

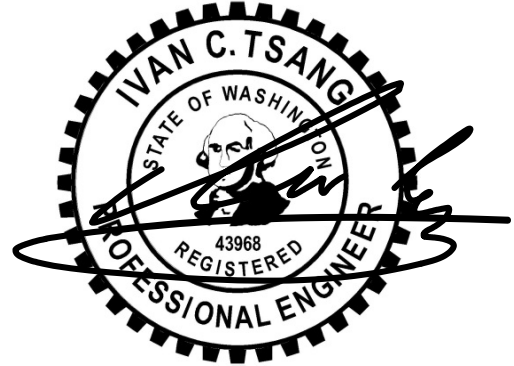
SUPPLEMENTAL *STRUCTURAL CALCULATIONS* FOR:

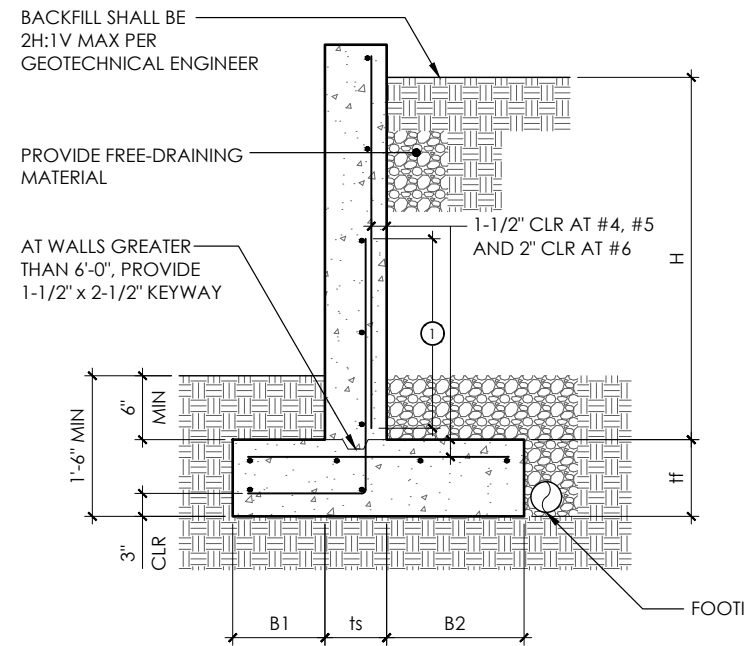
# 6427 E MERCER WAY

MERCER ISLAND, WA

ARCHITECT: CITIZEN DESIGN

OCTOBER 3, 2025





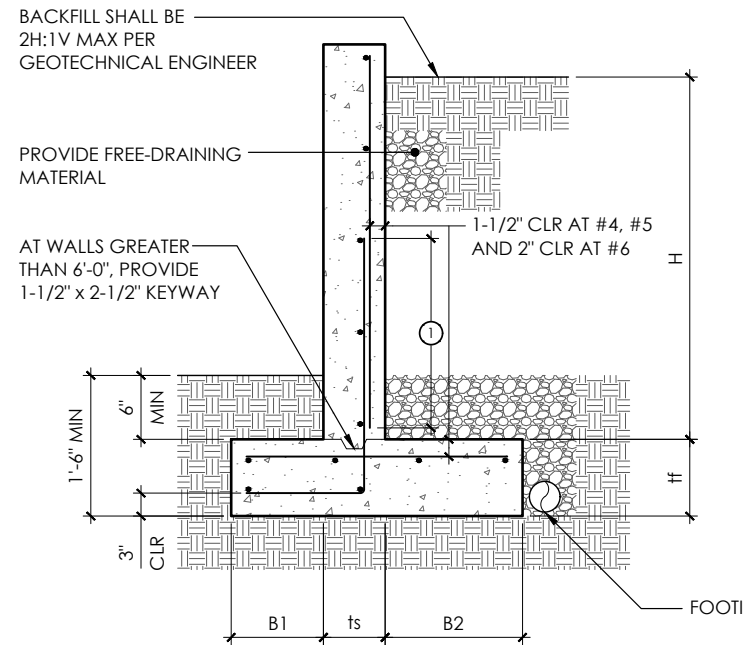
① LAP SPLICE - #4 = 32", #5 = 40", #6 = 48"

Retaining Wall Type	C02-X10
Bearing ( $q_{all}$ )	3 ksf
Bearing w/ Seismic ( $q_{eq}$ )	3.99 ksf
Active Pressure ( $K_a$ )	0.05 kcf
Ultimate Passive ( $K_p$ )	0.3 kcf
Ultimate Coef Frict ( $\mu$ )	0.4
Seismic Surcharge ( $K_{eq}$ )	9 H
Soil Weight ( $\rho_{soil}$ )	0.12 kcf
Frost Depth	18 in
Slab Resist Sliding	No
Concr Strength ( $f'_c$ )	2.5 ksi
Steel Strength ( $f_y$ )	60 ksi
Conc density ( $\rho_{conc}$ )	0.15 kcf
Ignore Passive	1 ft

FOS not included  
FOS not included

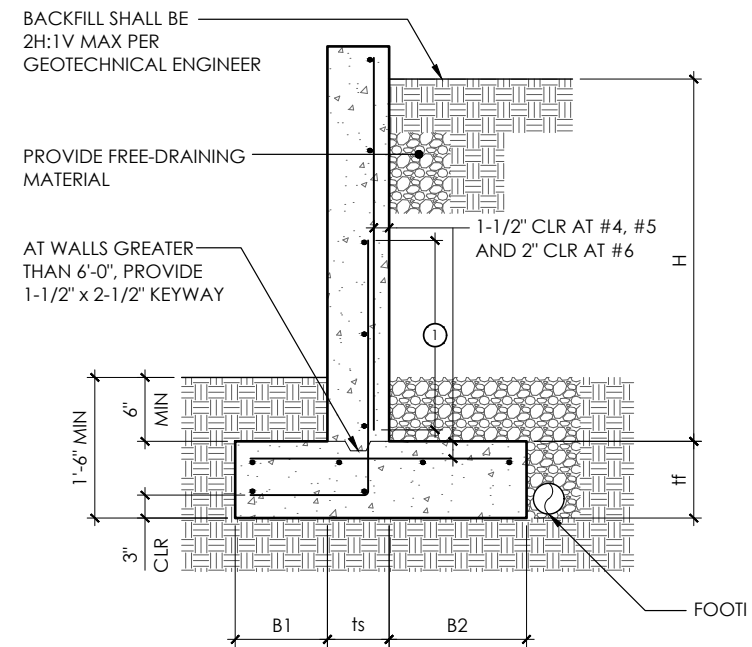
6" Min

Retaining Wall Schedule and Summary																											
Retain Height	Toe Width	Stem Width	Heel Width	Ftg Depth	Key Depth	Stem Reinf				Footing Reinf					Key Reinf		Slide FOS		OT FOS		Bearing w/o Eq	Bearing w/ Eq	Resultant in Middle Third	Max Force on Stem			
						Vert	Horiz	Top Heel	Bot Toe	Long	Vert	Long	w/o Seismic	w/ Seismic	w/o Seismic	w/ Seismic											
H	B1	ts	B2	ff	D	bar	in	bar	in	bar	in	bar	in	#	bar	bar	in	#	bar								
Formula																											
ft	ft	in	ft	in	in	bar	in	bar	in	bar	in	bar	in	#	bar	bar	in	#	bar					ksf	ksf		kip
4	0.75	6	2	9	0	#4	18	#4	16			#4	18	4	#4					1.53	1.22	3.45	2.39	0.84	1.07	Yes	
4	0.75	8	1.75	9	0	#4	18	#4	12			#4	18	4	#4					1.51	1.20	3.30	2.29	0.87	1.11	Yes	
5	0.75	6	3	10	0	#4	18	#4	16			#4	11	5	#4					1.52	1.20	3.92	2.69	1.00	1.25	Yes	
5	0.75	8	3	10	0	#4	12	#4	12			#4	11	5	#4					1.59	1.26	4.25	2.93	0.98	1.22	Yes	
6	1.5	6	4	10	0	#4	11	#4	16			#4	11	7	#4					1.60	1.25	5.51	3.75	0.80	1.09	Yes	
6	1.25	8	3.75	10	0	#4	12	#4	12			#4	11	7	#4					1.57	1.23	4.99	3.40	0.92	1.20	Yes	
7	1.75	8	4.5	10	0	#4	10	#4	12			#4	11	8	#4					1.55	1.21	5.55	3.75	0.89	1.23	Yes	
8	2.25	8	5.5	12	0	#5	10	#4	12			#5	14	8	#5					1.57	1.22	6.16	4.18	0.90	1.31	Yes	
9	2.75	8	6.25	12	0	#6	9	#4	12			#6	14	9	#5					1.56	1.21	6.50	4.39	1.03	1.37	Yes	
10	3	8	7	15	0	#6	6	#4	12			#5	11	12	#5					1.56	1.22	6.28	4.26	1.13	1.57	Yes	
11	3.5	10	7.75	15	0	#6	6	#4	10			#5	11	13	#5					1.58	1.23	6.75	4.56	1.29	1.64	Yes	
12	3.75	12	8.25	15	0	#6	6	#5	12			#5	10	14	#5					1.56	1.20	6.67	4.49	1.39	1.77	Yes	



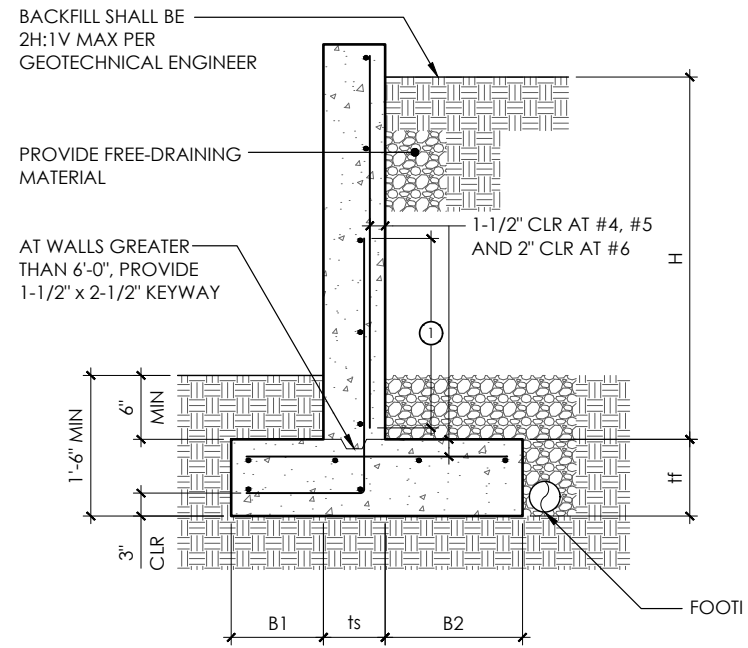
① LAP SPLICE - #4 = 32", #5 = 40", #6 = 48"

	Soil Cover	Ftg Width	Force Active Ftg Base	Force Active Stem Base	Force seismic	Weight stem	Weight footing	Weight Key	Weight Soil Heel	Weight Soil Toe	Moment Active Footing Base	Moment Active Stem Base	Moment Seismic Footing Base	Moment Seismic Stem Base	Moment Resist Stem	Moment Resist Footing	Moment Key	Msoil Heel	M Soil Toe	Over Turning Moment	Moment Resist	Passive Resist	Slide Demand	Sliding Resist	Resultant
H		L <sub>ftg</sub>	F <sub>a-ftg</sub>	F <sub>a-stem</sub>	F <sub>Eq</sub>	W <sub>stem</sub>	W <sub>ftg</sub>	W <sub>key</sub>	W <sub>soil-heel</sub>	W <sub>soil-toe</sub>	M <sub>a-ftg</sub>	M <sub>a-stem</sub>	M <sub>eq-ftg</sub>	M <sub>eq-stem</sub>	M <sub>r-stem</sub>	M <sub>r-ftg</sub>	M <sub>r-key</sub>	M <sub>r-soil-heel</sub>	M <sub>r-soil-toe</sub>	M <sub>o</sub>	M <sub>r</sub>	F <sub>p</sub>		F <sub>r</sub>	R
			$K_a * (H+tf)^2 / 2$	$K_a * (H^2) / 2$	$K_{eq} * (H^2)$	$\rho_c * ts * H$	$\rho_c * tf * (B1+ts+B2)$	$\rho_c * D$	$\rho_s * H * B2$	$\rho_s * B1 * F_{tg\ soil}$	$F_{a-ftg} * (H+tf) / 3$	$F_{a-stem} * H / 3$	$F_{eq} * (H/2+tf)$	$F_{eq} * H / 2$	$W_{stem} * (B1+ts/2)$	$W_{ftg} * (B1+ts+B2) / 2$	$W_{key} * 1.5'$	$W_{soil-heel} * (B1+ts+B2) / 2$	$W_{soil-toe} * (B1/2)$	$M_{a-ftg} + M_{eq-ftg}$	$M_{r-stem} + M_{r-ftg} + M_{r-key} + M_{r-soil-heel} + M_{r-soil-toe}$		$F_{a-ftg} + F_{eq}$		
ft		ft	kip	kip	kip	kip	kip	kip	kip	kip	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip-ft	kip	kip	kip	lbs
4	9	3.25	0.56	0.40	0.14	0.30	0.37	0.00	0.96	0.07	0.89	0.53	0.40	0.29	0.30	0.59	0.00	2.16	0.03	1.29	3.08	0.19	0.71	0.86	1.69
4	9	3.17	0.56	0.40	0.14	0.40	0.36	0.00	0.84	0.07	0.89	0.53	0.40	0.29	0.43	0.56	0.00	1.93	0.03	1.29	2.95	0.19	0.71	0.85	1.66
5	8	4.25	0.85	0.63	0.23	0.38	0.53	0.00	1.80	0.06	1.65	1.04	0.75	0.56	0.38	1.13	0.00	4.95	0.02	2.40	6.48	0.19	1.08	1.29	2.77
5	8	4.42	0.85	0.63	0.23	0.50	0.55	0.00	1.80	0.06	1.65	1.04	0.75	0.56	0.54	1.22	0.00	5.25	0.02	2.40	7.03	0.19	1.08	1.35	2.91
6	8	6.00	1.17	0.90	0.32	0.45	0.75	0.00	2.88	0.12	2.66	1.80	1.24	0.97	0.79	2.25	0.00	11.52	0.09	3.90	14.65	0.19	1.49	1.87	4.20
6	8	5.67	1.17	0.90	0.32	0.60	0.71	0.00	2.70	0.10	2.66	1.80	1.24	0.97	0.95	2.01	0.00	10.24	0.06	3.90	13.26	0.19	1.49	1.83	4.11
7	8	6.92	1.53	1.23	0.44	0.70	0.86	0.00	3.78	0.14	4.01	2.86	1.91	1.54	1.46	2.99	0.00	17.64	0.12	5.92	22.21	0.19	1.98	2.38	5.48
8	6	8.42	2.03	1.60	0.58	0.80	1.26	0.00	5.28	0.14	6.08	4.27	2.88	2.30	2.07	5.31	0.00	29.92	0.15	8.96	37.45	0.19	2.60	3.18	7.48
9	6	9.67	2.50	2.03	0.73	0.90	1.45	0.00	6.75	0.17	8.33	6.08	4.01	3.28	2.78	7.01	0.00	44.16	0.23	12.34	54.17	0.19	3.23	3.89	9.27
10	6	10.67	3.16	2.50	0.90	1.00	2.00	0.00	8.40	0.18	11.87	8.33	5.63	4.50	3.33	10.67	0.00	60.20	0.27	17.49	74.47	0.31	4.06	4.94	11.58
11	6	12.08	3.75	3.03	1.09	1.38	2.27	0.00	10.23	0.21	15.32	11.09	7.35	5.99	5.39	13.69	0.00	83.97	0.37	22.67	103.41	0.31	4.84	5.94	14.08
12	6	13.00	4.39	3.60	1.30	1.80	2.44	0.00	11.88	0.23	19.39	14.40	9.40	7.78	7.65	15.84	0.00	105.44	0.42	28.78	129.35	0.31	5.69	6.85	16.34



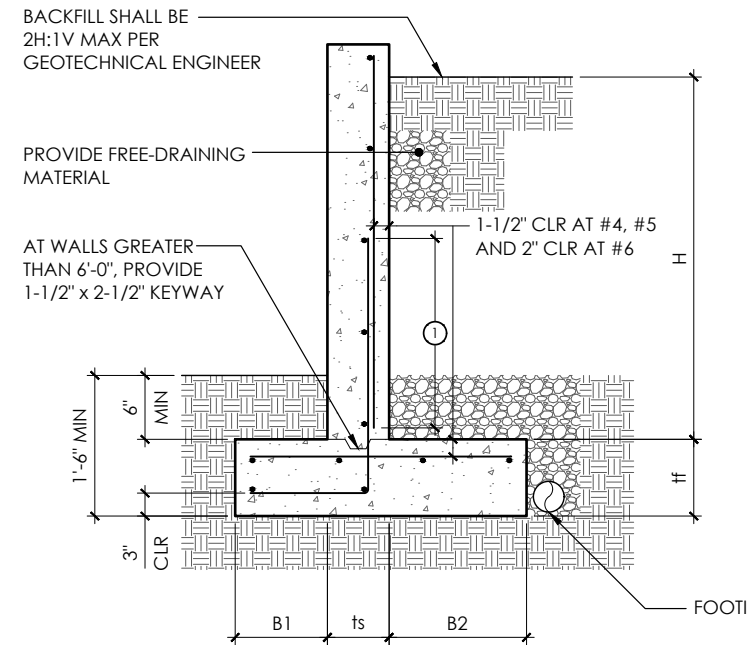
① LAP SPLICE - #4 = 32", #5 = 40", #6 = 48"

w/o Seismic																				
	Eccen w/o Seismic	ACI Bearing Toe	ACI Bearing Heel	Y	Pressure at Toe d Away From Stem	Pressure at Face of Stem Toe	Pressure at Face of Stem Heel	Wsoil + Wftg Toe	Msoil + Mftg Toe	Mtoe	Mu Toe	Wsoil + Wftg at Toe d Away from Stem	Vtoe d Away from Stem	Vu Toe d Away from Stem	Msoil + Mftg heel	Mheel	Mu Heel	Wsoil + Wftg Heel	V Heel	Vu Heel
H																				
ft	ft	ksf	ksf	ft	ksf	ksf	ksf	kip	kip-ft	kip-ft	kip-ft	kip	kip	kip	kip-ft	kip-ft	kip-ft	kip	kip	kip
4	-0.33	1.18	0.28	3.87	1.10	0.97	0.83	0.18	-0.07	0.31	0.24	0.07	-0.33	-0.26	1.42	-0.93	0.49	1.42	-1.11	0.31
4	-0.35	1.22	0.25	3.70	1.13	0.99	0.79	0.18	-0.07	0.32	0.25	0.07	-0.34	-0.27	1.09	-0.66	0.43	1.24	-0.91	0.34
5	-0.38	1.40	0.42	5.23	1.35	1.23	1.11	0.18	-0.07	0.38	0.31	0.05	-0.29	-0.24	3.92	-2.93	0.98	2.61	-2.30	0.31
5	-0.36	1.38	0.47	5.54	1.33	1.22	1.09	0.18	-0.07	0.37	0.30	0.05	-0.28	-0.23	3.92	-3.04	0.88	2.61	-2.33	0.28
6	-0.15	1.12	0.84	8.56	1.08	1.05	1.03	0.37	-0.28	1.24	0.96	0.24	-1.05	-0.82	8.11	-7.21	0.91	4.06	-3.73	0.33
6	-0.25	1.29	0.74	7.74	1.22	1.17	1.10	0.31	-0.19	0.97	0.78	0.17	-0.89	-0.71	7.13	-6.07	1.06	3.80	-3.46	0.34
7	-0.14	1.24	0.98	9.96	1.20	1.18	1.15	0.43	-0.38	1.87	1.49	0.30	-1.47	-1.18	11.72	-10.47	1.25	5.21	-4.79	0.43
8	-0.01	1.25	1.23	12.59	1.25	1.25	1.25	0.57	-0.64	3.17	2.53	0.39	-1.93	-1.54	20.15	-18.72	1.43	7.33	-6.82	0.51
9	0.11	1.44	1.25	14.16	1.40	1.38	1.37	0.69	-0.95	5.36	4.41	0.51	-2.89	-2.38	28.83	-25.16	3.67	9.23	-8.18	1.05
10	0.07	1.58	1.46	15.78	1.56	1.55	1.54	0.89	-1.34	7.07	5.73	0.61	-3.21	-2.60	40.79	-36.38	4.42	11.66	-10.49	1.17
11	0.21	1.81	1.46	17.48	1.73	1.70	1.68	1.04	-1.82	10.85	9.03	0.75	-4.50	-3.74	54.33	-46.00	8.32	14.02	-12.16	1.86
12	0.23	1.95	1.57	18.81	1.87	1.84	1.81	1.11	-2.09	13.43	11.34	0.83	-5.32	-4.49	66.46	-56.24	10.22	16.11	-13.96	2.15



① LAP SPLICE - #4 = 32", #5 = 40", #6 = 48"

w/ Seismic																				
	Eccen w/ Seismic	ACI Bearing Toe	ACI Bearing Heel	Y	Pressure at Toe d Away From Stem	Pressure at Face of Stem Toe	Pressure at Face of Stem Heel	Wsoil + Wftg Toe	Msoil + Mftg Toe	Mtoe	Mu Toe	Wsoil + Wftg at Toe d Away from Stem	Vtoe d Away from Stem	Vu Toe d Away from Stem	Msoil + Mftg heel	Mheel	Mu Heel	Wsoil + Wftg Heel	V Heel	Vu Heel
H																				
ft	ft	ksf	ksf	ft	ksf	ksf	ksf	kip	kip-ft	kip-ft	kip-ft	kip	kip	kip	kip-ft	kip-ft	kip-ft	kip	kip	kip
4	-0.57	1.49	0.00	3.17	1.36	1.14	0.91	0.18	-0.07	0.39	0.32	0.07	-0.42	-0.34	1.42	-0.56	0.86	1.42	-0.87	0.55
4	-0.59	1.56	0.00	2.99	1.41	1.17	0.82	0.18	-0.07	0.40	0.33	0.07	-0.43	-0.36	1.09	-0.34	0.75	1.24	-0.65	0.60
5	-0.65	1.75	0.07	4.42	1.67	1.45	1.26	0.18	-0.07	0.46	0.40	0.05	-0.36	-0.30	3.92	-2.10	1.82	2.61	-1.99	0.62
5	-0.62	1.70	0.15	4.77	1.63	1.44	1.20	0.18	-0.07	0.45	0.38	0.05	-0.35	-0.30	3.92	-2.24	1.67	2.61	-2.02	0.59
6	-0.44	1.41	0.55	7.68	1.27	1.20	1.12	0.37	-0.28	1.51	1.23	0.24	-1.29	-1.05	8.11	-5.92	2.19	4.06	-3.34	0.71
6	-0.56	1.61	0.42	6.83	1.46	1.35	1.21	0.31	-0.19	1.19	1.00	0.17	-1.09	-0.92	7.13	-4.79	2.34	3.80	-3.05	0.75
7	-0.49	1.58	0.64	8.91	1.42	1.34	1.25	0.43	-0.38	2.30	1.92	0.30	-1.81	-1.51	11.72	-8.55	3.18	5.21	-4.26	0.95
8	-0.40	1.60	0.89	11.43	1.47	1.41	1.35	0.57	-0.64	3.88	3.24	0.39	-2.36	-1.97	20.15	-15.80	4.34	7.33	-6.17	1.16
9	-0.32	1.61	1.08	13.54	1.50	1.46	1.42	0.69	-0.95	5.89	4.94	0.51	-3.17	-2.65	28.83	-23.25	5.57	9.23	-7.80	1.43
10	-0.41	1.87	1.17	14.76	1.74	1.67	1.63	0.89	-1.34	8.13	6.79	0.61	-3.69	-3.08	40.79	-32.37	8.42	11.66	-9.79	1.87
11	-0.31	1.88	1.38	17.20	1.78	1.74	1.70	1.04	-1.82	11.22	9.40	0.75	-4.65	-3.89	54.33	-44.71	9.61	14.02	-11.95	2.07
12	-0.35	2.04	1.48	18.46	1.92	1.88	1.84	1.11	-2.09	13.97	11.88	0.83	-5.53	-4.70	66.46	-54.37	12.09	16.11	-13.67	2.44



① LAP SPLICE - #4 = 32", #5 = 40", #6 = 48"

H	Stem Reinforcement										Footing Reinforcement															
	Vert							Horiz			Top Heel							Bot Toe							Long	
	Mu	ØMc	d	As req	As prov	fb/Fb	Vu	ØVn	As min	As prov	Mu	ØMc	d	As req	As prov	Vu	ØVn	Mu	ØMc	d	As req	As prov	Vu	ØVn	As min	As prov
ft	kip-ft	kip-ft	in	si	si		kip	kip	si	si	kip-ft	kip-ft	in	si	si	kip	kip	kip-ft	kip-ft	in	si	si	kip	kip	si	si
4	1.14	0.90	4.25	0.13	0.13	0.97	0.78	2.07	0.14	0.15	0.86	1.23	0.00	0.00	0.00	0.55	3.36	0.32	1.23	5.75	0.00	0.13	0.34	3.36	0.63	0.80
4	1.14	1.60	6.25	0.00	0.13	0.00	0.78	2.69	0.19	0.20	0.75	1.23	0.00	0.00	0.00	0.60	3.36	0.33	1.23	5.75	0.00	0.13	0.36	3.36	0.62	0.80
5	2.23	0.90	4.25	0.13	0.13	0.97	1.23	2.07	0.14	0.15	1.82	1.60	0.00	0.22	0.00	0.62	3.84	0.40	1.60	6.75	0.00	0.22	0.30	3.84	0.92	1.00
5	2.23	1.60	6.25	0.17	0.20	0.86	1.23	3.08	0.19	0.20	1.67	1.60	0.00	0.22	0.00	0.59	3.84	0.38	1.60	6.75	0.00	0.22	0.30	3.84	0.95	1.00
6	3.85	0.90	4.25	0.21	0.22	0.98	1.76	2.43	0.14	0.15	2.19	1.60	0.00	0.22	0.00	0.71	3.84	1.23	1.60	6.75	0.00	0.22	1.05	3.84	1.30	1.40
6	3.85	1.60	6.25	0.17	0.20	0.86	1.76	3.08	0.19	0.20	2.34	1.60	0.00	0.22	0.00	0.75	3.84	1.00	1.60	6.75	0.00	0.22	0.92	3.84	1.22	1.40
7	6.12	1.60	6.25	0.23	0.24	0.95	2.40	3.27	0.19	0.20	3.18	1.60	0.00	0.22	0.00	0.95	3.84	1.92	1.60	6.75	0.22	0.22	1.51	3.84	1.49	1.60
8	9.13	1.60	6.19	0.35	0.37	0.94	3.14	3.79	0.19	0.20	4.34	2.50	0.00	0.26	0.00	1.16	4.80	3.24	2.50	8.69	0.26	0.27	1.97	4.80	2.18	2.48
9	13.00	1.60	5.63	0.59	0.59	1.00	3.97	4.41	0.19	0.20	5.57	2.50	0.00	0.26	0.00	1.43	4.80	4.94	2.50	8.63	0.26	0.38	2.65	4.80	2.51	2.79
10	17.83	1.60	5.63	0.86	0.88	0.98	4.90	5.04	0.19	0.20	8.42	4.23	0.00	0.32	0.00	1.87	6.24	6.79	4.23	11.69	0.32	0.34	3.08	6.24	3.46	3.72
11	23.74	2.50	7.63	0.79	0.88	0.89	5.93	6.09	0.24	0.24	9.61	4.23	0.00	0.32	0.00	2.07	6.24	9.40	4.23	11.69	0.32	0.34	3.89	6.24	3.92	4.03
12	30.82	3.60	9.63	0.79	0.88	0.89	7.06	7.05	0.29	0.31	12.09	4.23	0.00	0.32	0.00	2.44	6.24	11.88	4.23	11.69	0.32	0.37	4.70	6.24	4.21	4.34