
-13,64	-249,788	-42,429	0	1196,957	252,678	61,304	-147,293	147,814
-13,64	-249,788	-42,429	0	1196,957	252,678	61,304	-147,293	147,814
-13,76	-263,665	-44,786	0	1207,597	255,035	62,022	-147,923	151,898
-13,76	-263,665	-44,786	0	1207,597	255,035	62,022	-147,923	151,898
-13,88	-277,542	-47,143	0	1218,237	257,393	62,741	-148,763	155,773
-13,88	-277,542	-47,143	0	1218,237	257,393	62,741	-148,763	155,773
-14	-291,419	-49,5	0	1228,877	259,75	63,459	-149,806	159,444
-14	-291,419	-49,5	0	1228,877	259,75	63,459	-149,806	159,444
-14,12	-305,066	-51,818	0	1239,34	262,068	64,165	-151,022	162,863
-14,12	-305,066	-51,818	0	1239,34	262,068	64,165	-151,022	162,863
-14,23	-318,713	-54,136	0	1249,804	264,386	64,871	-152,419	166,102
-14,23	-318,713	-54,136	0	1249,804	264,386	64,871	-152,419	166,102
-14,35	-332,36	-56,454	0	1260,267	266,704	65,578	-153,987	169,171
-14,35	-332,36	-56,454	0	1260,267	266,704	65,578	-153,987	169,171
-14,47	-346,007	-58,772	0	1270,731	269,022	66,284	-155,716	172,078
-14,47	-346,007	-58,772	0	1270,731	269,022	66,284	-155,716	172,078
-14,59	-359,654	-61,09	0	1281,194	271,34	66,99	-157,595	174,835
-14,59	-359,654	-61,09	0	1281,194	271,34	66,99	-157,595	174,835
-14,7	-359,302	-63,408	-0,332	1291,658	273,658	67,697	-159,614	177,453
-14,7	-359,302	-63,408	-0,332	1291,658	273,658	67,697	-159,614	177,453
-14,82	-369,765	-65,726	-1,039	1302,121	275,976	68,403	-161,761	179,941
-14,82	-369,765	-65,726	-1,039	1302,121	275,976	68,403	-161,761	179,941
-14,94	-380,228	-68,044	-1,745	1312,585	278,294	69,109	-164,026	182,313
-14,94	-380,228	-68,044	-1,745	1312,585	278,294	69,109	-164,026	182,313
-15,05	-390,692	-70,362	-2,451	1323,048	280,612	69,815	-166,398	184,577
-15,05	-390,692	-70,362	-2,451	1323,048	280,612	69,815	-166,398	184,577
-15,17	-401,155	-72,68	-3,158	1333,511	282,93	70,522	-168,866	186,745
-15,17	-401,155	-72,68	-3,158	1333,511	282,93	70,522	-168,866	186,745
-15,29	-411,619	-74,999	-3,864	1343,975	285,248	71,228	-171,42	188,826
-15,29	-411,619	-74,999	-3,864	1343,975	285,248	71,228	-171,42	188,826
-15,4	-422,082	-77,317	-4,57	1354,438	287,566	71,934	-174,051	190,832
-15,4	-422,082	-77,317	-4,57	1354,438	287,566	71,934	-174,051	190,832

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 13 / 58								
-15,52	-432,546	-79,635	-5,276	1364,902	289,884	72,641	-176,749	192,77
-15,52	-432,546	-79,635	-5,276	1364,902	289,884	72,641	-176,749	192,77
-15,64	-443,009	-81,953	-5,983	1375,365	292,203	73,347	-179,505	194,65
-15,64	-443,009	-81,953	-5,983	1375,365	292,203	73,347	-179,505	194,65
-15,76	-453,473	-84,271	-6,689	1385,829	294,521	74,053	-182,311	196,481
-15,76	-453,473	-84,271	-6,689	1385,829	294,521	74,053	-182,311	196,481
-15,87	-463,936	-86,589	-7,395	1396,292	296,839	74,76	-185,158	198,269
-15,87	-463,936	-86,589	-7,395	1396,292	296,839	74,76	-185,158	198,269
-15,99	-474,399	-88,907	-8,102	1406,756	299,157	75,466	-188,04	200,023
-15,99	-474,399	-88,907	-8,102	1406,756	299,157	75,466	-188,04	200,023
-16,11	-484,863	-91,225	-8,808	1417,219	301,475	76,172	-190,95	201,749
-16,11	-484,863	-91,225	-8,808	1417,219	301,475	76,172	-190,95	201,749
-16,22	-495,326	-93,543	-9,514	1427,682	303,793	76,878	-193,882	203,454
-16,22	-495,326	-93,543	-9,514	1427,682	303,793	76,878	-193,882	203,454
-16,34	-505,79	-95,861	-10,221	1438,146	306,111	77,585	-196,831	205,141
-16,34	-505,79	-95,861	-10,221	1438,146	306,111	77,585	-196,831	205,141
-16,46	-516,253	-98,179	-10,927	1448,609	308,429	78,291	-199,791	206,817
-16,46	-516,253	-98,179	-10,927	1448,609	308,429	78,291	-199,791	206,817
-16,58	-526,717	-100,497	-11,633	1459,073	310,747	78,997	-202,759	208,485
-16,58	-526,717	-100,497	-11,633	1459,073	310,747	78,997	-202,759	208,485
-16,69	-537,18	-102,815	-12,339	1469,536	313,065	79,704	-205,73	210,15
-16,69	-537,18	-102,815	-12,339	1469,536	313,065	79,704	-205,73	210,15
-16,81	-547,643	-105,133	-13,046	1480	315,383	80,41	-208,701	211,815
-16,81	-547,643	-105,133	-13,046	1480	315,383	80,41	-208,701	211,815
-16,93	-558,107	-107,451	-13,752	1490,463	317,701	81,116	-211,671	213,482
-16,93	-558,107	-107,451	-13,752	1490,463	317,701	81,116	-211,671	213,482
-17,04	-568,57	-109,769	-14,458	1500,927	320,019	81,822	-214,635	215,153
-17,04	-568,57	-109,769	-14,458	1500,927	320,019	81,822	-214,635	215,153
-17,16	-579,034	-112,087	-15,165	1511,39	322,337	82,529	-217,594	216,831
-17,16	-579,034	-112,087	-15,165	1511,39	322,337	82,529	-217,594	216,831
-17,28	-589,497	-114,405	-15,871	1521,853	324,655	83,235	-220,545	218,516
-17,28	-589,497	-114,405	-15,871	1521,853	324,655	83,235	-220,545	218,516
-17,4	-599,961	-116,723	-16,577	1532,317	326,973	83,941	-223,487	220,21
-17,4	-599,961	-116,723	-16,577	1532,317	326,973	83,941	-223,487	220,21
-17,51	-610,424	-119,041	-17,283	1542,78	329,291	84,648	-226,42	221,913
-17,51	-610,424	-119,041	-17,283	1542,78	329,291	84,648	-226,42	221,913
-17,63	-620,888	-121,36	-17,99	1553,244	331,609	85,354	-229,344	223,625
-17,63	-620,888	-121,36	-17,99	1553,244	331,609	85,354	-229,344	223,625
-17,75	-631,351	-123,678	-18,696	1563,707	333,927	86,06	-232,258	225,347
-17,75	-631,351	-123,678	-18,696	1563,707	333,927	86,06	-232,258	225,347
-17,86	-641,814	-125,996	-19,402	1574,171	336,246	86,767	-235,164	227,078
-17,86	-641,814	-125,996	-19,402	1574,171	336,246	86,767	-235,164	227,078
-17,98	-652,278	-128,314	-20,109	1584,634	338,564	87,473	-238,06	228,817
-17,98	-652,278	-128,314	-20,109	1584,634	338,564	87,473	-238,06	228,817
-18,1	-662,741	-130,632	-20,815	1595,098	340,882	88,179	-240,949	230,564
-18,1	-662,741	-130,632	-20,815	1595,098	340,882	88,179	-240,949	230,564
-18,21	-673,205	-132,95	-21,521	1605,561	343,2	88,885	-243,831	232,319

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 14 / 58								
-18,21	-673,205	-132,95	-21,521	1605,561	343,2	88,885	-243,831	232,319
-18,33	-683,668	-135,268	-22,227	1616,024	345,518	89,592	-246,706	234,079
-18,33	-683,668	-135,268	-22,227	1616,024	345,518	89,592	-246,706	234,079
-18,45	-694,132	-137,586	-22,934	1626,488	347,836	90,298	-249,577	235,845
-18,45	-694,132	-137,586	-22,934	1626,488	347,836	90,298	-249,577	235,845
-18,57	-704,595	-139,904	-23,64	1636,951	350,154	91,004	-252,444	237,614
-18,57	-704,595	-139,904	-23,64	1636,951	350,154	91,004	-252,444	237,614
-18,68	-715,058	-142,222	-24,346	1647,415	352,472	91,711	-255,308	239,385
-18,68	-715,058	-142,222	-24,346	1647,415	352,472	91,711	-255,308	239,385
-18,8	-725,522	-144,54	-25,053	1657,878	354,79	92,417	-258,171	241,159

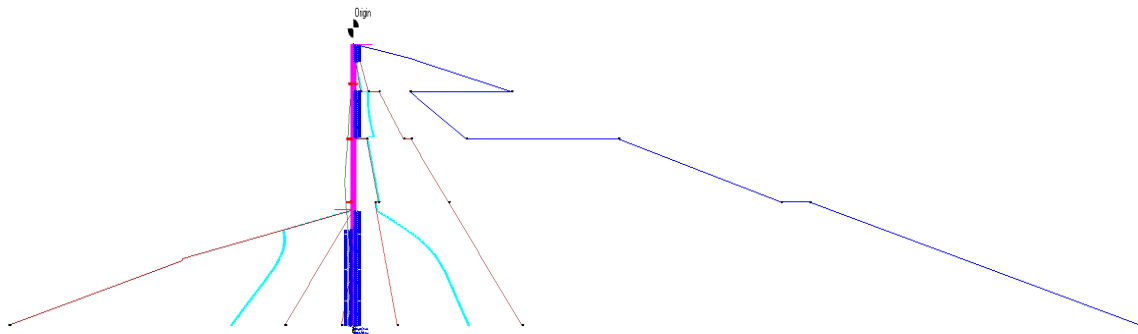


Figure 2. Earth Pressures (3rd Steel Strand Anchor)

SUBGRADE MODULI and ANALYSIS RESULTS (3rd Steel Strand

Anchor)

z: Depth

khf: Modulus of subgrade reaction in front of the wall

khb: Modulus of subgrade reaction behind the wall

Ux: Wall horizontal displacement

σ_w : Net displacement-dependent pressure acting on the wall

N: Normal force

M: Bending moment

V: Shear force

Table 8. Subgrade Moduli and Analysis Results (3rd Steel Strand Anchor)

z [m]	khf [kN/m ³]	khb [kN/m ³]	Ux [mm]	σ_w [kN/m ²]	N [kN/m]	Mz [kN.m/m]	Vx [kN/m]
-1	0	0	0,207	0	-1,145	0	0
-1,12	0	25852,893	0,15	6,943	-1,145	-0,016	-0,413
-1,12	0	25852,893	0,15	6,943	-2,289	-0,016	-0,402
-1,24	0	25852,893	0,092	7,356	-2,289	-0,114	-1,253
-1,24	0	25852,893	0,092	7,356	-3,434	-0,114	-1,25
-1,36	0	25852,893	0,035	7,427	-3,434	-0,316	-2,13
-1,36	0	25852,893	0,035	7,427	-4,579	-0,316	-2,136
-1,48	0	25852,893	-0,023	7,3	-4,579	-0,622	-3,012
-1,48	0	25852,893	-0,023	7,3	-5,724	-0,622	-3,026
-1,6	0	25852,893	-0,081	7,042	-5,724	-1,034	-3,88
-1,6	0	25852,893	-0,081	7,042	-6,868	-1,034	-3,902
-1,71	0	25852,893	-0,139	6,69	-6,868	-1,547	-4,719
-1,71	0	25852,893	-0,139	6,69	-8,013	-1,547	-4,749
-1,83	0	25852,893	-0,199	6,26	-8,013	-2,159	-5,52
-1,83	0	25852,893	-0,199	6,26	-9,158	-2,159	-5,558
-1,95	0	25852,893	-0,26	5,762	-9,158	-2,864	-6,274
-1,95	0	25852,893	-0,26	5,762	-10,302	-2,864	-6,319
-2,07	0	25852,893	-0,322	5,195	-10,302	-3,656	-6,972
-2,07	0	25852,893	-0,322	5,195	-11,447	-3,656	-7,025
-2,19	0	0	-0,387	5,554	-11,447	-4,529	-7,665
-2,19	0	0	-0,387	5,554	-12,592	-4,529	-7,665
-2,31	0	0	-0,455	6,201	-12,592	-5,483	-8,364
-2,31	0	0	-0,455	6,201	-13,736	-5,483	-8,364
-2,43	0	0	-0,527	6,84	-13,736	-6,524	-9,14
-2,43	0	0	-0,527	6,84	-14,881	-6,524	-9,14
-2,55	0	0	-0,603	7,472	-14,881	-7,662	-9,992
-2,55	0	0	-0,603	7,472	-16,026	-7,662	-9,992
-2,67	0	0	-0,683	8,099	-16,026	-8,906	-10,919
-2,67	0	0	-0,683	8,099	-17,171	-8,906	-10,919
-2,79	0	0	-0,77	8,722	-17,171	-10,265	-11,92
-2,79	0	0	-0,77	8,722	-18,315	-10,265	-11,92
-2,9	0	0	-0,864	9,343	-18,315	-11,747	-12,996
-2,9	0	0	-0,864	9,343	-19,46	-11,747	-12,996
-3,02	0	0	-0,965	9,961	-19,46	-13,362	-14,145
-3,02	0	0	-0,965	9,961	-20,605	-13,362	-14,145

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 16 / 58							
-3,14	0	0	-1,075	10,578	-20,605	-15,118	-15,367
-3,14	0	0	-1,075	10,578	-21,749	-15,118	-15,367
-3,26	0	0	-1,195	11,194	-21,749	-17,024	-16,663
-3,26	0	0	-1,195	11,194	-22,894	-17,024	-16,663
-3,38	0	0	-1,327	11,809	-22,894	-19,088	-18,032
-3,38	0	0	-1,327	11,809	-24,039	-19,088	-18,032
-3,5	0	0	-1,471	12,422	-24,039	-21,32	-19,475
-3,5	0	0	-1,471	12,422	-41,36	-21,32	40,309
-3,6	0	0	-1,603	12,938	-41,36	-17,352	39,041
-3,6	0	0	-1,603	12,938	-42,504	-17,352	39,041
-3,7	0	0	-1,743	13,452	-42,504	-13,514	37,722
-3,7	0	0	-1,743	13,452	-43,649	-13,514	37,722
-3,8	0	0	-1,89	13,967	-43,649	-9,809	36,351
-3,8	0	0	-1,89	13,967	-44,794	-9,809	36,351
-3,9	0	0	-2,042	14,481	-44,794	-6,245	34,929
-3,9	0	0	-2,042	14,481	-45,939	-6,245	34,929
-4	0	11030,727	-2,199	14,995	-45,939	-2,825	33,455
-4	0	11030,727	-2,199	29,692	-47,083	-2,825	33,442
-4,12	0	11030,727	-2,391	29,695	-47,083	0,974	29,878
-4,12	0	11030,727	-2,391	29,695	-48,228	0,974	29,87
-4,24	0	11030,727	-2,584	29,676	-48,228	4,344	26,307
-4,24	0	11030,727	-2,584	29,676	-49,373	4,344	26,304
-4,36	0	11030,727	-2,777	29,655	-49,373	7,287	22,744
-4,36	0	11030,727	-2,777	29,655	-50,517	7,287	22,745
-4,48	0	11030,727	-2,969	29,65	-50,517	9,803	19,187
-4,48	0	11030,727	-2,969	29,65	-51,662	9,803	19,194
-4,6	0	11030,727	-3,157	29,674	-51,662	11,893	15,634
-4,6	0	11030,727	-3,157	29,674	-52,807	11,893	15,645
-4,72	0	11030,727	-3,341	29,743	-52,807	13,556	12,08
-4,72	0	11030,727	-3,341	29,743	-53,952	13,556	12,094
-4,84	0	11030,727	-3,52	29,866	-53,952	14,793	8,518
-4,84	0	11030,727	-3,52	29,866	-55,096	14,793	8,535
-4,96	0	11030,727	-3,692	30,053	-55,096	15,602	4,94
-4,96	0	11030,727	-3,692	30,053	-56,241	15,602	4,96
-5,08	0	11030,727	-3,856	30,311	-56,241	15,98	1,339
-5,08	0	11030,727	-3,856	30,311	-57,386	15,98	1,36
-5,2	0	11030,727	-4,014	30,644	-57,386	15,924	-2,297
-5,2	0	11030,727	-4,014	30,644	-58,53	15,924	-2,274
-5,32	0	11030,727	-4,163	31,058	-58,53	15,43	-5,976
-5,32	0	11030,727	-4,163	31,058	-59,675	15,43	-5,953
-5,44	0	11030,727	-4,304	31,553	-59,675	14,491	-9,71
-5,44	0	11030,727	-4,304	31,553	-60,82	14,491	-9,687
-5,56	0	11030,727	-4,437	32,129	-60,82	13,1	-13,508
-5,56	0	11030,727	-4,437	32,129	-61,965	13,1	-13,487
-5,68	0	11030,727	-4,563	32,784	-61,965	11,248	-17,382
-5,68	0	11030,727	-4,563	32,784	-63,109	11,248	-17,362
-5,8	0	11030,727	-4,681	33,513	-63,109	8,927	-21,34

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 17 / 58							
-5,8	0	11030,727	-4,681	33,513	-64,254	8,927	-21,323
-5,92	0	11030,727	-4,793	34,311	-64,254	6,125	-25,392
-5,92	0	11030,727	-4,793	34,311	-65,399	6,125	-25,378
-6,04	0	11030,727	-4,899	35,168	-65,399	2,831	-29,546
-6,04	0	11030,727	-4,899	35,168	-66,543	2,831	-29,535
-6,16	0	11030,727	-5	36,074	-66,543	-0,969	-33,81
-6,16	0	11030,727	-5	36,074	-67,688	-0,969	-33,801
-6,28	0	11030,727	-5,099	37,015	-67,688	-5,287	-38,187
-6,28	0	11030,727	-5,099	37,015	-68,833	-5,287	-38,182
-6,4	0	11030,727	-5,196	37,975	-68,833	-10,138	-42,681
-6,4	0	11030,727	-5,196	37,975	-69,977	-10,138	-42,679
-6,52	0	11030,727	-5,293	38,935	-69,977	-15,535	-47,293
-6,52	0	11030,727	-5,293	38,935	-71,122	-15,535	-47,294
-6,64	0	11030,727	-5,393	39,873	-71,122	-21,493	-52,022
-6,64	0	11030,727	-5,393	39,873	-72,267	-21,493	-52,024
-6,76	0	11030,727	-5,498	40,762	-72,267	-28,025	-56,862
-6,76	0	11030,727	-5,498	40,762	-73,412	-28,025	-56,864
-6,88	0	11030,727	-5,612	41,576	-73,412	-35,144	-61,805
-6,88	0	11030,727	-5,612	41,576	-74,556	-35,144	-61,806
-7	0	0	-5,737	-12,464	-74,556	-42,73	-63,553
-7	0	0	-5,737	28,078	-75,701	-42,73	71,707
-7,1	0	0	-5,851	28,7	-75,701	-35,701	68,868
-7,1	0	0	-5,851	28,7	-76,846	-35,701	68,868
-7,2	0	0	-5,974	29,322	-76,846	-28,959	65,967
-7,2	0	0	-5,974	29,322	-77,99	-28,959	65,967
-7,3	0	0	-6,105	29,943	-77,99	-22,51	63,004
-7,3	0	0	-6,105	29,943	-79,135	-22,51	63,004
-7,4	0	0	-6,241	30,565	-79,135	-16,36	59,978
-7,4	0	0	-6,241	30,565	-80,28	-16,36	59,978
-7,5	0	0	-6,382	31,187	-80,28	-10,516	56,891
-7,5	0	0	-6,382	31,187	-81,425	-10,516	56,891
-7,62	0	0	-6,55	31,912	-81,425	-4,093	53,21
-7,62	0	0	-6,55	31,912	-82,569	-4,093	53,21
-7,73	0	0	-6,72	32,638	-82,569	1,896	49,444
-7,73	0	0	-6,72	32,638	-83,714	1,896	49,444
-7,85	0	0	-6,891	33,363	-83,714	7,441	45,594
-7,85	0	0	-6,891	33,363	-84,859	7,441	45,594
-7,97	0	0	-7,062	34,088	-84,859	12,532	41,66
-7,97	0	0	-7,062	34,088	-86,003	12,532	41,66
-8,08	0	0	-7,23	34,814	-86,003	17,158	37,64
-8,08	0	0	-7,23	34,814	-87,148	17,158	37,64
-8,2	0	0	-7,394	35,539	-87,148	21,311	33,537
-8,2	0	0	-7,394	35,539	-88,293	21,311	33,537
-8,32	0	0	-7,553	36,264	-88,293	24,98	29,348
-8,32	0	0	-7,553	36,264	-89,438	24,98	29,348
-8,43	0	0	-7,706	36,99	-89,438	28,156	25,075
-8,43	0	0	-7,706	36,99	-90,582	28,156	25,075

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 18 / 58							
-8,55	0	0	-7,851	37,715	-90,582	30,828	20,717
-8,55	0	0	-7,851	37,715	-91,727	30,828	20,717
-8,67	0	0	-7,987	38,44	-91,727	32,986	16,275
-8,67	0	0	-7,987	38,44	-92,872	32,986	16,275
-8,78	0	0	-8,114	39,166	-92,872	34,622	11,748
-8,78	0	0	-8,114	39,166	-94,016	34,622	11,748
-8,9	0	0	-8,229	39,891	-94,016	35,724	7,136
-8,9	0	0	-8,229	39,891	-95,161	35,724	7,136
-9,02	0	0	-8,333	40,617	-95,161	36,284	2,44
-9,02	0	0	-8,333	40,617	-96,306	36,284	2,44
-9,13	0	0	-8,424	41,342	-96,306	36,29	-2,341
-9,13	0	0	-8,424	41,342	-97,45	36,29	-2,341
-9,25	0	0	-8,501	42,067	-97,45	35,734	-7,207
-9,25	0	0	-8,501	42,067	-98,595	35,734	-7,207
-9,37	0	0	-8,563	42,793	-98,595	34,605	-12,157
-9,37	0	0	-8,563	42,793	-99,74	34,605	-12,157
-9,48	0	0	-8,611	43,518	-99,74	32,894	-17,192
-9,48	0	0	-8,611	43,518	-100,885	32,894	-17,192
-9,6	0	0	-8,643	44,243	-100,885	30,591	-22,311
-9,6	0	0	-8,643	44,243	-102,029	30,591	-22,311
-9,72	0	0	-8,659	44,968	-102,029	27,685	-27,515
-9,72	0	0	-8,659	44,968	-103,174	27,685	-27,515
-9,83	0	0	-8,659	45,694	-103,174	24,167	-32,804
-9,83	0	0	-8,659	45,694	-104,319	24,167	-32,804
-9,95	0	0	-8,643	46,419	-104,319	20,028	-38,177
-9,95	0	0	-8,643	46,419	-105,463	20,028	-38,177
-10,07	0	0	-8,61	47,144	-105,463	15,256	-43,635
-10,07	0	0	-8,61	47,144	-106,608	15,256	-43,635
-10,18	0	0	-8,563	47,87	-106,608	9,843	-49,177
-10,18	0	0	-8,563	47,87	-107,753	9,843	-49,177
-10,3	0	0	-8,499	48,595	-107,753	3,778	-54,804
-10,3	0	0	-8,499	48,595	-108,898	3,778	-54,804
-10,42	0	0	-8,422	49,32	-108,898	-2,948	-60,516
-10,42	0	0	-8,422	49,32	-110,042	-2,948	-60,516
-10,53	0	0	-8,33	50,046	-110,042	-10,346	-66,313
-10,53	0	0	-8,33	50,046	-111,187	-10,346	-66,313
-10,65	0	0	-8,226	50,771	-111,187	-18,424	-72,194
-10,65	0	0	-8,226	50,771	-112,332	-18,424	-72,194
-10,77	0	0	-8,11	51,496	-112,332	-27,194	-78,159
-10,77	0	0	-8,11	51,496	-113,476	-27,194	-78,159
-10,88	0	0	-7,985	52,222	-113,476	-36,665	-84,209
-10,88	0	0	-7,985	52,222	-114,621	-36,665	-84,209
-11	0	0	-7,851	52,947	-114,621	-46,846	-90,344
-11	0	0	-7,851	45,36	-193,891	-46,846	44,972
-11,1	0	0	-7,731	45,963	-193,891	-42,577	40,406
-11,1	0	0	-7,731	45,963	-195,036	-42,577	40,406
-11,2	0	0	-7,606	46,566	-195,036	-38,767	35,78

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 19 / 58							
-11,2	0	0	-7,606	46,566	-196,18	-38,767	35,78
-11,3	0	0	-7,477	47,17	-196,18	-35,423	31,093
-11,3	0	0	-7,477	47,17	-197,325	-35,423	31,093
-11,4	0	0	-7,344	47,773	-197,325	-32,551	26,346
-11,4	0	0	-7,344	47,773	-198,47	-32,551	26,346
-11,5	0	0	-7,207	48,376	-198,47	-30,156	21,538
-11,5	0	0	-7,207	48,376	-199,614	-30,156	21,538
-11,62	0	22350,612	-7,04	38,174	-199,614	-27,91	16,387
-11,62	0	22350,612	-7,04	38,174	-200,759	-27,91	16,077
-11,74	0	22350,612	-6,87	30,427	-200,759	-26,249	11,994
-11,74	0	22350,612	-6,87	30,427	-201,904	-26,249	11,681
-11,86	0	22350,612	-6,697	22,758	-201,904	-25,056	8,515
-11,86	0	22350,612	-6,697	22,758	-203,048	-25,056	8,201
-11,98	0	22350,612	-6,523	15,139	-203,048	-24,222	5,945
-11,98	0	22350,612	-6,523	15,139	-204,193	-24,222	5,632
-12,1	0	22350,612	-6,349	7,537	-204,193	-23,641	4,283
-12,1	0	22350,612	-6,349	7,537	-205,338	-23,641	3,973
-12,21	0	22350,612	-6,177	-0,079	-205,338	-23,204	3,529
-12,21	0	22350,612	-6,177	-0,079	-206,483	-23,204	3,225
-12,33	0	22350,612	-6,008	-7,743	-206,483	-22,801	3,69
-12,33	0	22350,612	-6,008	-7,743	-207,627	-22,801	3,394
-12,45	0	22350,612	-5,844	-15,484	-207,627	-22,324	4,777
-12,45	0	22350,612	-5,844	-15,484	-208,772	-22,324	4,49
-12,57	0	22350,612	-5,685	-23,331	-208,772	-21,661	6,801
-12,57	0	22350,612	-5,685	-23,331	-209,917	-21,661	6,526
-12,69	0	22350,612	-5,533	-31,312	-209,917	-20,7	9,779
-12,69	0	22350,612	-5,533	-31,312	-211,061	-20,7	9,518
-12,81	22350,612	22350,612	-5,389	-35,707	-211,061	-19,335	13,507
-12,81	22350,612	22350,612	-5,389	-35,707	-212,206	-19,335	13,018
-12,93	22350,612	22350,612	-5,254	-29,293	-212,206	-17,547	16,887
-12,93	22350,612	22350,612	-5,254	-29,293	-213,351	-17,547	16,433
-13,05	22350,612	22350,612	-5,128	-23,264	-213,351	-15,397	19,561
-13,05	22350,612	22350,612	-5,128	-23,264	-214,496	-15,397	19,146
-13,17	22350,612	22350,612	-5,012	-17,644	-214,496	-12,967	21,581
-13,17	22350,612	22350,612	-5,012	-17,644	-215,64	-12,967	21,207
-13,29	22350,612	22350,612	-4,906	-12,448	-215,64	-10,329	22,998
-13,29	22350,612	22350,612	-4,906	-12,448	-216,785	-10,329	22,668
-13,4	22350,612	22350,612	-4,81	-7,688	-216,785	-7,554	23,867
-13,4	22350,612	22350,612	-4,81	-7,688	-217,93	-7,554	23,583
-13,52	22350,612	22350,612	-4,724	-3,365	-217,93	-4,702	24,241
-13,52	22350,612	22350,612	-4,724	-3,365	-219,074	-4,702	24,004
-13,64	22350,612	22350,612	-4,648	0,52	-219,074	-1,83	24,173
-13,64	22350,612	22350,612	-4,648	0,52	-220,219	-1,83	23,985
-13,76	22350,612	22350,612	-4,582	3,976	-220,219	1,014	23,717
-13,76	22350,612	22350,612	-4,582	3,976	-221,364	1,014	23,577
-13,88	22350,612	22350,612	-4,525	7,01	-221,364	3,785	22,923
-13,88	22350,612	22350,612	-4,525	7,01	-222,509	3,785	22,831

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 20 / 58							
-14	22350,612	22350,612	-4,478	9,638	-222,509	6,448	21,84
-14	22350,612	22350,612	-4,478	9,638	-223,653	6,448	21,796
-14,12	22350,612	22350,612	-4,439	11,841	-223,653	8,928	20,539
-14,12	22350,612	22350,612	-4,439	11,841	-224,798	8,928	20,54
-14,23	22350,612	22350,612	-4,408	13,683	-224,798	11,248	19,046
-14,23	22350,612	22350,612	-4,408	13,683	-225,943	11,248	19,091
-14,35	22350,612	22350,612	-4,384	15,183	-225,943	13,385	17,401
-14,35	22350,612	22350,612	-4,384	15,183	-227,087	13,385	17,487
-14,47	22350,612	22350,612	-4,367	16,362	-227,087	15,326	15,64
-14,47	22350,612	22350,612	-4,367	16,362	-228,232	15,326	15,765
-14,59	22350,612	22350,612	-4,356	17,24	-228,232	17,057	13,798
-14,59	22350,612	22350,612	-4,356	17,24	-229,377	17,057	13,959
-14,7	22350,612	22350,612	-4,35	17,839	-229,377	18,572	11,906
-14,7	22350,612	22350,612	-4,35	17,839	-230,521	18,572	12,1
-14,82	22350,612	22350,612	-4,349	18,18	-230,521	19,866	9,992
-14,82	22350,612	22350,612	-4,349	18,18	-231,666	19,866	10,216
-14,94	22350,612	22350,612	-4,353	18,287	-231,666	20,937	8,081
-14,94	22350,612	22350,612	-4,353	18,287	-232,811	20,937	8,332
-15,05	22350,612	22350,612	-4,361	18,179	-232,811	21,787	6,197
-15,05	22350,612	22350,612	-4,361	18,179	-233,956	21,787	6,47
-15,17	22350,612	22350,612	-4,372	17,879	-233,956	22,421	4,359
-15,17	22350,612	22350,612	-4,372	17,879	-235,1	22,421	4,651
-15,29	22350,612	22350,612	-4,386	17,406	-235,1	22,844	2,586
-15,29	22350,612	22350,612	-4,386	17,406	-236,245	22,844	2,893
-15,4	22350,612	22350,612	-4,403	16,78	-236,245	23,065	0,892
-15,4	22350,612	22350,612	-4,403	16,78	-237,39	23,065	1,209
-15,52	22350,612	22350,612	-4,421	16,021	-237,39	23,093	-0,711
-15,52	22350,612	22350,612	-4,421	16,021	-238,534	23,093	-0,387
-15,64	22350,612	22350,612	-4,442	15,145	-238,534	22,94	-2,211
-15,64	22350,612	22350,612	-4,442	15,145	-239,679	22,94	-1,884
-15,76	22350,612	22350,612	-4,463	14,17	-239,679	22,618	-3,6
-15,76	22350,612	22350,612	-4,463	14,17	-240,824	22,618	-3,275
-15,87	22350,612	22350,612	-4,485	13,111	-240,824	22,14	-4,872
-15,87	22350,612	22350,612	-4,485	13,111	-241,969	22,14	-4,552
-15,99	22350,612	22350,612	-4,508	11,983	-241,969	21,519	-6,021
-15,99	22350,612	22350,612	-4,508	11,983	-243,113	21,519	-5,71
-16,11	22350,612	22350,612	-4,532	10,799	-243,113	20,772	-7,044
-16,11	22350,612	22350,612	-4,532	10,799	-244,258	20,772	-6,746
-16,22	22350,612	22350,612	-4,555	9,571	-244,258	19,91	-7,939
-16,22	22350,612	22350,612	-4,555	9,571	-245,403	19,91	-7,658
-16,34	22350,612	22350,612	-4,579	8,31	-245,403	18,951	-8,705
-16,34	22350,612	22350,612	-4,579	8,31	-246,547	18,951	-8,445
-16,46	22350,612	22350,612	-4,602	7,026	-246,547	17,908	-9,343
-16,46	22350,612	22350,612	-4,602	7,026	-247,692	17,908	-9,107
-16,58	22350,612	22350,612	-4,625	5,727	-247,692	16,797	-9,853
-16,58	22350,612	22350,612	-4,625	5,727	-248,837	16,797	-9,644
-16,69	22350,612	22350,612	-4,647	4,421	-248,837	15,632	-10,238

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 21 / 58							
-16,69	22350,612	22350,612	-4,647	4,421	-249,982	15,632	-10,059
-16,81	22350,612	22350,612	-4,668	3,114	-249,982	14,427	-10,5
-16,81	22350,612	22350,612	-4,668	3,114	-251,126	14,427	-10,353
-16,93	22350,612	22350,612	-4,689	1,811	-251,126	13,196	-10,641
-16,93	22350,612	22350,612	-4,689	1,811	-252,271	13,196	-10,53
-17,04	22350,612	22350,612	-4,709	0,518	-252,271	11,954	-10,666
-17,04	22350,612	22350,612	-4,709	0,518	-253,416	11,954	-10,593
-17,16	22350,612	22350,612	-4,729	-0,763	-253,416	10,713	-10,578
-17,16	22350,612	22350,612	-4,729	-0,763	-254,56	10,713	-10,544
-17,28	22350,612	22350,612	-4,747	-2,029	-254,56	9,487	-10,381
-17,28	22350,612	22350,612	-4,747	-2,029	-255,705	9,487	-10,389
-17,4	22350,612	22350,612	-4,765	-3,277	-255,705	8,288	-10,078
-17,4	22350,612	22350,612	-4,765	-3,277	-256,85	8,288	-10,129
-17,51	22350,612	22350,612	-4,782	-4,507	-256,85	7,127	-9,673
-17,51	22350,612	22350,612	-4,782	-4,507	-257,994	7,127	-9,769
-17,63	22350,612	22350,612	-4,798	-5,719	-257,994	6,017	-9,171
-17,63	22350,612	22350,612	-4,798	-5,719	-259,139	6,017	-9,312
-17,75	22350,612	22350,612	-4,814	-6,911	-259,139	4,969	-8,573
-17,75	22350,612	22350,612	-4,814	-6,911	-260,284	4,969	-8,762
-17,86	22350,612	22350,612	-4,829	-8,086	-260,284	3,993	-7,884
-17,86	22350,612	22350,612	-4,829	-8,086	-261,429	3,993	-8,121
-17,98	22350,612	22350,612	-4,843	-9,243	-261,429	3,1	-7,107
-17,98	22350,612	22350,612	-4,843	-9,243	-262,573	3,1	-7,392
-18,1	22350,612	22350,612	-4,857	-10,385	-262,573	2,301	-6,243
-18,1	22350,612	22350,612	-4,857	-10,385	-263,718	2,301	-6,578
-18,21	22350,612	22350,612	-4,871	-11,512	-263,718	1,604	-5,297
-18,21	22350,612	22350,612	-4,871	-11,512	-264,863	1,604	-5,681
-18,33	22350,612	22350,612	-4,884	-12,627	-264,863	1,021	-4,268
-18,33	22350,612	22350,612	-4,884	-12,627	-266,007	1,021	-4,703
-18,45	22350,612	22350,612	-4,897	-13,733	-266,007	0,559	-3,16
-18,45	22350,612	22350,612	-4,897	-13,733	-267,152	0,559	-3,644
-18,57	22350,612	22350,612	-4,909	-14,83	-267,152	0,229	-1,972
-18,57	22350,612	22350,612	-4,909	-14,83	-268,297	0,229	-2,507
-18,68	22350,612	22350,612	-4,922	-15,923	-268,297	0,04	-0,707
-18,68	22350,612	22350,612	-4,922	-15,923	-269,442	0,04	-1,292
-18,8	22350,612	22350,612	-4,935	-17,013	-269,442	0	0,636

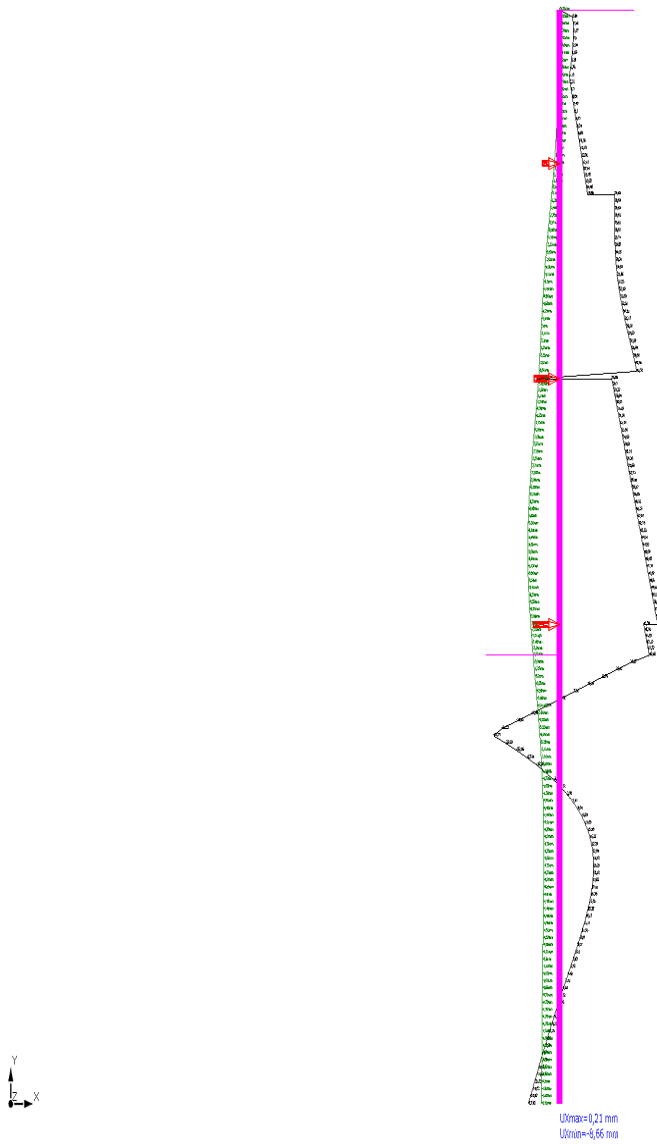


Figure 3. Displacements and Effects (3rd Steel Strand Anchor)

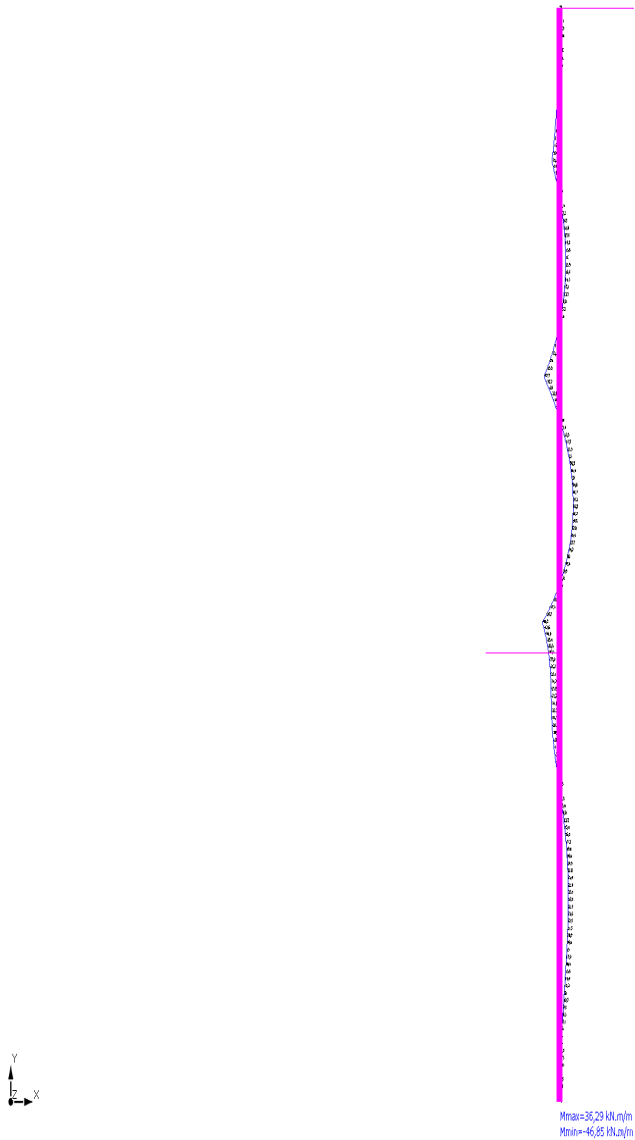


Figure 4. Moment Diagram (3rd Steel Strand Anchor)

X: Horizontal distance to the wall
Sv: Settlement behind the wall

Table 9. Settlements Behind the Wall (3rd Steel Strand Anchor)

X [m]	Sv [m]
0	-22,366
0,5	-21,404
0,999	-20,441
1,499	-19,477
1,999	-18,512
2,498	-17,547
2,998	-16,58
3,498	-15,612
3,997	-14,644

Downtown Excavation Support System Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 24 / 58	
4,497	-13,674
4,997	-12,704
5,496	-11,732
5,996	-10,76
6,496	-9,786
6,995	-8,812
7,495	-7,837
7,994	-6,861
8,494	-5,883
8,994	-4,905
9,493	-3,926
9,993	-2,946
10,493	-1,965
10,992	-0,983
11,492	0

WALL HORIZONTAL DISPLACEMENT VERIFICATION (3rd Steel Strand Anchor)

$U_{x,max}$: Maximum horizontal displacement

$U_{x,lim}$: Horizontal displacement limit

H: Excavation depth

δH : Coefficient for the limit horizontal displacement

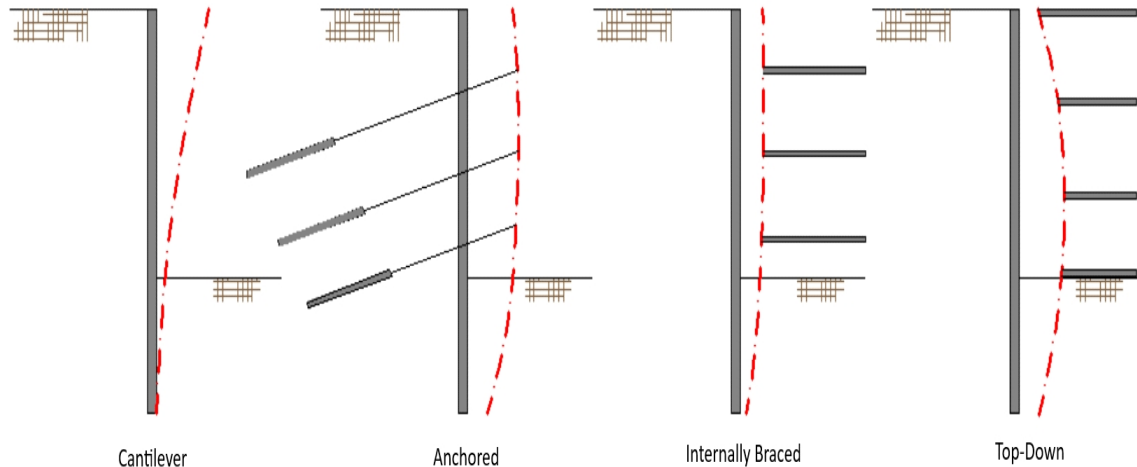


Figure 5. Typical Displacement Shapes

Table 10. Horizontal Displacement Verification (3rd Steel Strand Anchor)

Node	$U_{x,max}$ [mm]	$U_{x,lim}$ [mm]	H [m]	δH	Kontrol
76	-8,66	33	11	0,003H	√

PULL-OUT FAILURE of GROUTED ANCHOR-SOIL INTERFACE (STR) (3rd Steel Strand Anchor)

z: Depth

D: Grout diameter

L: Grout length

τ_f : Ultimate skin friction

T_f: Ultimate bearing capacity of anchor

R_{a;d}: Design pull-out resistance Of anchor-soil interface

F: Anchor force

E_{a;d}: Design anchor force

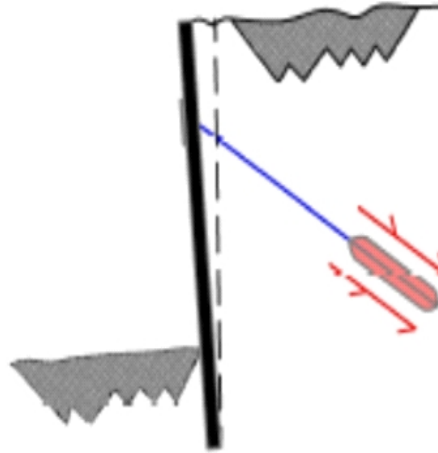


Figure 6. Pull-Out Failure of Grouted Anchor-Soil Interface (STR)

Table 11. Pull-Out Verification Of Grouted Anchor-Soil Interface (3rd Steel Strand Anchor)

Anchor Name	Type	z [m]	D [m]	L [m]	τ_f [kN/m ²]	T _f [kN]	R _{a;d} [kN]	F [kN]	E _{a;d} [kN]	FS	Check
Ankraj 1	Steel Strand	2,5	0,15	10	53kN/m ² ; 88,13kN/m ² ;	390,132	278,666	98,116	132,457	3,98	✓
Ankraj 3	Steel Strand	10	0,15	10	227kN/m ² ;	1069,734	764,096	250	337,5	4,28	✓

ANCHOR TENDON TENSILE FAILURE (STR) (3rd Steel Strand Anchor)

z: Depth

n: Tendon number

d₁: Nominal diameter of a single tendon

f_u: Nominal tensile strength a single tendon

R_t: Anchor tensile strength

R_{t;d}: Anchor design tensile strength

F: Anchor force

E_{a;d}: Design anchor force

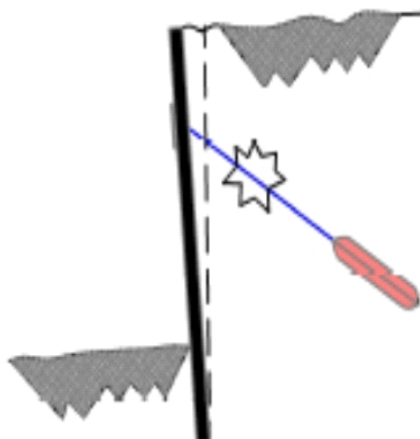


Figure 7. Anchor Tendon Tensile Failure

Table 12. Anchor Tendon Tensile Verification (3rd Steel Strand Anchor)

Anchor Name	Type	z [m]	n	d_1 [mm]	f_u [kN/m ²]	R_t [kN]	$R_{t;d}$ [kN]	F [kN]	$E_{a;d}$ [kN]	FS	Check
Ankraj 1	CelikH alat	2,5	3	15,7	177000	796,5	568,93	98,116	132,457	8,12	✓
Ankraj 3	CelikH alat	10	3	15,7	177000	796,5	568,93	250	337,5	3,19	✓

PULL-OUT FAILURE AT THE TENDON-GROUT INTERFACE of ANCHOR (STR) (3rd Steel Strand Anchor)

z: Depth

n: Tendon number

d_s : Combined diameter of bars/strands. For multiple strands or bars, it represents their nominal combined diameter.

L: Grout length

f_c : Grout compressive strength

τ_c : Tendon-to-grout bond strength

R_c : Pull-out resistance of tendon-grout interface

$R_{c;d}$: Design pull-out resistance of tendon-grout interface

F: Anchor force

$E_{a;d}$: Design anchor force

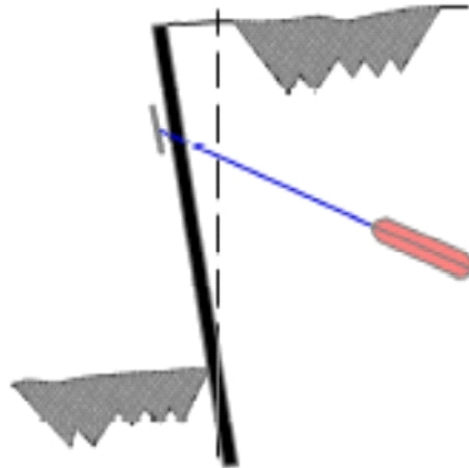


Figure 8. Pull-Out Failure of Tendon-Grout Interface

Table 13. Pull-Out Verification of tendon-grout interface (3rd Steel Strand Anchor)

Anch or Name	Type	z [m]	n	d _s [mm]	L [m]	f _c [kN/ m ²]	τ _c [kN/ m ²]	R _c [kN]	R _{c;d} [kN]	F [kN]	E _{a;d} [kN]	FS	Check
Ankra j1	Celik Halat	2,5	3	47,1	10	10000	1151, 069	1703, 226	1216, 59	98,11 6	132,4 57	17,36	√
Ankra j3	Celik Halat	10	3	47,1	10	10000	1151, 069	1703, 226	1216, 59	250	337,5	6,81	√

ANCHOR INTERNAL STABILITY (3rd Steel Strand Anchor)

H_o: The theoretical depth below the excavation level at the controlled construction stage

E_a: Active earth pressure force acting on the wall between the top level and point H_o

δ: Weighted average of the wall-soil friction angle between the top level and point H_o

W_i: Block weight of the verified anchor

θ_i: The angle between the inclined surface of the verified anchor's block and the horizontal

E_{ai}: The active earth pressure force acting on the vertical part of the verified anchor's block

δ_i: Weighted average of the wall-soil friction angle along the vertical part of the verified anchor's block

C_i: Cohesion reaction between the inclined surface of the verified anchor block and the soil.

i_a: Included anchors. The calculated forces of the included anchors are incorporated into the block analysis of the verified anchor.

Φ_i: Average internal friction angle on the inclined surface of the verified anchor block

Q_i: Reaction force acting on the inclined surface of the verified anchor block

F_i: Reaction force acting on the inclined surface of the verified anchor block

F: Verified anchor force.

FS: Factor of safety

F_i*: Allowable reduced maximum force in the verified anchor

F*: Factored verified anchor force

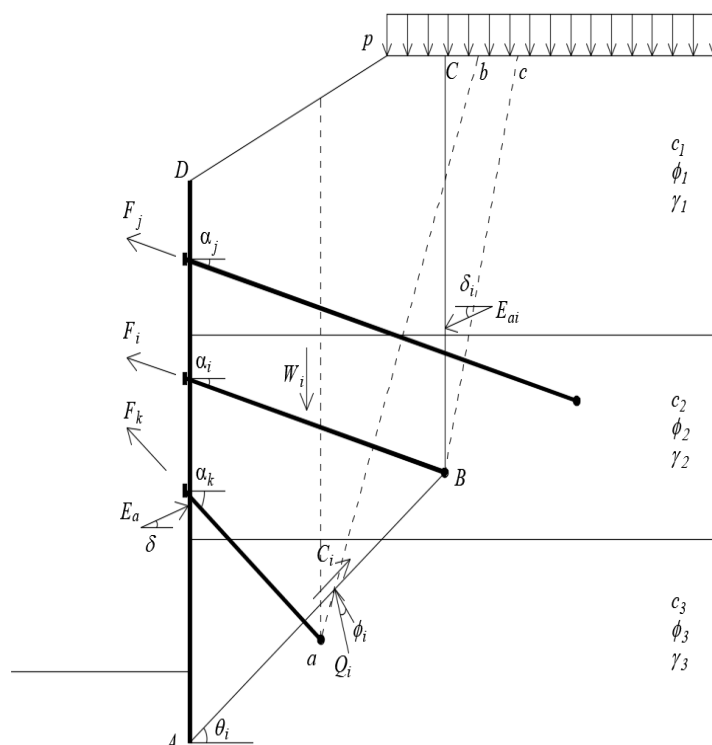


Figure 9. Anchorage Internal Stability Verification

$$H_o = 0,71[m]$$

$$E_a = 258,76[kN/m]$$

$$\delta = 15[^\circ]$$

Table 14. Anchorage Internal Stability Verification (3rd Steel Strand Anchor)

W_i [kN/m]	θ_i [°]	E_{ai} [kN/m]	δ_i [°]	C_i [kN/m]	Φ_i [°]	Q_i [kN/m]	F_i [kN/m]	F [kN/FS]	F_i^* [kN/m]	F^* [kN/m]	Check
3056,38	14,72	65,04	15	229,99	28,22	2742,29	1087,16	61,32	17,73	776,55	82,79 ✓
3780,12	-25,83	709,18	15	252,56	28,8	3948,83	3409,63	156,25	21,82	2435,45	210,94 ✓

SUPPORT FORCES AND SECTION DESIGN (3rd Steel Strand Anchor)

z: Depth

L: Support length

S: Horizontal spacing

D: Profile outer diameter

t: Profile wall thickness

Fy: Characteristic yield stress of steel

Fu: Steel tensile strength

Table 15. Support Properties (3rd Steel Strand Anchor)

Type	z [m]	L [m]	S [m]	D [mm]	t [mm]	Steel Class	Fy [kN/m²]	Fu [kN/m²]
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Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 29 / 58								
Steel Pipe	6	8,5	4	450	30	TS EN 10025-2 S235	235000	360000

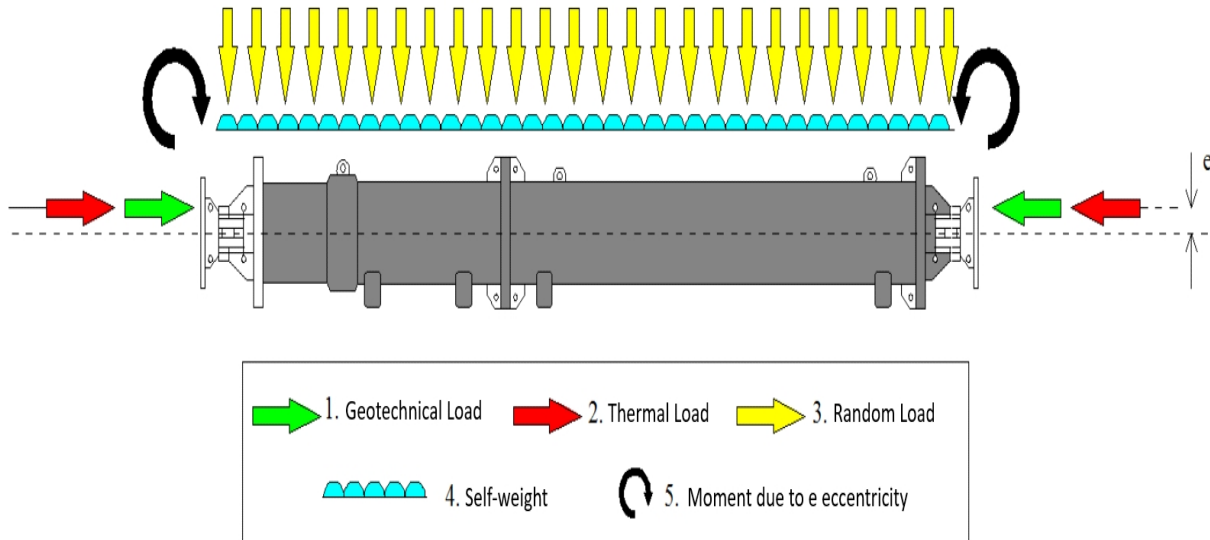


Figure 10. Support Forces and Section Design

Psls: Support force calculated for the SLS case

Puls: Support force calculated for the ULS case

Gk: Characteristic total self-weight of support

Gk,geo: Characteristic geotechnical load

Qk,temp: Characteristic thermal load

Qk,random: Additional uniformly distributed vertical load on the support

Mecc: Moment obtained with additional eccentricity in a momentless joint

Table 16. Effects on Support Element (3rd Steel Strand Anchor)

Type	Psls [kN]	Puls [kN]	Gk [kN/m]	Gk,geo [kN]	Qk,temp [kN]	Qk,random [kN/m]	Mecc [kN.m]
Steel Pipe	534,46	721,521	3,047	721,521	299,256	1	90,025

Pr: Required axial compressive strength

Mr: Required bending moment strength

Pc: Design compressive force strength

Mcx: Design bending moment strength

Table 17. Compression-Bending Design (3rd Steel Strand Anchor)

Type	Combination	Pr [kN]	Mr [kN.m]	Pc [kN]	Mcx [kN.m]	Capacity Ratio	Check
Steel Pipe	LC2	1200,329	123,049	7172,02	1121,162	0,19	$0,19 \leq 1 \checkmark$

Kombinasyon: Load combination for shear design

Vr: Required shear strength

Vd: Not Found

Table 18. Shear Design (3rd Steel Strand Anchor)

Type	Combination	Vr [kN]	Vd [kN]	Capacity Ratio	Check
Steel Pipe	LC3	19,751	2511,609	0,01	$0,01 \leq 1 \checkmark$

WALL STRUCTURAL DESIGN (3rd Steel Strand Anchor)

D: Pile diameter

Nd: Design normal force

Md: Design bending moment

fck: Characteristic concrete compressive strength

fyk: Characteristic steel tensile strength

ρ : Reinforcement percentage

Amin: Minimum longitudinal reinforcement area

Ast: Required reinforcement area

Asmax: Maximum reinforcement area

Acur: Current reinforcement area

Table 19. Compression-Bending Design (3rd Steel Strand Anchor)

Node	Location [m]	D [mm]	Nd [kN]	Md [kN.m]	fck [kN/m ²]	fyk [kN/m ²]	ρ	Amin [mm ²]	Ast [mm ²]	Asma [mm ²]	Acur [mm ²]	Rebar	Check
52	-7	650	81,76	108,43	25000	42000	0,01	3318,3	3318,3	13273,2	3455,8	11 Φ 20	$\checkmark$

Vd: Design shear force

Vcr: Shear cracking strength

Vc: Contribution of concrete to shear strength

Vw: Strength contribution of shear reinforcement

Aswmin: Minimum transverse reinforcement area

Asw: Required transverse reinforcement area

Aswcur: Current transverse reinforcement area

Table 20. Shear Design (3rd Steel Strand Anchor)

Node	Location [m]	D [mm]	Nd [kN]	Vd [kN]	fck [kN/m ²]	fyk [kN/m ²]	Vcr [kN]	Vc [kN]	Vw [kN]	Aswmin [mm ² /m]	Asw [mm ² /m]	Aswcur [mm ² /m]	Rebar	Check
52	-7	650	-81,76	126,71	25000	42000	211,53	169,22	0	512,57	512,57	670,2	Φ 8/15	$\checkmark$

CONSTRUCTION STAGE: Final Excavation

Excavation depth= 13[m]

Excavation level= -14[m]

GWT= -21[m]

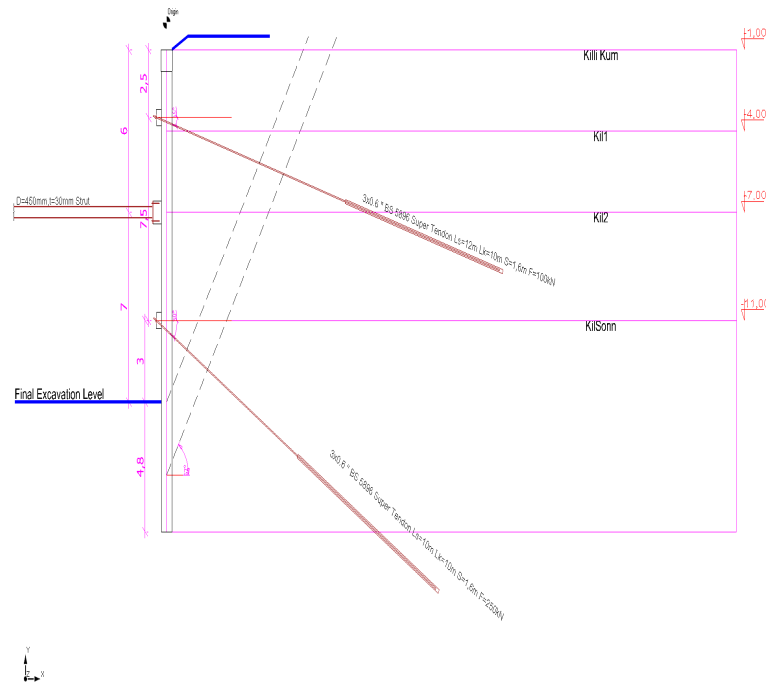


Figure 11. Construction Stage (Final Excavation)

ANCHORS (Final Excavation)

z: Depth. Vertical distance from wall top elevation to anchorage elevation

S: Horizontal spacing

L_s : Anchor unbonded length

L_k : Anchor bond length

L: Anchor length

n: Represents the number of steel strands in prestressed tendon systems or the number of reinforcing bars in soil nail systems.

d_i : Strand/reinforcement diameter. Represents the diameter of a steel strand or a reinforced concrete bar.

d_s : Combined diameter of bars/strands. For multiple strands or bars, it represents their nominal combined diameter.

d: Represents the grout diameter in strand systems and the nail diameter in soil nail systems.

Table 21. Anchorage General Properties (Final Excavation)

Name	Type	z [m]	S [m]	L_s [m]	L_k [m]	n	d_i	d_s [m]	d [m]
Ankraj1	Steel Strand	2,5	1,6	12	10	3	0.6 "	0,047	0,15
Ankraj3	Steel Strand	10	1,6	10	10	3	0.6 "	0,047	0,15

E: Modulus of Elasticity

F_p : Prestress force

Table 22. Anchor Mechanical Properties

Downtown Excavation Support System				
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 32 / 58				
Name	Type	Prestressing Application	E [kN/m ²]	F _p [kN]
Ankraj1	Steel Strand	None	210000000	100
Ankraj3	Steel Strand	None	210000000	250

SUPPORTS (Final Excavation)

z: Vertical distance from wall top elevation to support elevation

L: Support length

S: Horizontal spacing

D: Profile outer diameter

t: Profile wall thickness

Table 23. Support General Properties (Final Excavation)

Support Name	Type	Application of Support	z [m]	L [m]	S [m]	D [mm]	t [mm]	Steel Class
Destek1	Steel Pipe	None	6	8,5	4	450	30	TS EN 10025-2 S235

EARTH PRESSURES (Final Excavation)

z: Depth

σ_{pf} : Passive pressure in front of the wall

σ_{rf} : Pressure in front of the wall at rest

σ_{af} : Active pressure in front of the wall

σ_{pb} : Passive pressure behind the wall

σ_{rb} : Pressure behind the wall at rest

σ_{ab} : Active pressure behind the wall

σ_f : Displacement-dependent pressure in front of the wall

σ_b : Displacement-dependent pressure behind the wall

Table 24. Earth Pressures (Final Excavation)

z [m]	σ_{pf} [kN/m ²]	σ_{rf} [kN/m ²]	σ_{af} [kN/m ²]	σ_{pb} [kN/m ²]	σ_{rb} [kN/m ²]	σ_{ab} [kN/m ²]	σ_f [kN/m ²]	σ_b [kN/m ²]
-1	0	0	0	0	0	0	0	0
-1,12	0	0	0	17,241	2,959	1,896	0	3,51
-1,12	0	0	0	17,241	2,959	1,896	0	3,51
-1,24	0	0	0	33,504	4,94	2,813	0	5,101
-1,24	0	0	0	33,504	4,94	2,813	0	5,101
-1,36	0	0	0	49,427	6,581	3,391	0	6,351
-1,36	0	0	0	49,427	6,581	3,391	0	6,351
-1,48	0	0	0	65,157	8,028	3,775	0	7,401
-1,48	0	0	0	65,157	8,028	3,775	0	7,401
-1,6	0	0	0	80,765	9,354	4,037	0	8,317
-1,6	0	0	0	80,765	9,354	4,037	0	8,317
-1,71	0	0	0	96,293	10,599	4,22	0	9,133
-1,71	0	0	0	96,293	10,599	4,22	0	9,133
-1,83	0	0	0	111,767	11,792	4,349	0	9,864

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 33 / 58								
-1,83	0	0	0	111,767	11,792	4,349	0	9,864
-1,95	0	0	0	127,205	12,948	4,441	0	10,514
-1,95	0	0	0	127,205	12,948	4,441	0	10,514
-2,07	0	0	0	136,199	14,079	4,894	0	11,08
-2,07	0	0	0	136,199	14,079	4,894	0	11,08
-2,19	0	0	0	148,355	15,192	5,554	0	11,552
-2,19	0	0	0	148,355	15,192	5,554	0	11,552
-2,31	0	0	0	160,498	16,293	6,201	0	11,916
-2,31	0	0	0	160,498	16,293	6,201	0	11,916
-2,43	0	0	0	172,633	17,385	6,84	0	12,154
-2,43	0	0	0	172,633	17,385	6,84	0	12,154
-2,55	0	0	0	184,761	18,471	7,472	0	12,245
-2,55	0	0	0	184,761	18,471	7,472	0	12,245
-2,67	0	0	0	196,884	19,551	8,099	0	12,164
-2,67	0	0	0	196,884	19,551	8,099	0	12,164
-2,79	0	0	0	209,004	20,628	8,722	0	11,886
-2,79	0	0	0	209,004	20,628	8,722	0	11,886
-2,9	0	0	0	221,121	21,703	9,343	0	11,38
-2,9	0	0	0	221,121	21,703	9,343	0	11,38
-3,02	0	0	0	233,235	22,775	9,961	0	10,614
-3,02	0	0	0	233,235	22,775	9,961	0	10,614
-3,14	0	0	0	245,348	23,845	10,578	0	10,578
-3,14	0	0	0	245,348	23,845	10,578	0	10,578
-3,26	0	0	0	257,46	24,915	11,194	0	11,194
-3,26	0	0	0	257,46	24,915	11,194	0	11,194
-3,38	0	0	0	269,571	25,983	11,809	0	11,809
-3,38	0	0	0	269,571	25,983	11,809	0	11,809
-3,5	0	0	0	281,681	27,05	12,422	0	12,422
-3,5	0	0	0	281,681	27,05	12,422	0	12,422
-3,6	0	0	0	291,853	27,946	12,938	0	12,938
-3,6	0	0	0	291,853	27,946	12,938	0	12,938
-3,7	0	0	0	302,024	28,842	13,452	0	13,452
-3,7	0	0	0	302,024	28,842	13,452	0	13,452
-3,8	0	0	0	312,195	29,737	13,967	0	13,967
-3,8	0	0	0	312,195	29,737	13,967	0	13,967
-3,9	0	0	0	322,366	30,633	14,481	0	14,481
-3,9	0	0	0	322,366	30,633	14,481	0	14,481
-4	0	0	0	332,537	31,527	14,995	0	14,995
-4	0	0	0	118,733	54,096	4,733	0	36,753
-4,12	0	0	0	123,487	56,156	4,735	0	36,734
-4,12	0	0	0	123,487	56,156	4,735	0	36,734
-4,24	0	0	0	128,24	58,215	4,736	0	36,675
-4,24	0	0	0	128,24	58,215	4,736	0	36,675
-4,36	0	0	0	132,994	60,274	4,738	0	36,6
-4,36	0	0	0	132,994	60,274	4,738	0	36,6
-4,48	0	0	0	137,747	62,333	4,739	0	36,53
-4,48	0	0	0	137,747	62,333	4,739	0	36,53

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 34 / 58								
-4,6	0	0	0	142,5	64,392	4,74	0	36,483
-4,6	0	0	0	142,5	64,392	4,74	0	36,483
-4,72	0	0	0	147,253	66,45	4,741	0	36,474
-4,72	0	0	0	147,253	66,45	4,741	0	36,474
-4,84	0	0	0	152,006	68,509	4,742	0	36,516
-4,84	0	0	0	152,006	68,509	4,742	0	36,516
-4,96	0	0	0	156,758	70,567	4,742	0	36,618
-4,96	0	0	0	156,758	70,567	4,742	0	36,618
-5,08	0	0	0	161,511	72,625	4,743	0	36,785
-5,08	0	0	0	161,511	72,625	4,743	0	36,785
-5,2	0	0	0	166,263	74,684	4,743	0	37,022
-5,2	0	0	0	166,263	74,684	4,743	0	37,022
-5,32	0	0	0	171,016	76,742	4,744	0	37,329
-5,32	0	0	0	171,016	76,742	4,744	0	37,329
-5,44	0	0	0	175,768	78,8	4,744	0	37,705
-5,44	0	0	0	175,768	78,8	4,744	0	37,705
-5,56	0	0	0	180,521	80,858	4,745	0	38,144
-5,56	0	0	0	180,521	80,858	4,745	0	38,144
-5,68	0	0	0	185,273	82,916	4,745	0	38,639
-5,68	0	0	0	185,273	82,916	4,745	0	38,639
-5,8	0	0	0	190,026	84,974	4,746	0	39,179
-5,8	0	0	0	190,026	84,974	4,746	0	39,179
-5,92	0	0	0	194,778	87,032	4,746	0	39,75
-5,92	0	0	0	194,778	87,032	4,746	0	39,75
-6,04	0	0	0	199,53	89,09	4,746	0	40,335
-6,04	0	0	0	199,53	89,09	4,746	0	40,335
-6,16	0	0	0	204,282	91,148	4,746	0	40,914
-6,16	0	0	0	204,282	91,148	4,746	0	40,914
-6,28	0	0	0	209,035	93,206	4,747	0	41,462
-6,28	0	0	0	209,035	93,206	4,747	0	41,462
-6,4	0	0	0	213,787	95,264	4,747	0	41,951
-6,4	0	0	0	213,787	95,264	4,747	0	41,951
-6,52	0	0	0	218,539	97,322	4,747	0	42,349
-6,52	0	0	0	218,539	97,322	4,747	0	42,349
-6,64	0	0	0	223,291	99,38	4,747	0	42,621
-6,64	0	0	0	223,291	99,38	4,747	0	42,621
-6,76	0	0	0	228,043	101,437	4,747	0	42,726
-6,76	0	0	0	228,043	101,437	4,747	0	42,726
-6,88	0	0	0	232,796	103,495	4,748	0	42,619
-6,88	0	0	0	232,796	103,495	4,748	0	42,619
-7	0	0	0	237,548	105,553	4,748	0	-12,519
-7	0	0	0	557,979	121,148	28,078	0	28,078
-7,1	0	0	0	566,555	123,128	28,7	0	28,7
-7,1	0	0	0	566,555	123,128	28,7	0	28,7
-7,2	0	0	0	575,131	125,108	29,322	0	29,322
-7,2	0	0	0	575,131	125,108	29,322	0	29,322
-7,3	0	0	0	583,706	127,088	29,943	0	29,943

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 35 / 58								
-7,3	0	0	0	583,706	127,088	29,943	0	29,943
-7,4	0	0	0	592,282	129,068	30,565	0	30,565
-7,4	0	0	0	592,282	129,068	30,565	0	30,565
-7,5	0	0	0	600,858	131,048	31,187	0	31,187
-7,5	0	0	0	600,858	131,048	31,187	0	31,187
-7,62	0	0	0	610,863	133,358	31,912	0	31,912
-7,62	0	0	0	610,863	133,358	31,912	0	31,912
-7,73	0	0	0	620,868	135,668	32,638	0	32,638
-7,73	0	0	0	620,868	135,668	32,638	0	32,638
-7,85	0	0	0	630,873	137,978	33,363	0	33,363
-7,85	0	0	0	630,873	137,978	33,363	0	33,363
-7,97	0	0	0	640,878	140,289	34,088	0	34,088
-7,97	0	0	0	640,878	140,289	34,088	0	34,088
-8,08	0	0	0	650,883	142,599	34,814	0	34,814
-8,08	0	0	0	650,883	142,599	34,814	0	34,814
-8,2	0	0	0	660,887	144,909	35,539	0	35,539
-8,2	0	0	0	660,887	144,909	35,539	0	35,539
-8,32	0	0	0	670,892	147,219	36,264	0	36,264
-8,32	0	0	0	670,892	147,219	36,264	0	36,264
-8,43	0	0	0	680,897	149,529	36,99	0	36,99
-8,43	0	0	0	680,897	149,529	36,99	0	36,99
-8,55	0	0	0	690,902	151,839	37,715	0	37,715
-8,55	0	0	0	690,902	151,839	37,715	0	37,715
-8,67	0	0	0	700,907	154,149	38,44	0	38,44
-8,67	0	0	0	700,907	154,149	38,44	0	38,44
-8,78	0	0	0	710,912	156,459	39,166	0	39,166
-8,78	0	0	0	710,912	156,459	39,166	0	39,166
-8,9	0	0	0	720,917	158,769	39,891	0	39,891
-8,9	0	0	0	720,917	158,769	39,891	0	39,891
-9,02	0	0	0	730,922	161,079	40,617	0	40,617
-9,02	0	0	0	730,922	161,079	40,617	0	40,617
-9,13	0	0	0	740,927	163,389	41,342	0	41,342
-9,13	0	0	0	740,927	163,389	41,342	0	41,342
-9,25	0	0	0	750,932	165,699	42,067	0	42,067
-9,25	0	0	0	750,932	165,699	42,067	0	42,067
-9,37	0	0	0	760,937	168,009	42,793	0	42,793
-9,37	0	0	0	760,937	168,009	42,793	0	42,793
-9,48	0	0	0	770,942	170,319	43,518	0	43,518
-9,48	0	0	0	770,942	170,319	43,518	0	43,518
-9,6	0	0	0	780,947	172,629	44,243	0	44,243
-9,6	0	0	0	780,947	172,629	44,243	0	44,243
-9,72	0	0	0	790,952	174,939	44,968	0	44,968
-9,72	0	0	0	790,952	174,939	44,968	0	44,968
-9,83	0	0	0	800,957	177,249	45,694	0	45,694
-9,83	0	0	0	800,957	177,249	45,694	0	45,694
-9,95	0	0	0	810,961	179,559	46,419	0	46,419
-9,95	0	0	0	810,961	179,559	46,419	0	46,419

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 36 / 58								
-10,07	0	0	0	820,966	181,869	47,144	0	47,144
-10,07	0	0	0	820,966	181,869	47,144	0	47,144
-10,18	0	0	0	830,971	184,179	47,87	0	47,87
-10,18	0	0	0	830,971	184,179	47,87	0	47,87
-10,3	0	0	0	840,976	186,489	48,595	0	48,595
-10,3	0	0	0	840,976	186,489	48,595	0	48,595
-10,42	0	0	0	850,981	188,799	49,32	0	49,32
-10,42	0	0	0	850,981	188,799	49,32	0	49,32
-10,53	0	0	0	860,986	191,109	50,046	0	50,046
-10,53	0	0	0	860,986	191,109	50,046	0	50,046
-10,65	0	0	0	870,991	193,419	50,771	0	50,771
-10,65	0	0	0	870,991	193,419	50,771	0	50,771
-10,77	0	0	0	880,996	195,729	51,496	0	51,496
-10,77	0	0	0	880,996	195,729	51,496	0	51,496
-10,88	0	0	0	891,001	198,039	52,222	0	52,222
-10,88	0	0	0	891,001	198,039	52,222	0	52,222
-11	0	0	0	901,006	200,35	52,947	0	52,947
-11	0	0	0	960,751	200,35	45,36	0	45,36
-11,1	0	0	0	969,689	202,33	45,963	0	45,963
-11,1	0	0	0	969,689	202,33	45,963	0	45,963
-11,2	0	0	0	978,626	204,31	46,566	0	46,566
-11,2	0	0	0	978,626	204,31	46,566	0	46,566
-11,3	0	0	0	987,564	206,29	47,17	0	47,17
-11,3	0	0	0	987,564	206,29	47,17	0	47,17
-11,4	0	0	0	996,501	208,27	47,773	0	47,773
-11,4	0	0	0	996,501	208,27	47,773	0	47,773
-11,5	0	0	0	1005,439	210,25	48,376	0	48,376
-11,5	0	0	0	1005,439	210,25	48,376	0	48,376
-11,62	0	0	0	1016,079	212,607	49,094	0	49,094
-11,62	0	0	0	1016,079	212,607	49,094	0	49,094
-11,74	0	0	0	1026,719	214,964	49,813	0	49,813
-11,74	0	0	0	1026,719	214,964	49,813	0	49,813
-11,86	0	0	0	1037,359	217,321	50,531	0	50,531
-11,86	0	0	0	1037,359	217,321	50,531	0	50,531
-11,98	0	0	0	1047,998	219,678	51,249	0	51,249
-11,98	0	0	0	1047,998	219,678	51,249	0	51,249
-12,1	0	0	0	1058,638	222,035	51,967	0	51,967
-12,1	0	0	0	1058,638	222,035	51,967	0	51,967
-12,21	0	0	0	1069,278	224,393	52,686	0	52,686
-12,21	0	0	0	1069,278	224,393	52,686	0	52,686
-12,33	0	0	0	1079,918	226,75	53,404	0	53,404
-12,33	0	0	0	1079,918	226,75	53,404	0	53,404
-12,45	0	0	0	1090,558	229,107	54,122	0	54,122
-12,45	0	0	0	1090,558	229,107	54,122	0	54,122
-12,57	0	0	0	1101,198	231,464	54,84	0	54,84
-12,57	0	0	0	1101,198	231,464	54,84	0	54,84
-12,69	0	0	0	1111,838	233,821	55,558	0	55,558

Downtown Excavation Support System									
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 37 / 58									
-12,69	0	0	0	1111,838	233,821	55,558	0	55,558	
-12,81	0	0	0	1122,478	236,178	56,277	0	56,277	
-12,81	0	0	0	1122,478	236,178	56,277	0	56,277	
-12,93	0	0	0	1133,118	238,535	56,995	0	56,995	
-12,93	0	0	0	1133,118	238,535	56,995	0	56,995	
-13,05	0	0	0	1143,758	240,893	57,713	0	57,713	
-13,05	0	0	0	1143,758	240,893	57,713	0	57,713	
-13,17	0	0	0	1154,398	243,25	58,431	0	58,431	
-13,17	0	0	0	1154,398	243,25	58,431	0	58,431	
-13,29	0	0	0	1165,038	245,607	59,15	0	59,15	
-13,29	0	0	0	1165,038	245,607	59,15	0	59,15	
-13,4	0	0	0	1175,677	247,964	59,868	0	59,868	
-13,4	0	0	0	1175,677	247,964	59,868	0	59,868	
-13,52	0	0	0	1186,317	250,321	60,586	0	60,586	
-13,52	0	0	0	1186,317	250,321	60,586	0	60,586	
-13,64	0	0	0	1196,957	252,678	61,304	0	61,304	
-13,64	0	0	0	1196,957	252,678	61,304	0	61,304	
-13,76	0	0	0	1207,597	255,035	62,022	0	62,022	
-13,76	0	0	0	1207,597	255,035	62,022	0	62,022	
-13,88	0	0	0	1218,237	257,393	62,741	0	62,741	
-13,88	0	0	0	1218,237	257,393	62,741	0	62,741	
-14	0	0	0	1228,877	259,75	63,459	0	63,459	
-14	0	0	0	1228,877	259,75	63,459	0	63,459	
-14,12	-13,647	-2,318	0	1239,34	262,068	64,165	-13,647	64,165	
-14,12	-13,647	-2,318	0	1239,34	262,068	64,165	-13,647	64,165	
-14,23	-27,294	-4,636	0	1249,804	264,386	64,871	-27,294	64,871	
-14,23	-27,294	-4,636	0	1249,804	264,386	64,871	-27,294	64,871	
-14,35	-40,941	-6,954	0	1260,267	266,704	65,578	-40,941	65,578	
-14,35	-40,941	-6,954	0	1260,267	266,704	65,578	-40,941	65,578	
-14,47	-54,588	-9,272	0	1270,731	269,022	66,284	-54,588	66,284	
-14,47	-54,588	-9,272	0	1270,731	269,022	66,284	-54,588	66,284	
-14,59	-68,235	-11,59	0	1281,194	271,34	66,99	-68,235	66,99	
-14,59	-68,235	-11,59	0	1281,194	271,34	66,99	-68,235	66,99	
-14,7	-81,882	-13,908	0	1291,658	273,658	67,697	-81,882	67,697	
-14,7	-81,882	-13,908	0	1291,658	273,658	67,697	-81,882	67,697	
-14,82	-95,529	-16,226	0	1302,121	275,976	68,403	-95,529	72,213	
-14,82	-95,529	-16,226	0	1302,121	275,976	68,403	-95,529	72,213	
-14,94	-109,176	-18,544	0	1312,585	278,294	69,109	-109,176	78,463	
-14,94	-109,176	-18,544	0	1312,585	278,294	69,109	-109,176	78,463	
-15,05	-122,823	-20,862	0	1323,048	280,612	69,815	-122,823	84,705	
-15,05	-122,823	-20,862	0	1323,048	280,612	69,815	-122,823	84,705	
-15,17	-136,469	-23,18	0	1333,511	282,93	70,522	-136,469	90,926	
-15,17	-136,469	-23,18	0	1333,511	282,93	70,522	-136,469	90,926	
-15,29	-150,116	-25,499	0	1343,975	285,248	71,228	-150,116	97,113	
-15,29	-150,116	-25,499	0	1343,975	285,248	71,228	-150,116	97,113	
-15,4	-163,763	-27,817	0	1354,438	287,566	71,934	-163,763	103,255	
-15,4	-163,763	-27,817	0	1354,438	287,566	71,934	-163,763	103,255	

Downtown Excavation Support System									
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 38 / 58									
-15,52	-177,41	-30,135	0	1364,902	289,884	72,641	-177,41	109,341	
-15,52	-177,41	-30,135	0	1364,902	289,884	72,641	-177,41	109,341	
-15,64	-191,057	-32,453	0	1375,365	292,203	73,347	-191,057	115,363	
-15,64	-191,057	-32,453	0	1375,365	292,203	73,347	-191,057	115,363	
-15,76	-204,704	-34,771	0	1385,829	294,521	74,053	-204,704	121,311	
-15,76	-204,704	-34,771	0	1385,829	294,521	74,053	-204,704	121,311	
-15,87	-218,351	-37,089	0	1396,292	296,839	74,76	-206,746	127,181	
-15,87	-218,351	-37,089	0	1396,292	296,839	74,76	-206,746	127,181	
-15,99	-231,998	-39,407	0	1406,756	299,157	75,466	-205,595	132,968	
-15,99	-231,998	-39,407	0	1406,756	299,157	75,466	-205,595	132,968	
-16,11	-245,645	-41,725	0	1417,219	301,475	76,172	-204,53	138,669	
-16,11	-245,645	-41,725	0	1417,219	301,475	76,172	-204,53	138,669	
-16,22	-259,292	-44,043	0	1427,682	303,793	76,878	-203,552	144,283	
-16,22	-259,292	-44,043	0	1427,682	303,793	76,878	-203,552	144,283	
-16,34	-272,939	-46,361	0	1438,146	306,111	77,585	-202,662	149,81	
-16,34	-272,939	-46,361	0	1438,146	306,111	77,585	-202,662	149,81	
-16,46	-286,586	-48,679	0	1448,609	308,429	78,291	-201,858	155,25	
-16,46	-286,586	-48,679	0	1448,609	308,429	78,291	-201,858	155,25	
-16,58	-300,233	-50,997	0	1459,073	310,747	78,997	-201,138	160,606	
-16,58	-300,233	-50,997	0	1459,073	310,747	78,997	-201,138	160,606	
-16,69	-313,88	-53,315	0	1469,536	313,065	79,704	-200,499	165,881	
-16,69	-313,88	-53,315	0	1469,536	313,065	79,704	-200,499	165,881	
-16,81	-327,527	-55,633	0	1480	315,383	80,41	-199,938	171,078	
-16,81	-327,527	-55,633	0	1480	315,383	80,41	-199,938	171,078	
-16,93	-341,174	-57,951	0	1490,463	317,701	81,116	-199,45	176,202	
-16,93	-341,174	-57,951	0	1490,463	317,701	81,116	-199,45	176,202	
-17,04	-354,821	-60,269	0	1500,927	320,019	81,822	-199,03	181,258	
-17,04	-354,821	-60,269	0	1500,927	320,019	81,822	-199,03	181,258	
-17,16	-355,596	-62,587	-0,082	1511,39	322,337	82,529	-198,673	186,252	
-17,16	-355,596	-62,587	-0,082	1511,39	322,337	82,529	-198,673	186,252	
-17,28	-366,059	-64,905	-0,789	1521,853	324,655	83,235	-198,372	191,188	
-17,28	-366,059	-64,905	-0,789	1521,853	324,655	83,235	-198,372	191,188	
-17,4	-376,523	-67,223	-1,495	1532,317	326,973	83,941	-198,123	196,073	
-17,4	-376,523	-67,223	-1,495	1532,317	326,973	83,941	-198,123	196,073	
-17,51	-386,986	-69,541	-2,201	1542,78	329,291	84,648	-197,919	200,914	
-17,51	-386,986	-69,541	-2,201	1542,78	329,291	84,648	-197,919	200,914	
-17,63	-397,45	-71,86	-2,907	1553,244	331,609	85,354	-197,754	205,715	
-17,63	-397,45	-71,86	-2,907	1553,244	331,609	85,354	-197,754	205,715	
-17,75	-407,913	-74,178	-3,614	1563,707	333,927	86,06	-197,622	210,483	
-17,75	-407,913	-74,178	-3,614	1563,707	333,927	86,06	-197,622	210,483	
-17,86	-418,376	-76,496	-4,32	1574,171	336,246	86,767	-197,517	215,225	
-17,86	-418,376	-76,496	-4,32	1574,171	336,246	86,767	-197,517	215,225	
-17,98	-428,84	-78,814	-5,026	1584,634	338,564	87,473	-197,433	219,944	
-17,98	-428,84	-78,814	-5,026	1584,634	338,564	87,473	-197,433	219,944	
-18,1	-439,303	-81,132	-5,733	1595,098	340,882	88,179	-197,366	224,647	
-18,1	-439,303	-81,132	-5,733	1595,098	340,882	88,179	-197,366	224,647	
-18,21	-449,767	-83,45	-6,439	1605,561	343,2	88,885	-197,311	229,338	

Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 39 / 58								
-18,21	-449,767	-83,45	-6,439	1605,561	343,2	88,885	-197,311	229,338
-18,33	-460,23	-85,768	-7,145	1616,024	345,518	89,592	-197,263	234,022
-18,33	-460,23	-85,768	-7,145	1616,024	345,518	89,592	-197,263	234,022
-18,45	-470,694	-88,086	-7,851	1626,488	347,836	90,298	-197,22	238,701
-18,45	-470,694	-88,086	-7,851	1626,488	347,836	90,298	-197,22	238,701
-18,57	-481,157	-90,404	-8,558	1636,951	350,154	91,004	-197,179	243,379
-18,57	-481,157	-90,404	-8,558	1636,951	350,154	91,004	-197,179	243,379
-18,68	-491,62	-92,722	-9,264	1647,415	352,472	91,711	-197,138	248,056
-18,68	-491,62	-92,722	-9,264	1647,415	352,472	91,711	-197,138	248,056
-18,8	-502,084	-95,04	-9,97	1657,878	354,79	92,417	-197,096	252,734

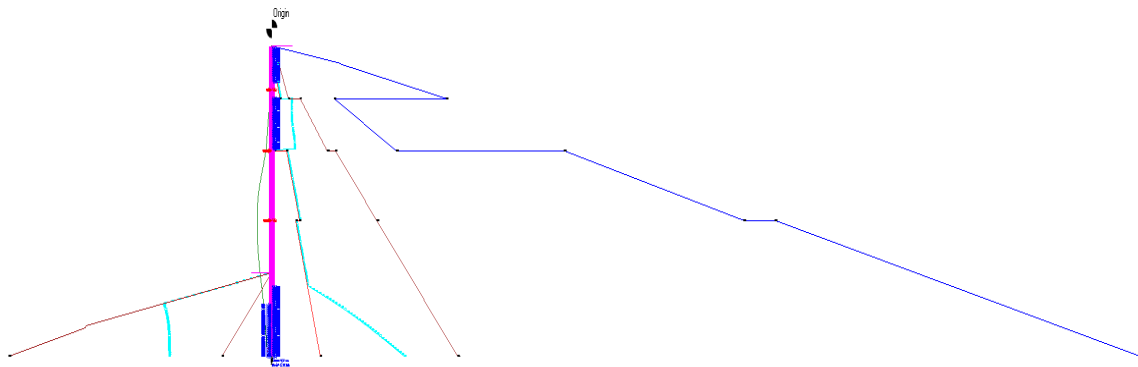


Figure 12. Earth Pressures (Final Excavation)

SUBGRADE MODULI and ANALYSIS RESULTS (Final Excavation)

z:

Depth

khf: Modulus of subgrade reaction in front of the wall

khb: Modulus of subgrade reaction behind the wall

Ux: Wall horizontal displacement

σ_w : Net displacement-dependent pressure acting on the wall

N: Normal force

M: Bending moment

V: Shear force

Table 25. Subgrade Moduli and Analysis Results (Final Excavation)

z [m]	khf [kN/m ³]	khb [kN/m ³]	Ux [mm]	σ_w [kN/m ²]	N [kN/m]	Mz [kN.m/m]	Vx [kN/m]
-1	0	0	-0,066	0	-1,145	0	0
-1,12	0	25852,893	-0,071	3,51	-1,145	-0,008	-0,209
-1,12	0	25852,893	-0,071	3,51	-2,289	-0,008	0,022
-1,24	0	25852,893	-0,076	5,101	-2,289	-0,034	-0,49
-1,24	0	25852,893	-0,076	5,101	-3,434	-0,034	-0,284
-1,36	0	25852,893	-0,081	6,351	-3,434	-0,107	-0,966
-1,36	0	25852,893	-0,081	6,351	-4,579	-0,107	-0,786
-1,48	0	25852,893	-0,086	7,401	-4,579	-0,248	-1,605
-1,48	0	25852,893	-0,086	7,401	-5,724	-0,248	-1,45
-1,6	0	25852,893	-0,092	8,317	-5,724	-0,475	-2,385
-1,6	0	25852,893	-0,092	8,317	-6,868	-0,475	-2,256
-1,71	0	25852,893	-0,098	9,133	-6,868	-0,805	-3,295
-1,71	0	25852,893	-0,098	9,133	-8,013	-0,805	-3,191
-1,83	0	25852,893	-0,106	9,864	-8,013	-1,251	-4,322
-1,83	0	25852,893	-0,106	9,864	-9,158	-1,251	-4,243
-1,95	0	25852,893	-0,115	10,514	-9,158	-1,828	-5,456
-1,95	0	25852,893	-0,115	10,514	-10,302	-1,828	-5,403
-2,07	0	25852,893	-0,127	11,08	-10,302	-2,547	-6,688
-2,07	0	25852,893	-0,127	11,08	-11,447	-2,547	-6,659
-2,19	0	25852,893	-0,142	11,552	-11,447	-3,419	-8,007
-2,19	0	25852,893	-0,142	11,552	-12,592	-3,419	-8,003
-2,31	0	25852,893	-0,161	11,916	-12,592	-4,455	-9,4
-2,31	0	25852,893	-0,161	11,916	-13,736	-4,455	-9,42
-2,43	0	25852,893	-0,185	12,154	-13,736	-5,661	-10,853
-2,43	0	25852,893	-0,185	12,154	-14,881	-5,661	-10,898
-2,55	0	25852,893	-0,214	12,245	-14,881	-7,045	-12,35
-2,55	0	25852,893	-0,214	12,245	-16,026	-7,045	-12,417
-2,67	0	25852,893	-0,25	12,164	-16,026	-8,61	-13,87
-2,67	0	25852,893	-0,25	12,164	-17,171	-8,61	-13,96
-2,79	0	25852,893	-0,294	11,886	-17,171	-10,357	-15,392
-2,79	0	25852,893	-0,294	11,886	-18,315	-10,357	-15,504
-2,9	0	25852,893	-0,346	11,38	-18,315	-12,286	-16,889
-2,9	0	25852,893	-0,346	11,38	-19,46	-12,286	-17,021
-3,02	0	25852,893	-0,41	10,614	-19,46	-14,391	-18,33
-3,02	0	25852,893	-0,41	10,614	-20,605	-14,391	-18,481
-3,14	0	0	-0,485	10,578	-20,605	-16,666	-19,743
-3,14	0	0	-0,485	10,578	-21,749	-16,666	-19,743

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 41 / 58							
-3,26	0	0	-0,574	11,194	-21,749	-19,093	-21,039
-3,26	0	0	-0,574	11,194	-22,894	-19,093	-21,039
-3,38	0	0	-0,679	11,809	-22,894	-21,678	-22,408
-3,38	0	0	-0,679	11,809	-24,039	-21,678	-22,408
-3,5	0	0	-0,8	12,422	-24,039	-24,431	-23,85
-3,5	0	0	-0,8	12,422	-41,36	-24,431	34,924
-3,6	0	0	-0,917	12,938	-41,36	-21,002	33,656
-3,6	0	0	-0,917	12,938	-42,504	-21,002	33,656
-3,7	0	0	-1,044	13,452	-42,504	-17,702	32,336
-3,7	0	0	-1,044	13,452	-43,649	-17,702	32,336
-3,8	0	0	-1,182	13,967	-43,649	-14,536	30,965
-3,8	0	0	-1,182	13,967	-44,794	-14,536	30,965
-3,9	0	0	-1,327	14,481	-44,794	-11,51	29,543
-3,9	0	0	-1,327	14,481	-45,939	-11,51	29,543
-4	0	11030,727	-1,479	14,995	-45,939	-8,629	28,069
-4	0	11030,727	-1,479	36,753	-47,083	-8,629	27,977
-4,12	0	11030,727	-1,666	36,734	-47,083	-5,537	23,568
-4,12	0	11030,727	-1,666	36,734	-48,228	-5,537	23,466
-4,24	0	11030,727	-1,858	36,675	-48,228	-2,985	19,061
-4,24	0	11030,727	-1,858	36,675	-49,373	-2,985	18,959
-4,36	0	11030,727	-2,05	36,6	-49,373	-0,974	14,563
-4,36	0	11030,727	-2,05	36,6	-50,517	-0,974	14,46
-4,48	0	11030,727	-2,243	36,53	-50,517	0,498	10,072
-4,48	0	11030,727	-2,243	36,53	-51,662	0,498	9,968
-4,6	0	11030,727	-2,433	36,483	-51,662	1,431	5,588
-4,6	0	11030,727	-2,433	36,483	-52,807	1,431	5,484
-4,72	0	11030,727	-2,62	36,474	-52,807	1,827	1,106
-4,72	0	11030,727	-2,62	36,474	-53,952	1,827	1,001
-4,84	0	11030,727	-2,802	36,516	-53,952	1,684	-3,378
-4,84	0	11030,727	-2,802	36,516	-55,096	1,684	-3,483
-4,96	0	11030,727	-2,979	36,618	-55,096	1,003	-7,871
-4,96	0	11030,727	-2,979	36,618	-56,241	1,003	-7,978
-5,08	0	11030,727	-3,15	36,785	-56,241	-0,218	-12,382
-5,08	0	11030,727	-3,15	36,785	-57,386	-0,218	-12,489
-5,2	0	11030,727	-3,314	37,022	-57,386	-1,983	-16,917
-5,2	0	11030,727	-3,314	37,022	-58,53	-1,983	-17,025
-5,32	0	11030,727	-3,472	37,329	-58,53	-4,293	-21,486
-5,32	0	11030,727	-3,472	37,329	-59,675	-4,293	-21,595
-5,44	0	11030,727	-3,624	37,705	-59,675	-7,154	-26,097
-5,44	0	11030,727	-3,624	37,705	-60,82	-7,154	-26,206
-5,56	0	11030,727	-3,771	38,144	-60,82	-10,571	-30,757
-5,56	0	11030,727	-3,771	38,144	-61,965	-10,571	-30,866
-5,68	0	11030,727	-3,913	38,639	-61,965	-14,551	-35,473
-5,68	0	11030,727	-3,913	38,639	-63,109	-14,551	-35,582
-5,8	0	11030,727	-4,051	39,179	-63,109	-19,1	-40,251
-5,8	0	11030,727	-4,051	39,179	-64,254	-19,1	-40,359
-5,92	0	11030,727	-4,188	39,75	-64,254	-24,227	-45,095

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 42 / 58							
-5,92	0	11030,727	-4,188	39,75	-65,399	-24,227	-45,201
-6,04	0	11030,727	-4,324	40,335	-65,399	-29,939	-50,006
-6,04	0	11030,727	-4,324	40,335	-66,543	-29,939	-50,109
-6,16	0	11030,727	-4,462	40,914	-66,543	-36,244	-54,984
-6,16	0	11030,727	-4,462	40,914	-67,688	-36,244	-55,083
-6,28	0	11030,727	-4,605	41,462	-67,688	-43,149	-60,025
-6,28	0	11030,727	-4,605	41,462	-68,833	-43,149	-60,118
-6,4	0	11030,727	-4,755	41,951	-68,833	-50,663	-65,123
-6,4	0	11030,727	-4,755	41,951	-69,977	-50,663	-65,207
-6,52	0	11030,727	-4,915	42,349	-69,977	-58,791	-70,265
-6,52	0	11030,727	-4,915	42,349	-71,122	-58,791	-70,338
-6,64	0	11030,727	-5,089	42,621	-71,122	-67,537	-75,437
-6,64	0	11030,727	-5,089	42,621	-72,267	-67,537	-75,497
-6,76	0	11030,727	-5,282	42,726	-72,267	-76,904	-80,618
-6,76	0	11030,727	-5,282	42,726	-73,412	-76,904	-80,661
-6,88	0	11030,727	-5,497	42,619	-73,412	-86,891	-85,782
-6,88	0	11030,727	-5,497	42,619	-74,556	-86,891	-85,806
-7	0	0	-5,739	-12,519	-74,556	-97,362	-87,612
-7	0	0	-5,739	28,078	-75,701	-97,362	95,927
-7,1	0	0	-5,965	28,7	-75,701	-87,911	93,088
-7,1	0	0	-5,965	28,7	-76,846	-87,911	93,088
-7,2	0	0	-6,211	29,322	-76,846	-78,746	90,187
-7,2	0	0	-6,211	29,322	-77,99	-78,746	90,187
-7,3	0	0	-6,474	29,943	-77,99	-69,875	87,223
-7,3	0	0	-6,474	29,943	-79,135	-69,875	87,223
-7,4	0	0	-6,753	30,565	-79,135	-61,304	84,198
-7,4	0	0	-6,753	30,565	-80,28	-61,304	84,198
-7,5	0	0	-7,043	31,187	-80,28	-53,038	81,11
-7,5	0	0	-7,043	31,187	-81,425	-53,038	81,11
-7,62	0	0	-7,395	31,912	-81,425	-43,789	77,43
-7,62	0	0	-7,395	31,912	-82,569	-43,789	77,43
-7,73	0	0	-7,758	32,638	-82,569	-34,974	73,664
-7,73	0	0	-7,758	32,638	-83,714	-34,974	73,664
-7,85	0	0	-8,128	33,363	-83,714	-26,604	69,814
-7,85	0	0	-8,128	33,363	-84,859	-26,604	69,814
-7,97	0	0	-8,502	34,088	-84,859	-18,688	65,879
-7,97	0	0	-8,502	34,088	-86,003	-18,688	65,879
-8,08	0	0	-8,878	34,814	-86,003	-11,235	61,86
-8,08	0	0	-8,878	34,814	-87,148	-11,235	61,86
-8,2	0	0	-9,253	35,539	-87,148	-4,257	57,756
-8,2	0	0	-9,253	35,539	-88,293	-4,257	57,756
-8,32	0	0	-9,625	36,264	-88,293	2,238	53,568
-8,32	0	0	-9,625	36,264	-89,438	2,238	53,568
-8,43	0	0	-9,991	36,99	-89,438	8,239	49,295
-8,43	0	0	-9,991	36,99	-90,582	8,239	49,295
-8,55	0	0	-10,349	37,715	-90,582	13,737	44,937
-8,55	0	0	-10,349	37,715	-91,727	13,737	44,937

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 43 / 58							
-8,67	0	0	-10,698	38,44	-91,727	18,721	40,494
-8,67	0	0	-10,698	38,44	-92,872	18,721	40,494
-8,78	0	0	-11,034	39,166	-92,872	23,182	35,967
-8,78	0	0	-11,034	39,166	-94,016	23,182	35,967
-8,9	0	0	-11,357	39,891	-94,016	27,11	31,356
-8,9	0	0	-11,357	39,891	-95,161	27,11	31,356
-9,02	0	0	-11,664	40,617	-95,161	30,495	26,659
-9,02	0	0	-11,664	40,617	-96,306	30,495	26,659
-9,13	0	0	-11,954	41,342	-96,306	33,327	21,878
-9,13	0	0	-11,954	41,342	-97,45	33,327	21,878
-9,25	0	0	-12,226	42,067	-97,45	35,597	17,013
-9,25	0	0	-12,226	42,067	-98,595	35,597	17,013
-9,37	0	0	-12,48	42,793	-98,595	37,294	12,063
-9,37	0	0	-12,48	42,793	-99,74	37,294	12,063
-9,48	0	0	-12,713	43,518	-99,74	38,408	7,028
-9,48	0	0	-12,713	43,518	-100,885	38,408	7,028
-9,6	0	0	-12,925	44,243	-100,885	38,93	1,909
-9,6	0	0	-12,925	44,243	-102,029	38,93	1,909
-9,72	0	0	-13,116	44,968	-102,029	38,85	-3,295
-9,72	0	0	-13,116	44,968	-103,174	38,85	-3,295
-9,83	0	0	-13,286	45,694	-103,174	38,158	-8,584
-9,83	0	0	-13,286	45,694	-104,319	38,158	-8,584
-9,95	0	0	-13,435	46,419	-104,319	36,844	-13,957
-9,95	0	0	-13,435	46,419	-105,463	36,844	-13,957
-10,07	0	0	-13,563	47,144	-105,463	34,898	-19,415
-10,07	0	0	-13,563	47,144	-106,608	34,898	-19,415
-10,18	0	0	-13,671	47,87	-106,608	32,31	-24,958
-10,18	0	0	-13,671	47,87	-107,753	32,31	-24,958
-10,3	0	0	-13,759	48,595	-107,753	29,071	-30,585
-10,3	0	0	-13,759	48,595	-108,898	29,071	-30,585
-10,42	0	0	-13,83	49,32	-108,898	25,171	-36,296
-10,42	0	0	-13,83	49,32	-110,042	25,171	-36,296
-10,53	0	0	-13,884	50,046	-110,042	20,599	-42,093
-10,53	0	0	-13,884	50,046	-111,187	20,599	-42,093
-10,65	0	0	-13,923	50,771	-111,187	15,346	-47,974
-10,65	0	0	-13,923	50,771	-112,332	15,346	-47,974
-10,77	0	0	-13,95	51,496	-112,332	9,402	-53,939
-10,77	0	0	-13,95	51,496	-113,476	9,402	-53,939
-10,88	0	0	-13,966	52,222	-113,476	2,757	-59,99
-10,88	0	0	-13,966	52,222	-114,621	2,757	-59,99
-11	0	0	-13,975	52,947	-114,621	-4,599	-66,124
-11	0	0	-13,975	45,36	-193,891	-4,599	95,519
-11,1	0	0	-13,979	45,963	-193,891	4,725	90,953
-11,1	0	0	-13,979	45,963	-195,036	4,725	90,953
-11,2	0	0	-13,979	46,566	-195,036	13,589	86,326
-11,2	0	0	-13,979	46,566	-196,18	13,589	86,326
-11,3	0	0	-13,974	47,17	-196,18	21,988	81,639

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 44 / 58							
-11,3	0	0	-13,974	47,17	-197,325	21,988	81,639
-11,4	0	0	-13,962	47,773	-197,325	29,915	76,892
-11,4	0	0	-13,962	47,773	-198,47	29,915	76,892
-11,5	0	0	-13,945	48,376	-198,47	37,365	72,085
-11,5	0	0	-13,945	48,376	-199,614	37,365	72,085
-11,62	0	0	-13,914	49,094	-199,614	45,602	66,283
-11,62	0	0	-13,914	49,094	-200,759	45,602	66,283
-11,74	0	0	-13,872	49,813	-200,759	53,143	60,396
-11,74	0	0	-13,872	49,813	-201,904	53,143	60,396
-11,86	0	0	-13,82	50,531	-201,904	59,978	54,423
-11,86	0	0	-13,82	50,531	-203,048	59,978	54,423
-11,98	0	0	-13,756	51,249	-203,048	66,097	48,364
-11,98	0	0	-13,756	51,249	-204,193	66,097	48,364
-12,1	0	0	-13,681	51,967	-204,193	71,49	42,221
-12,1	0	0	-13,681	51,967	-205,338	71,49	42,221
-12,21	0	0	-13,595	52,686	-205,338	76,146	35,991
-12,21	0	0	-13,595	52,686	-206,483	76,146	35,991
-12,33	0	0	-13,498	53,404	-206,483	80,056	29,676
-12,33	0	0	-13,498	53,404	-207,627	80,056	29,676
-12,45	0	0	-13,392	54,122	-207,627	83,209	23,276
-12,45	0	0	-13,392	54,122	-208,772	83,209	23,276
-12,57	0	0	-13,275	54,84	-208,772	85,595	16,79
-12,57	0	0	-13,275	54,84	-209,917	85,595	16,79
-12,69	0	0	-13,149	55,558	-209,917	87,203	10,219
-12,69	0	0	-13,149	55,558	-211,061	87,203	10,219
-12,81	0	0	-13,014	56,277	-211,061	88,024	3,562
-12,81	0	0	-13,014	56,277	-212,206	88,024	3,562
-12,93	0	0	-12,87	56,995	-212,206	88,048	-3,18
-12,93	0	0	-12,87	56,995	-213,351	88,048	-3,18
-13,05	0	0	-12,718	57,713	-213,351	87,264	-10,008
-13,05	0	0	-12,718	57,713	-214,496	87,264	-10,008
-13,17	0	0	-12,557	58,431	-214,496	85,661	-16,922
-13,17	0	0	-12,557	58,431	-215,64	85,661	-16,922
-13,29	0	0	-12,389	59,15	-215,64	83,231	-23,92
-13,29	0	0	-12,389	59,15	-216,785	83,231	-23,92
-13,4	0	0	-12,213	59,868	-216,785	79,963	-31,005
-13,4	0	0	-12,213	59,868	-217,93	79,963	-31,005
-13,52	0	0	-12,03	60,586	-217,93	75,846	-38,175
-13,52	0	0	-12,03	60,586	-219,074	75,846	-38,175
-13,64	0	0	-11,839	61,304	-219,074	70,87	-45,43
-13,64	0	0	-11,839	61,304	-220,219	70,87	-45,43
-13,76	0	0	-11,641	62,022	-220,219	65,026	-52,771
-13,76	0	0	-11,641	62,022	-221,364	65,026	-52,771
-13,88	0	0	-11,436	62,741	-221,364	58,302	-60,197
-13,88	0	0	-11,436	62,741	-222,509	58,302	-60,197
-14	0	0	-11,226	63,459	-222,509	50,69	-67,709
-14	0	0	-11,226	63,459	-223,653	50,69	-67,709

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 45 / 58							
-14,12	0	0	-11,013	50,518	-223,653	42,357	-74,381
-14,12	0	0	-11,013	50,518	-224,798	42,357	-74,381
-14,23	0	0	-10,795	37,577	-224,798	33,333	-79,538
-14,23	0	0	-10,795	37,577	-225,943	33,333	-79,538
-14,35	0	0	-10,573	24,637	-225,943	23,793	-83,179
-14,35	0	0	-10,573	24,637	-227,087	23,793	-83,179
-14,47	0	0	-10,348	11,696	-227,087	13,916	-85,306
-14,47	0	0	-10,348	11,696	-228,232	13,916	-85,306
-14,59	0	0	-10,12	-1,244	-228,232	3,878	-85,918
-14,59	0	0	-10,12	-1,244	-229,377	3,878	-85,918
-14,7	0	0	-9,891	-14,185	-229,377	-6,143	-85,015
-14,7	0	0	-9,891	-14,185	-230,521	-6,143	-85,015
-14,82	0	22350,612	-9,661	-23,316	-230,521	-15,977	-82,82
-14,82	0	22350,612	-9,661	-23,316	-231,666	-15,977	-81,663
-14,94	0	22350,612	-9,431	-30,712	-231,666	-25,361	-78,501
-14,94	0	22350,612	-9,431	-30,712	-232,811	-25,361	-77,458
-15,05	0	22350,612	-9,203	-38,117	-232,811	-34,202	-73,429
-15,05	0	22350,612	-9,203	-38,117	-233,956	-34,202	-72,497
-15,17	0	22350,612	-8,978	-45,543	-233,956	-42,411	-67,6
-15,17	0	22350,612	-8,978	-45,543	-235,1	-42,411	-66,777
-15,29	0	22350,612	-8,755	-53,003	-235,1	-49,9	-61,009
-15,29	0	22350,612	-8,755	-53,003	-236,245	-49,9	-60,291
-15,4	0	22350,612	-8,537	-60,508	-236,245	-56,578	-53,646
-15,4	0	22350,612	-8,537	-60,508	-237,39	-56,578	-53,028
-15,52	0	22350,612	-8,324	-68,069	-237,39	-62,354	-45,502
-15,52	0	22350,612	-8,324	-68,069	-238,534	-62,354	-44,979
-15,64	0	22350,612	-8,116	-75,695	-238,534	-67,136	-36,564
-15,64	0	22350,612	-8,116	-75,695	-239,679	-67,136	-36,131
-15,76	0	22350,612	-7,914	-83,393	-239,679	-70,83	-26,819
-15,76	0	22350,612	-7,914	-83,393	-240,824	-70,83	-26,47
-15,87	22350,612	22350,612	-7,718	-79,565	-240,824	-73,366	-16,931
-15,87	22350,612	22350,612	-7,718	-79,565	-241,969	-73,366	-16,388
-15,99	22350,612	22350,612	-7,53	-72,627	-241,969	-74,755	-7,48
-15,99	22350,612	22350,612	-7,53	-72,627	-243,113	-74,755	-7,079
-16,11	22350,612	22350,612	-7,348	-65,861	-243,113	-75,102	1,027
-16,11	22350,612	22350,612	-7,348	-65,861	-244,258	-75,102	1,299
-16,22	22350,612	22350,612	-7,173	-59,269	-244,258	-74,514	8,623
-16,22	22350,612	22350,612	-7,173	-59,269	-245,403	-74,514	8,779
-16,34	22350,612	22350,612	-7,006	-52,852	-245,403	-73,094	15,342
-16,34	22350,612	22350,612	-7,006	-52,852	-246,547	-73,094	15,396
-16,46	22350,612	22350,612	-6,845	-46,608	-246,547	-70,944	21,218
-16,46	22350,612	22350,612	-6,845	-46,608	-247,692	-70,944	21,182
-16,58	22350,612	22350,612	-6,691	-40,532	-247,692	-68,159	26,283
-16,58	22350,612	22350,612	-6,691	-40,532	-248,837	-68,159	26,17
-16,69	22350,612	22350,612	-6,543	-34,619	-248,837	-64,831	30,569
-16,69	22350,612	22350,612	-6,543	-34,619	-249,982	-64,831	30,391
-16,81	22350,612	22350,612	-6,402	-28,86	-249,982	-61,048	34,107

Downtown Excavation Support System							
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 46 / 58							
-16,81	22350,612	22350,612	-6,402	-28,86	-251,126	-61,048	33,876
-16,93	22350,612	22350,612	-6,267	-23,248	-251,126	-56,897	36,927
-16,93	22350,612	22350,612	-6,267	-23,248	-252,271	-56,897	36,653
-17,04	22350,612	22350,612	-6,136	-17,771	-252,271	-52,46	39,054
-17,04	22350,612	22350,612	-6,136	-17,771	-253,416	-52,46	38,748
-17,16	22350,612	22350,612	-6,011	-12,421	-253,416	-47,814	40,516
-17,16	22350,612	22350,612	-6,011	-12,421	-254,56	-47,814	40,187
-17,28	22350,612	22350,612	-5,891	-7,184	-254,56	-43,036	41,334
-17,28	22350,612	22350,612	-5,891	-7,184	-255,705	-43,036	40,991
-17,4	22350,612	22350,612	-5,774	-2,05	-255,705	-38,199	41,532
-17,4	22350,612	22350,612	-5,774	-2,05	-256,85	-38,199	41,181
-17,51	22350,612	22350,612	-5,661	2,995	-256,85	-33,375	41,126
-17,51	22350,612	22350,612	-5,661	2,995	-257,994	-33,375	40,775
-17,63	22350,612	22350,612	-5,552	7,961	-257,994	-28,634	40,134
-17,63	22350,612	22350,612	-5,552	7,961	-259,139	-28,634	39,789
-17,75	22350,612	22350,612	-5,444	12,862	-259,139	-24,041	38,57
-17,75	22350,612	22350,612	-5,444	12,862	-260,284	-24,041	38,236
-17,86	22350,612	22350,612	-5,34	17,708	-260,284	-19,664	36,446
-17,86	22350,612	22350,612	-5,34	17,708	-261,429	-19,664	36,127
-17,98	22350,612	22350,612	-5,237	22,511	-261,429	-15,567	33,773
-17,98	22350,612	22350,612	-5,237	22,511	-262,573	-15,567	33,473
-18,1	22350,612	22350,612	-5,135	27,281	-262,573	-11,813	30,558
-18,1	22350,612	22350,612	-5,135	27,281	-263,718	-11,813	30,279
-18,21	22350,612	22350,612	-5,034	32,028	-263,718	-8,466	26,807
-18,21	22350,612	22350,612	-5,034	32,028	-264,863	-8,466	26,551
-18,33	22350,612	22350,612	-4,934	36,759	-264,863	-5,588	22,525
-18,33	22350,612	22350,612	-4,934	36,759	-266,007	-5,588	22,294
-18,45	22350,612	22350,612	-4,835	41,481	-266,007	-3,241	17,714
-18,45	22350,612	22350,612	-4,835	41,481	-267,152	-3,241	17,509
-18,57	22350,612	22350,612	-4,735	46,2	-267,152	-1,486	12,377
-18,57	22350,612	22350,612	-4,735	46,2	-268,297	-1,486	12,199
-18,68	22350,612	22350,612	-4,636	50,918	-268,297	-0,385	6,514
-18,68	22350,612	22350,612	-4,636	50,918	-269,442	-0,385	6,362
-18,8	22350,612	22350,612	-4,537	55,638	-269,442	0	0,125

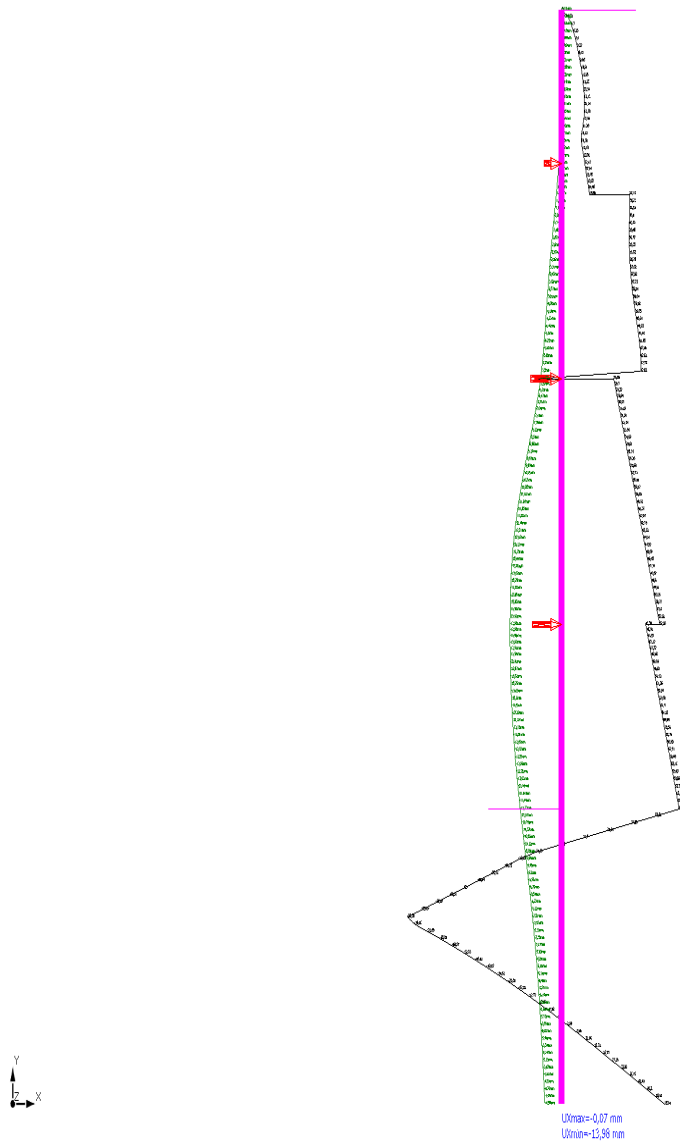


Figure 13. Displacements and Effects (Final Excavation)

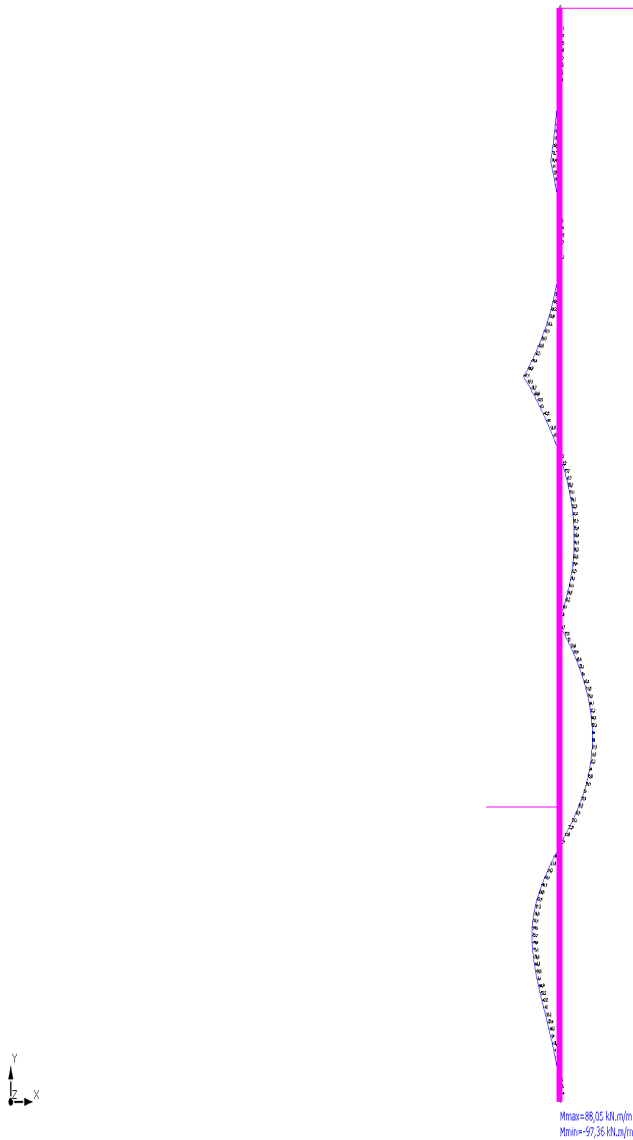


Figure 14. Moment Diagram (Final Excavation)

X: Horizontal distance to the wall
Sv: Settlement behind the wall

Table 26. Settlements Behind the Wall (Final Excavation)

X [m]	S _v [m]
0	-33,969
0,5	-32,516
0,999	-31,062
1,499	-29,605
1,999	-28,145
2,498	-26,684
2,998	-25,22
3,498	-23,755
3,997	-22,287

Downtown Excavation Support System Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 49 / 58	
4,497	-20,816
4,997	-19,344
5,496	-17,869
5,996	-16,393
6,496	-14,914
6,995	-13,432
7,495	-11,949
7,994	-10,463
8,494	-8,975
8,994	-7,485
9,493	-5,992
9,993	-4,498
10,493	-3,001
10,992	-1,501
11,492	0

WALL HORIZONTAL DISPLACEMENT VERIFICATION (Final Excavation)

$U_{x,max}$: Maximum horizontal displacement

$U_{x,lim}$: Horizontal displacement limit

H: Excavation depth

δH : Coefficient for the limit horizontal displacement

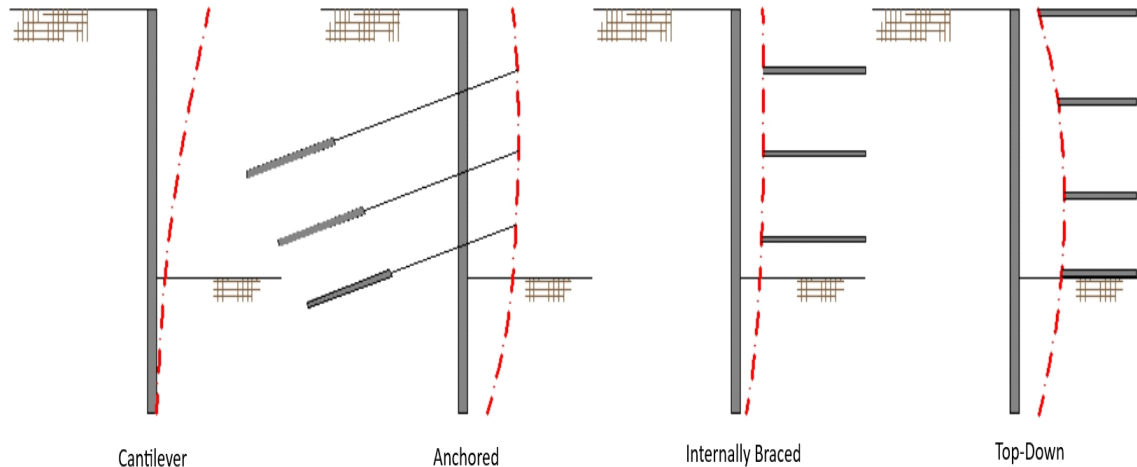


Figure 15. Typical Displacement Shapes

Table 27. Horizontal Displacement Verification (Final Excavation)

Node	$U_{x,max}$ [mm]	$U_{x,lim}$ [mm]	H [m]	δH	Kontrol
88	-13,98	40,5	13,5	0,003H	√

PULL-OUT FAILURE of GROUTED ANCHOR-SOIL INTERFACE (STR) (Final Excavation)

z: Depth

D: Grout diameter

L: Grout length

τ_f : Ultimate skin friction

T_f: Ultimate bearing capacity of anchor

R_{a;d}: Design pull-out resistance Of anchor-soil interface

F: Anchor force

E_{a;d}: Design anchor force

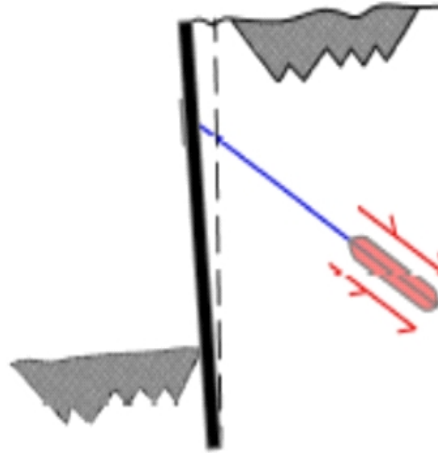


Figure 16. Pull-Out Failure of Grouted Anchor-Soil Interface (STR)

Table 28. Pull-Out Verification Of Grouted Anchor-Soil Interface (Final Excavation)

Anchor Name	Type	z [m]	D [m]	L [m]	τ_f [kN/m ²]	T _f [kN]	R _{a;d} [kN]	F [kN]	E _{a;d} [kN]	FS	Check
Ankraj 1	Steel Strand	2,5	0,15	10	53kN/m ² ; 88,13kN/m ² ;	390,132	278,666	96,725	130,579	4,03	✓
Ankraj 3	Steel Strand	10	0,15	10	227kN/m ² ;	1069,734	764,096	303,217	409,343	3,53	✓

ANCHOR TENDON TENSILE FAILURE (STR) (Final Excavation)

z: Depth

n: Tendon number

d₁: Nominal diameter of a single tendon

f_u: Nominal tensile strength a single tendon

R_t: Anchor tensile strength

R_{t;d}: Anchor design tensile strength

F: Anchor force

E_{a;d}: Design anchor force

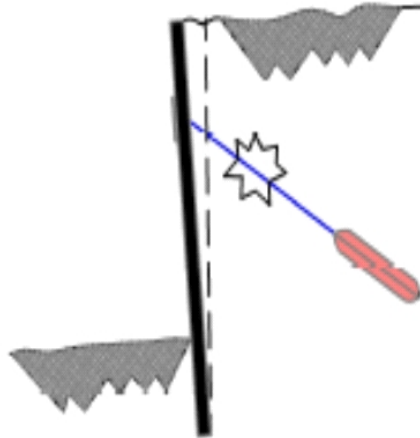


Figure 17. Anchor Tendon Tensile Failure

Table 29. Anchor Tendon Tensile Verification (Final Excavation)

Anchor Name	Type	z [m]	n	d_1 [mm]	f_u [kN/m ²]	R_t [kN]	$R_{t;d}$ [kN]	F [kN]	$E_{a;d}$ [kN]	FS	Check
Ankraj 1	CelikH alat	2,5	3	15,7	177000	796,5	568,93	96,725	130,579	8,23	✓
Ankraj 3	CelikH alat	10	3	15,7	177000	796,5	568,93	303,217	409,343	2,63	✓

PULL-OUT FAILURE AT THE TENDON-GROUT INTERFACE of ANCHOR (STR) (Final Excavation)

z: Depth

n: Tendon number

d_s : Combined diameter of bars/strands. For multiple strands or bars, it represents their nominal combined diameter.

L: Grout length

f_c : Grout compressive strength

τ_c : Tendon-to-grout bond strength

R_c : Pull-out resistance of tendon-grout interface

$R_{c;d}$: Design pull-out resistance of tendon-grout interface

F: Anchor force

$E_{a;d}$: Design anchor force

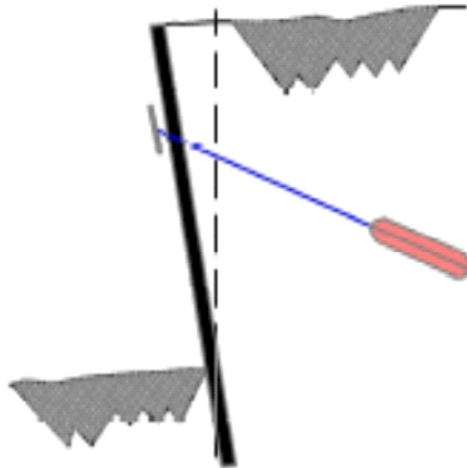


Figure 18. Pull-Out Failure of Tendon-Grout Interface

Table 30. Pull-Out Verification of tendon-grout interface (Final Excavation)

Anch or Name	Type	z [m]	n	d_s [mm]	L [m]	f_c [kN/ m ²]	τ_c [kN/ m ²]	R_c [kN]	$R_{c;d}$ [kN]	F [kN]	$E_{a;d}$ [kN]	FS	Check
Ankra j1	Celik Halat	2,5	3	47,1	10	10000	1151, 069	1703, 226	1216, 59	96,72 5	130,5 79	17,61	√
Ankra j3	Celik Halat	10	3	47,1	10	10000	1151, 069	1703, 226	1216, 59	303,2 17	409,3 43	5,62	√

ANCHOR INTERNAL STABILITY (Final Excavation)

H_o : The theoretical depth below the excavation level at the controlled construction stage

E_a : Active earth pressure force acting on the wall between the top level and point H_o

δ : Weighted average of the wall-soil friction angle between the top level and point H_o

W_i : Block weight of the verified anchor

θ_i : The angle between the inclined surface of the verified anchor's block and the horizontal

E_{ai} : The active earth pressure force acting on the vertical part of the verified anchor's block

δ_i : Weighted average of the wall-soil friction angle along the vertical part of the verified anchor's block

C_i : Cohesion reaction between the inclined surface of the verified anchor block and the soil.

i_a : Included anchors. The calculated forces of the included anchors are incorporated into the block analysis of the verified anchor.

Φ_i : Average internal friction angle on the inclined surface of the verified anchor block

Q_i : Reaction force acting on the inclined surface of the verified anchor block

F_i : Reaction force acting on the inclined surface of the verified anchor block

F: Verified anchor force.

FS: Factor of safety

F_i^* : Allowable reduced maximum force in the verified anchor

F^* : Factored verified anchor force

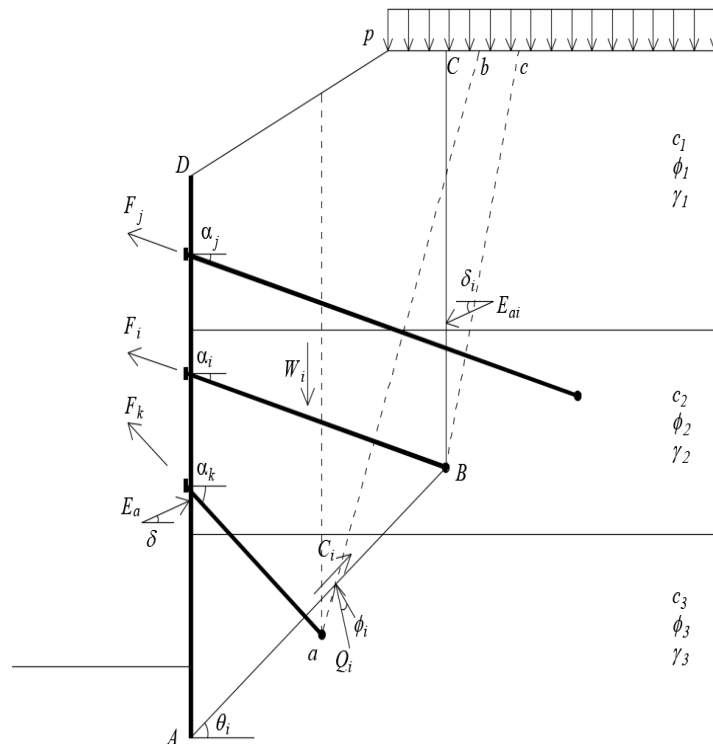


Figure 19. Anchorage Internal Stability Verification

$$\begin{aligned} H_o &= 0,57 [\text{m}] \\ E_a &= 399,96 [\text{kN/m}] \\ \delta &= 15 [^\circ] \end{aligned}$$

Table 31. Anchorage Internal Stability Verification (Final Excavation)

W _i [kN/ m]	θ _i [°]	E _{ai} [kN/ m]	δ _i [°]	C _i [kN/ m]	Φ _i [°]	Q _i [kN/ m]	F _i [kN/ m]	F [kN/ m]	FS	F _i * [kN/ m]	F* [kN/ m]	Check
3440,2	22,12	65,04	15	264,91	28,43	3030,45	933,77	60,45	15,45	666,98	81,61	√
4083,76	-16,82	709,18	15	237,49	28,8	3859,22	3034,89	189,51	16,01	2167,78	255,84	√

SUPPORT FORCES AND SECTION DESIGN (Final Excavation)

z: Depth

L: Support length

S: Horizontal spacing

D: Profile outer diameter

t: Profile wall thickness

Fy: Characteristic yield stress of steel

Fu: Steel tensile strength

Table 32. Support Properties (Final Excavation)

Type	z [m]	L [m]	S [m]	D [mm]	t [mm]	Steel Class	Fy [kN/m ²]	Fu [kN/m ²]
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Downtown Excavation Support System								
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 54 / 58								
Steel Pipe	6	8,5	4	450	30	TS EN 10025-2 S235	235000	360000

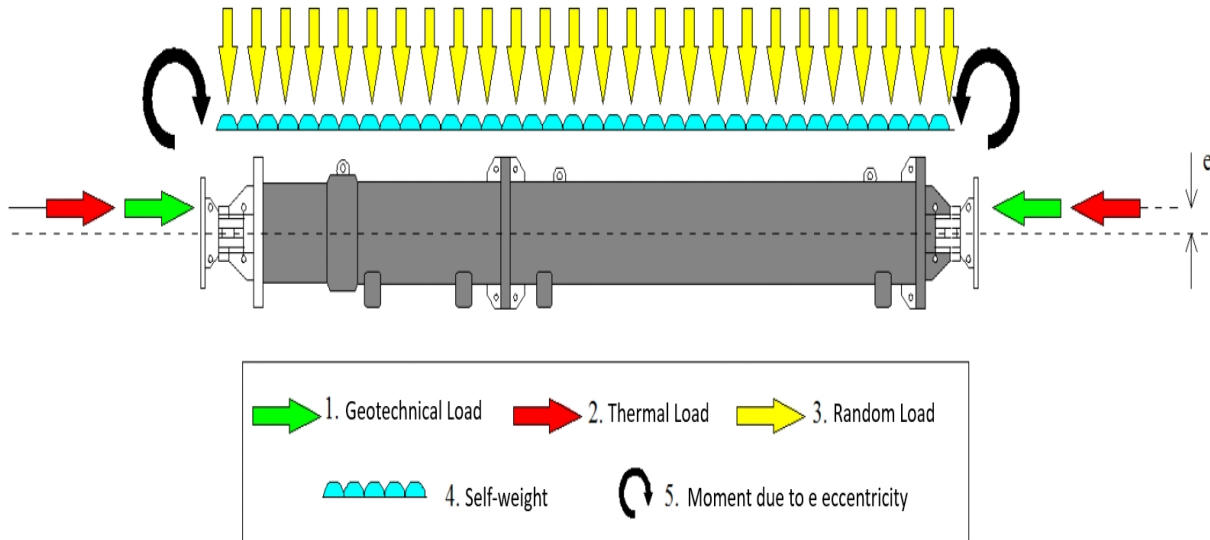


Figure 20. Support Forces and Section Design

Psls: Support force calculated for the SLS case

Puls: Support force calculated for the ULS case

Gk: Characteristic total self-weight of support

Gk,geo: Characteristic geotechnical load

Qk,temp: Characteristic thermal load

Qk,random: Additional uniformly distributed vertical load on the support

Mecc: Moment obtained with additional eccentricity in a momentless joint

Table 33. Effects on Support Element (Final Excavation)

Type	Psls [kN]	Puls [kN]	Gk [kN/m]	Gk,geo [kN]	Qk,temp [kN]	Qk,random [kN/m]	Mecc [kN.m]
Steel Pipe	726,818	981,204	3,047	981,204	299,256	1	109,501

Pr: Required axial compressive strength

Mr: Required bending moment strength

Pc: Design compressive force strength

Mcx: Design bending moment strength

Table 34. Compression-Bending Design (Final Excavation)

Type	Combination	Pr [kN]	Mr [kN.m]	Pc [kN]	Mcx [kN.m]	Capacity Ratio	Check
Steel Pipe	LC2	1460,013	142,526	7172,02	1121,162	0,32	$0,32 \leq 1 \checkmark$

Kombinasyon: Load combination for shear design

Vr: Required shear strength

Vd: Not Found

Table 35. Shear Design (Final Excavation)

Type	Combination	Vr [kN]	Vd [kN]	Capacity Ratio	Check
Steel Pipe	LC3	19,751	2511,609	0,01	$0,01 \leq 1 \checkmark$

WALL STRUCTURAL DESIGN (Final Excavation)

D: Pile diameter

Nd: Design normal force

Md: Design bending moment

fck: Characteristic concrete compressive strength

fyk: Characteristic steel tensile strength

ρ : Reinforcement percentage

Amin: Minimum longitudinal reinforcement area

Ast: Required reinforcement area

Asmax: Maximum reinforcement area

Acur: Current reinforcement area

Table 36. Compression-Bending Design (Final Excavation)

Node	Location [m]	D [mm]	Nd [kN]	Md [kN.m]	fck [kN/m ²]	fyk [kN/m ²]	ρ	Amin [mm ²]	Ast [mm ²]	Asma [mm ²]	Acur [mm ²]	Rebar	Check
52	-7	650	81,76	108,43	25000	42000	0,01	3318,3	3318,3	13273,2	3455,8	11 Φ 20	$\checkmark$

Vd: Design shear force

Vcr: Shear cracking strength

Vc: Contribution of concrete to shear strength

Vw: Strength contribution of shear reinforcement

Aswmin: Minimum transverse reinforcement area

Asw: Required transverse reinforcement area

Aswcur: Current transverse reinforcement area

Table 37. Shear Design (Final Excavation)

Node	Location [m]	D [mm]	Nd [kN]	Vd [kN]	fck [kN/m ²]	fyk [kN/m ²]	Vcr [kN]	Vc [kN]	Vw [kN]	Aswmin [mm ² /m]	Asw [mm ² /m]	Aswcur [mm ² /m]	Rebar	Check
52	-7	650	-81,76	126,71	25000	42000	211,53	169,22	0	512,57	512,57	670,25	Φ 8/15	$\checkmark$

EXTERNAL STABILITY (Final Excavation)

Limit equilibrium method: Bishop

Sliding surface: Circle

Type of analysis: Standard

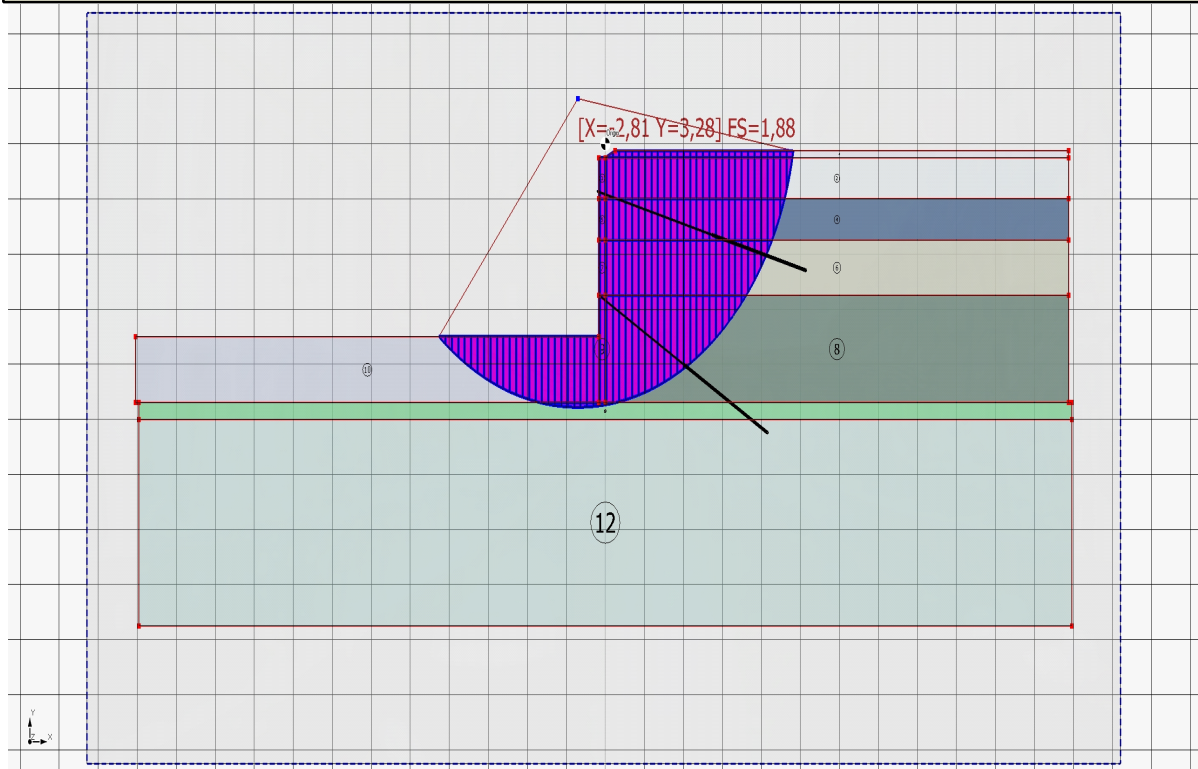


Figure 21. Limit Equilibrium Analysis (Final Excavation)

$$FS = \frac{\sum_i c_i L_i + N_i \tan \phi_i}{\sum_i W_i \sin \alpha_i} = \frac{\sum_i R_s}{\sum_i F_s}$$

$$m_\alpha = \cos \alpha + \frac{\sin \alpha \tan \phi}{FS}$$

$$N_i = (W_i - u_i \times L_i) \times \cos \alpha$$

B: Slice width

W: Slice weight

α : Slice base inclination angle

L: Slice base length

Uw: Pore water pressure at slice base

N: Normal force acting perpendicular to slice base

c: Cohesion at slice base

Φ : Angle of internal friction at slice base

Rs: Resisting forces

Fs: Mobilized driving forces

FS: Factor of safety

Table 38. Limit Equilibrium Analysis (Final Excavation)

Slice	B [m]	W [kN/m]	α [°]	L [m]	Uw [kN/m ²]	N [kN/m]	c [kN/m ²]	Φ [°]	Rs [kN/m]	M α	Fs [kN/m]	FS
1	0,65	3,48	-38,37	0,846	0	2,729	17,5	28,8	31,521	0,6	-2,16	

Downtown Excavation Support System												
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 57 / 58												
2	0,65	10,074	-36,34	0,82	0	8,115	17,5	28,8	33,694	0,63	-5,969	
3	0,65	16,186	-34,18	0,798	0	13,391	17,5	28,8	35,648	0,66	-9,092	
4	0,65	21,843	-32,3	0,781	0	18,464	17,5	28,8	37,689	0,69	-11,671	
5	0,65	27,079	-30,16	0,764	0	23,414	17,5	28,8	39,304	0,72	-13,603	
6	0,65	31,922	-28,37	0,751	0	28,088	17,5	28,8	41,044	0,74	-15,169	
7	0,65	36,388	-26,32	0,737	0	32,615	17,5	28,8	42,401	0,77	-16,136	
8	0,65	40,502	-24,63	0,727	0	36,818	17,5	28,8	43,843	0,79	-16,877	
9	0,65	44,277	-22,58	0,715	0	40,883	17,5	28,8	44,886	0,81	-17	
10	0,65	47,726	-20,92	0,707	0	44,579	17,5	28,8	46,02	0,83	-17,042	
11	0,65	50,866	-19,03	0,699	0	48,087	17,5	28,8	46,863	0,85	-16,583	
12	0,65	53,699	-17,27	0,692	0	51,277	17,5	28,8	47,634	0,87	-15,943	
13	0,65	56,244	-15,62	0,686	0	54,168	17,5	28,8	48,318	0,88	-15,141	
14	0,65	58,502	-13,68	0,68	0	56,843	17,5	28,8	48,724	0,9	-13,834	
15	0,65	60,48	-12,07	0,675	0	59,144	17,5	28,8	49,152	0,92	-12,642	
16	0,65	62,191	-10,37	0,672	0	61,174	17,5	28,8	49,414	0,93	-11,198	
17	0,65	63,629	-8,53	0,668	0	62,925	17,5	28,8	49,485	0,95	-9,437	
18	0,65	64,804	-6,93	0,665	0	64,331	17,5	28,8	49,534	0,96	-7,822	
19	0,65	65,723	-5,25	0,663	0	65,447	17,5	28,8	49,431	0,97	-6,016	
20	0,65	66,379	-3,43	0,662	0	66,26	17,5	28,8	49,159	0,98	-3,972	
21	0,65	66,78	-1,84	0,661	0	66,746	17,5	28,8	48,853	0,99	-2,145	
22	0,65	66,929	-0,19	0,661	0	66,929	17,5	28,8	48,413	1	-0,224	
23	0,65	66,82	1,65	0,661	0	66,792	17,5	28,8	47,803	1,01	1,923	
24	0,65	66,455	3,24	0,662	0	66,349	17,5	28,8	47,158	1,01	3,755	
25	0,65	99,092	4,87	0,663	0	98,734	17,5	28,8	64,229	1,02	8,41	
26	0,65	275,891	6,74	0,665	0	273,984	17,5	28,8	157,541	1,03	32,382	
27	0,65	235,031	8,34	0,668	0	232,546	17,5	28,8	134,736	1,03	34,082	
28	0,65	236,893	9,99	0,671	0	233,301	17,5	28,8	134,606	1,04	41,096	
29	0,65	235,473	11,87	0,675	0	230,435	17,5	28,8	132,634	1,04	48,45	
30	0,65	233,533	13,49	0,679	0	227,093	17,5	28,8	130,608	1,04	54,464	
31	0,65	231,32	15,23	0,685	0	223,192	17,5	28,8	128,397	1,04	60,781	

Downtown Excavation Support System												
Zoning Information: Seattle Province, Capitol Hill District, PL-874233 Layout, 47A Block, 112 Parcel, 58 / 58												
32	0,65	228,817	17,08	0,691	0	218,726	17,5	28,8	126,024	1,04	67,203	
33	0,65	226,026	18,71	0,697	0	214,076	17,5	28,8	123,673	1,04	72,522	
34	0,65	222,936	20,66	0,706	0	208,601	17,5	28,8	121,043	1,04	78,653	
35	0,65	219,531	22,39	0,714	0	202,986	17,5	28,8	118,425	1,04	83,611	
36	0,65	215,809	24,24	0,724	0	196,776	17,5	28,8	115,634	1,03	88,617	
37	0,65	211,745	26,13	0,736	0	190,099	17,5	28,8	112,716	1,03	93,263	
38	0,65	207,335	27,99	0,748	0	183,085	17,5	28,8	109,708	1,02	97,3	
39	0,65	202,547	29,96	0,762	0	334,083	17,5	28,8	192,644	1,01	101,162	
40	0,65	197,375	31,91	0,778	0	167,538	17,5	28,8	103,249	1	104,344	
41	0,65	191,779	33,89	0,796	0	159,195	17,5	28,8	99,84	0,99	106,939	
42	0,65	185,741	36,05	0,817	0	150,182	17,5	28,8	96,249	0,98	109,294	
43	0,65	179,221	38,07	0,839	0	141,088	17,5	28,8	92,587	0,97	110,518	
44	0,65	172,174	40,26	0,866	0	131,396	17,5	28,8	88,752	0,95	111,261	
45	0,65	164,555	42,59	0,897	0	121,148	17,5	28,8	84,764	0,93	111,362	
46	0,65	156,297	44,9	0,933	0	110,716	17,5	28,8	80,676	0,91	110,321	
47	0,65	147,32	47,32	0,975	0	99,86	17,5	28,8	76,463	0,89	108,31	
48	0,65	137,521	49,88	1,025	0	88,622	17,5	28,8	72,153	0,87	105,158	
49	0,65	126,766	52,56	1,087	0	77,063	12	28	61,35	0,83	100,652	
50	0,65	114,87	55,44	1,164	0	65,163	12	28	56,677	0,8	94,598	
51	0,65	101,557	58,6	1,268	0	77,648	12	28	69,273	0,76	86,687	
52	0,65	86,427	62	1,407	0	40,579	12	28	47,594	0,72	76,309	
53	0,65	68,776	65,85	1,615	0	28,139	10	26	40,315	0,65	62,756	
54	0,65	47,303	70,45	1,975	0	15,829	10	26	39,072	0,58	44,577	
55	0,65	19,109	76,6	2,86	0	4,427	5	32	22,4	0,56	18,589	
Σ									4110,023		2189,672	1,88

$$FS = 1,88 > 1,5 \checkmark$$