These calculations must be on site and made available by the Permittee for all inspections.

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

DESIGN CALCULATIONS

PRRWF20250442

EAST TOWN CROSSING
PUYALLUP, WA

Missing Wall 1 Calculations (3ft height...ok)

SUBMITTED BY:

Robert Race, P.E.

REV 3
05/12/2025

City of Puyallup
Building
REVIEWED FOR COMPLIANCE
BSnowden
05/20/2025
3:07:44 PM

CITY OF PUYALLUP STATE OF WASHINGTON

Robert Race

Digitally signed by Robert Race
DN: E=rra...@rea-llc.com, CN=Robert Race, O="Race Engineering Associates, LLC", SERIALNUMBER=AATL20241218300..., L=Eagan, S=Minnesota, C=US
Date: 2025.05.12 09:47:50 -05'00'

ROBERT J. RACE
STATE OF WASHINGTON
26697
REGISTERED
PROFESSIONAL ENGINEER

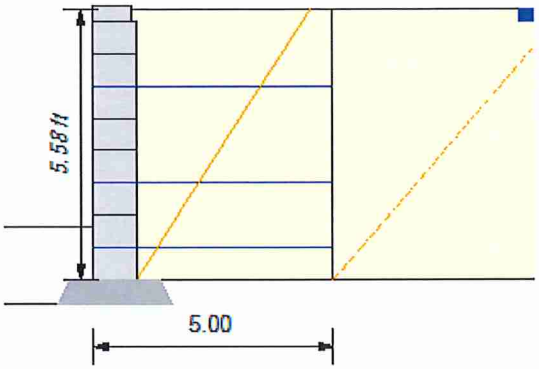
I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATIONS, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WASHINGTON.

DATE: May 12, 2025

ROBERT J. RACE, P.E. LICENSE NO. 26697

REA Analysis

Project:	EAST TOWN CROSSING PIONEER IMPROVEMENTS
Location:	PUYALLUP, WA
Designer:	rjr
Date:	3/24/2025
Section:	Wall 5, S_83.0_to_89.0
Design Method:	NCMA_09_3rd_Ed, Ignore Vert. Force
Design Unit:	GeoWall Plus 4.0: PL



Seismic Acc:	0.400g
Design Method:	AASHTO 2020, Kavazanjian
Design Equation:	AASHTO 2020, A11.5.1-1

SOIL PARAMETERS	Φ	coh	γ
Reinforced Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Retained Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Foundation Soil:	32 deg	50 lbf/ft2	120 lbf/ft3
Leveling Pad:	40 deg	0 lbf/ft2	135 lbf/ft3
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	5.58 ft (4.49 ft Exp.)			Live Load:	250 lbf/ft2
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	8.04 ft		
Embedment:	1.09 ft	LL2 Width:	50 ft		
Leveling Pad Depth:	0.50 ft	Dead Load:	0 lbf/ft2		
Back Slope Angle:	0.0 deg	Dead Load Offset:	0.0 ft		
Back Slope Length:	0.0 ft	Dead Load Width:	0.00 ft		
Back Slope Toe Offset:	0.0 ft				

Vertical δ on Single Depth

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Tension/Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Unit/Unit Shear:	1.50 / 1.13		

RESULTS (Static / Seismic)

FoS Sliding:	4.50 / [2.47]	FoS Overturning:	8.83 / [4.39]
Bearing	778 / [768]	FoS Bearing:	16.65 / [18.27]
FoS Pullout	2.75 / [1.32]		
Total Pullout	3,629	FoS Total Pullout	7.06
Total Pullout (S)	3,629	FoS Total Pullout (S)	7.03
Top FoSot:	4.08	FoS Connection:	8.10

ID	*Height*	*Length*	*Name*	*Ta_tn [Ta_tns]*	*Rc %*	*TMax [Tmd]*	*FS Tal [seis]*	*PkCn [seis]*	*PkCn/FS [seis]*	*FS SeisPO*	*FS Sldg*
3	*4*	*5*	*3XT*	*1330 [2893]*	*100*	*102 [110]*	*19.50 [13.60]*	*876 [1168]*	*12.84 [6.18]*	*2.75 [1.32]*	*35.14 [25.94]*
2	*2*	*5*	*3XT*	*1330 [2893]*	*100*	*175 [71]*	*11.41 [11.75]*	*944 [1259]*	*8.10 [5.75]*	*6.84 [4.86]*	*11.31 [8.04]*
1	*0.67*	*5*	*3XT*	*1330 [2893]*	*100*	*146 [43]*	*13.67 [15.33]*	*990 [1320]*	*10.18 [7.87]*	*14.75 [11.40]*	*7.36 [4.92]*

Column Descriptions:

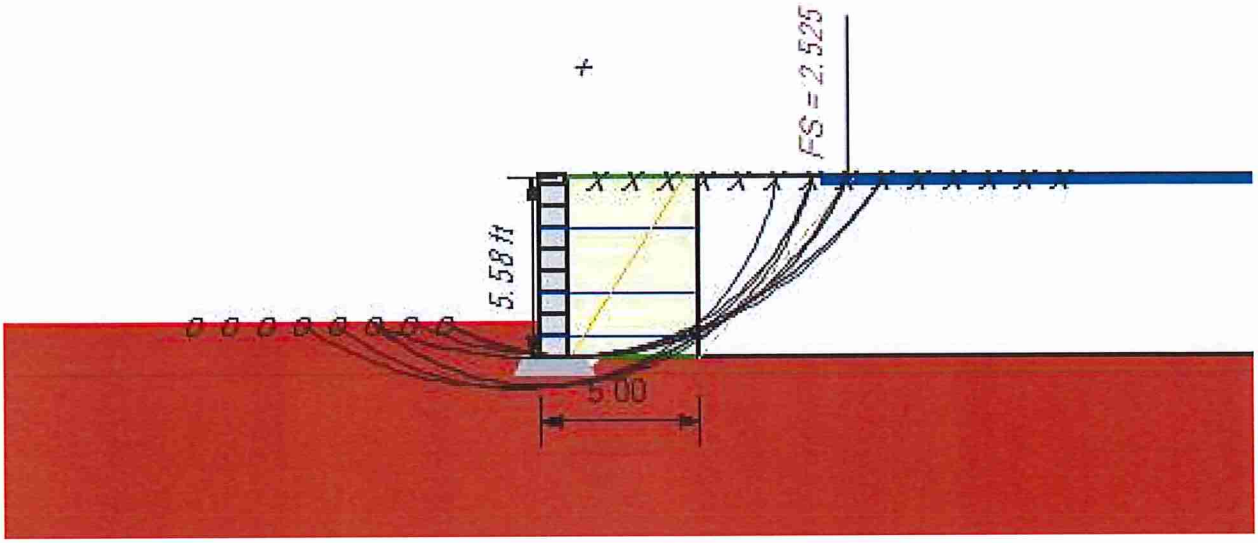
Ta: allowable geogrid strength
Rc %: percent coverage for geosynthetics
EP (Pa) internal active earth pressure
LL (Pql) earth pressure due to live load surcharge
DL (Pqd) earth pressure due to dead load surcharge
Tmax maximum earth pressure on geosynthetic layer
FSstr factor of safety on geogrid strength (LTDS/Tmax)
Ta cn allowable tension on the connection
FS Pkcn, factor of safety on the connection (PkCn/Tmax)
FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
Grid Embedment, depth of embedment beyond the theoretical failure plane.

CONNECTION RESULTS TABLE

Connection results compare the load on the connection (pullout at the face) to the resistance of the connection. In the NCMA design methodolgy the connection load accounts for the loading 'over the active zone' in the failure plane from each reinforcing layer. Note that live load (LL) in Tmax for the reinforcing layer is the load calculated from the base of the wall and maybe larger then LL for the connection (Tcn)

AASHTO design methodology (Simplified or Stiffness) the connection load, To, is equal to the Tmax in the reinforcing. In Limit equilibrium the the connection load (To) is less than the Tmax in the reinforcing layer as it is calculated at each layer of reinforcing, similar to the Trial Wedge Method using in REA software.

ID	Height	Length	Name	%Coverage	Pa	LL	Tcn	TaCn	FSPkCn
3	4	5	3XT	100	102	0	102	1314	12.84
2	2	5	3XT	100	175	0	175	1417	8.10
1	0.67	5	3XT	100	146	0	146	1485	10.18


FS = 2.525
5.58 ft
5.00

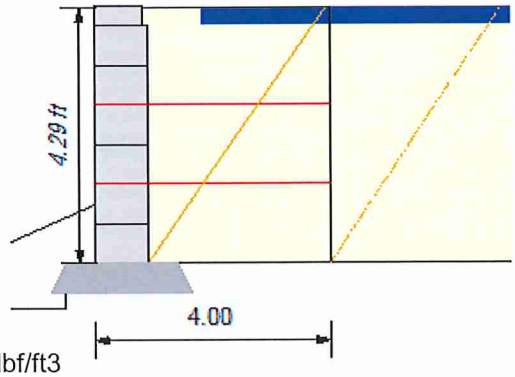
GLOBAL RESULTS

Global stability is a global analysis (Bishop) with the failure planes originating at the top of the slope / wall and exiting out below the wall in the area infront of the structure. For MSE walls, the resistance of the geogrid reinforcement is included in the resisting forces. The curve may go through the base of the wall and the wall shear would be included. In most cases the failure plane will pass below the structure.

ID	Enter Point X	Enter Point Y	Exit Point X	Exit Point Y	Center X	Center Y	Radius	Mo	Mr	FoS
1	9.65	5.58	-3.00	1.09	1.31	9.00	9.01	12453.80	31548.79	2.53
1	8.53	5.58	-3.00	1.09	1.00	7.87	7.87	10525.16	26732.95	2.53
2	8.53	5.58	-5.23	1.09	0.24	7.66	8.55	14242.97	36529.17	2.56
2	7.41	5.58	-5.23	1.09	-0.12	6.75	7.63	12090.85	31086.31	2.56
1	10.76	5.58	-4.12	1.09	0.81	11.66	11.67	17411.73	44757.61	2.56
2	9.65	5.58	-3.00	1.09	1.31	8.99	9.00	12449.13	32072.37	2.57
2	9.65	5.58	-7.46	1.09	-0.88	10.86	11.78	21352.41	55204.59	2.58
1	10.76	5.58	-5.23	1.09	0.05	13.00	13.03	20125.79	52156.19	2.58
2	10.76	5.58	-5.23	1.09	0.06	12.96	13.00	20110.50	52173.60	2.59
2	8.53	5.58	-6.35	1.09	-0.51	8.65	9.55	16348.12	42655.16	2.60

REA Analysis

Project:	EAST TOWN CROSSING PIONEER IMPROVEMENTS
Location:	PUYALLUP, WA
Designer:	rjr
Date:	3/24/2025
Section:	Wall 2, S_15.0_to_22.0
Design Method:	NCMA_09_3rd_Ed, Ignore Vert. Force
Design Unit:	GeoWall Plus 4.0: PL



Seismic Acc:	0.400g
Design Method:	AASHTO 2020, Kavazanjian
Design Equation:	AASHTO 2020, A11.5.1-1

SOIL PARAMETERS	Φ	coh	γ
Reinforced Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Retained Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Foundation Soil:	32 deg	50 lbf/ft2	120 lbf/ft3
Leveling Pad:	40 deg	0 lbf/ft2	135 lbf/ft3
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	4.29 ft (3.30 ft Exp.)		Live Load:	100	Live Load 2:
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	1.00 ft	LL2 Offset:	11 ft
Embedment:	0.99 ft	Live Load Width:	10 ft	LL2 Width:	50 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	0 lbf/ft2		
Back Slope Angle:	0.0 deg	Dead Load Offset:	0.0 ft		
Back Slope Length:	0.0 ft	Dead Load Width:	0.00 ft		
Back Slope Toe Offset:	0.0 ft				
Vertical δ on Single Depth		Toe Slope Angle:	45.80 deg		
		Toe Slope Length:	1.69 ft		
		Toe Slope Bench:	0.00 ft		

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Tension/Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Unit/Unit Shear:	1.50 / 1.13		

RESULTS (Static / Seismic)

FoS Sliding:	3.71 / [2.38]	FoS Overturning:	8.12 / [4.30]
Bearing	684 / [584]	FoS Bearing:	16.58 / [20.52]
FoS Pullout	2.95 / [1.52]		
Total Pullout	999	FoS Total Pullout	3.31
Total Pullout (S)	999	FoS Total Pullout (S)	3.16
Top FoSot:	2.70	FoS Connection:	9.93

ID	*Height*	*Length*	*Name*	*Ta_tn [Ta_tns]*	*Rc %*	*TMax [Tmd]*	*FS Tal [seis]*	*PkCn [seis]*	*PkCn/FS [seis]*	*FS SeisPO*	*FS Sldg*
2	*2.67*	*4*	*3XT*	*1330 [2893]*	*100*	*120 [75]*	*16.67 [14.83]*	*876 [1168]*	*10.98 [8.45]*	*1.98 [1.52]*	*15.27 [12.32]*
1	*1.33*	*4*	*3XT*	*1330 [2893]*	*100*	*144 [44]*	*13.89 [15.43]*	*922 [1229]*	*9.63 [8.41]*	*5.31 [4.64]*	*8.35 [6.31]*

Column Descriptions:

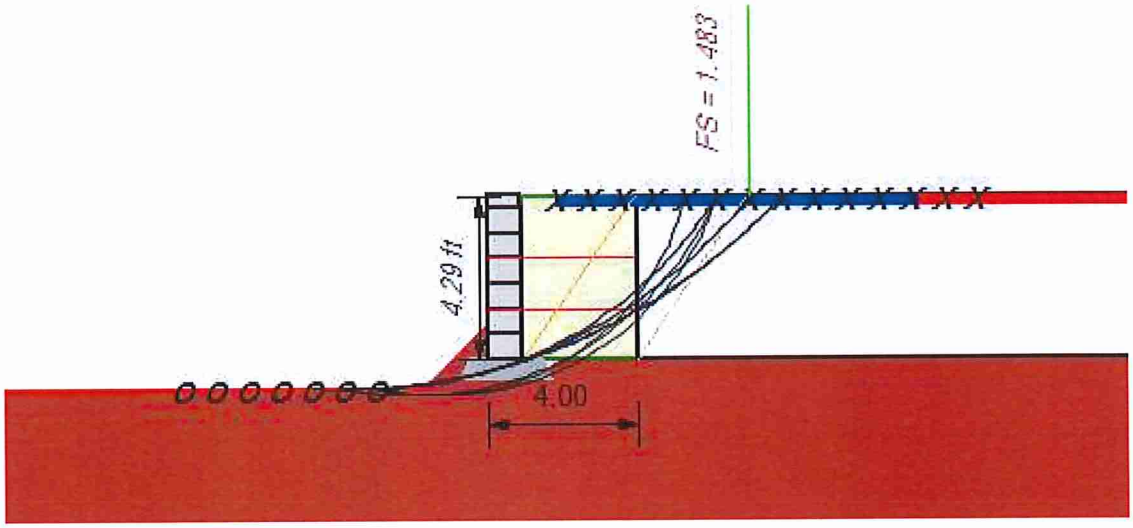
Ta: allowable geogrid strength
Rc %: percent coverage for geosynthetics
EP (Pa) internal active earth pressure
LL (Pql) earth pressure due to live load surcharge
DL (Pqd) earth pressure due to dead load surcharge
Tmax maximum earth pressure on geosynthetic layer
FSstr factor of safety on geogrid strength (LTDS/Tmax)
Ta cn allowable tension on the connection
FS Pkcn, factor of safety on the connection (PkCn/Tmax)
FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
Grid Embedment, depth of embedment beyond the theoretical failure plane.

CONNECTION RESULTS TABLE

Connection results compare the load on the connection (pullout at the face) to the resistance of the connection. In the NCMA design methodolgy the connection load accounts for the loading 'over the active zone' in the failure plane from each reinforcing layer. Note that live load (LL) in Tmax for the reinforcing layer is the load calculated from the base of the wall and maybe larger then LL for the connection (Tcn)

AASHTO design methodology (Simplified or Stiffness) the connection load, To, is equal to the Tmax in the reinforcing. In Limit equilibrium the the connection load (To) is less than the Tmax in the reinforcing layer as it is calculated at each layer of reinforcing, similar to the Trial Wedge Method using in REA software.

ID	Height	Length	Name	%Coverage	Pa	LL	LL2	Tcn	TaCn	FSPkCn
2	2.67	4	3XT	100	80	8	0	88	1314	14.90
1	1.33	4	3XT	100	121	19	0	139	1382	9.93


FS = 1.483
4.29 ft
4.00

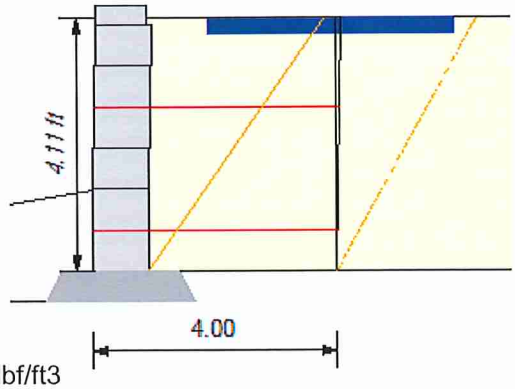
GLOBAL RESULTS

Global stability is a global analysis (Bishop) with the failure planes originating at the top of the slope / wall and exiting out below the wall in the area infront of the structure. For MSE walls, the resistance of the geogrid reinforcement is included in the resisting forces. The curve may go through the base of the wall and the wall shear would be included. In most cases the failure plane will pass below the structure.

ID	Enter Point X	Enter Point Y	Exit Point X	Exit Point Y	Center X	Center Y	Radius	Mo	Mr	FoS
1	6.98	4.29	-3.00	-0.75	-3.55	12.74	13.50	14485.08	21596.81	1.48
1	7.84	4.29	-3.86	-0.75	-3.98	15.63	16.38	17880.45	27107.42	1.51
1	6.12	4.29	-3.00	-0.75	-3.04	10.11	10.86	11373.61	17478.62	1.53
2	5.27	4.29	-3.00	-0.75	-1.39	5.92	6.86	7807.38	12017.09	1.53
1	7.84	4.29	-3.00	-0.75	-4.15	15.91	16.69	18224.03	28188.17	1.54
1	6.12	4.29	-3.86	-0.75	-3.13	10.22	10.99	11504.28	17829.95	1.54
1	6.98	4.29	-3.86	-0.75	-3.52	12.70	13.45	14386.68	22564.54	1.56
2	6.12	4.29	-3.86	-0.75	-1.94	7.85	8.81	10590.20	16719.33	1.57
2	6.12	4.29	-3.00	-0.75	-1.24	6.84	7.79	9513.53	15164.78	1.58
1	7.84	4.29	-4.72	-0.75	-4.04	15.72	16.49	17952.42	28617.70	1.59

REA Analysis

Project:	EAST TOWN CROSSING PIONEER IMPROVEMENTS
Location:	PUYALLUP, WA
Designer:	rjr
Date:	3/24/2025
Section:	Wall 3, S_43.0_to_51.0
Design Method:	NCMA_09_3rd_Ed, Ignore Vert. Force
Design Unit:	GeoWall Plus 4.0: PL



Seismic Acc:	0.400g
Design Method:	AASHTO 2020, Kavazanjian
Design Equation:	AASHTO 2020, A11.5.1-1

SOIL PARAMETERS	Φ	coh	γ
Reinforced Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Retained Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Foundation Soil:	32 deg	50 lbf/ft2	120 lbf/ft3
Leveling Pad:	40 deg	0 lbf/ft2	135 lbf/ft3
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	4.11 ft (2.80 ft Exp.)			Live Load:	100 lbf/ft2
Wall Batter/Tilt:	1.00/ 0.00 deg	Live Load Offset:	1.00 ft		
Embedment:	1.31 ft	LL2 Width:	4 ft		
Leveling Pad Depth:	0.50 ft	Dead Load:	0 lbf/ft2		
Back Slope Angle:	0.0 deg	Dead Load Offset:	0.0 ft		
Back Slope Length:	0.0 ft	Dead Load Width:	0.00 ft		
Back Slope Toe Offset:	0.0 ft				
Vertical δ on Single Depth		Toe Slope Angle:	35.80 deg		
		Toe Slope Length:	0.90 ft		
		Toe Slope Bench:	0.00 ft		

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Tension/Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Unit/Unit Shear:	1.50 / 1.13		

RESULTS (Static / Seismic)

FoS Sliding:	4.15 / [2.50]	FoS Overturning:	9.69 / [4.71]
Bearing	644 / [557]	FoS Bearing:	19.61 / [23.47]
FoS Pullout	2.44 / [1.32]		
Total Pullout	1,304	FoS Total Pullout	4.82
Total Pullout (S)	1,304	FoS Total Pullout (S)	4.57
Top FoSot:	4.27	FoS Connection:	9.88

ID	*Height*	*Length*	*Name*	*Ta_tn [Ta_tns]*	*Rc %*	*TMax [Tmd]*	*FS Tal [seis]*	*PkCn [seis]*	*PkCn/FS [seis]*	*FS SeisPO*	*FS Sldg*
2	*2.67*	*4*	*3XT*	*1330 [2893]*	*100*	*130 [76]*	*15.37 [14.06]*	*876 [1168]*	*10.12 [7.93]*	*1.68 [1.32]*	*17.92 [14.76]*
1	*0.67*	*4*	*3XT*	*1330 [2893]*	*100*	*146 [41]*	*13.62 [15.39]*	*944 [1259]*	*9.67 [8.53]*	*7.41 [6.54]*	*7.43 [5.64]*

Column Descriptions:

Ta: allowable geogrid strength
Rc %: percent coverage for geosynthetics
EP (Pa) internal active earth pressure
LL (Pql) earth pressure due to live load surcharge
DL (Pqd) earth pressure due to dead load surcharge
Tmax maximum earth pressure on geosynthetic layer
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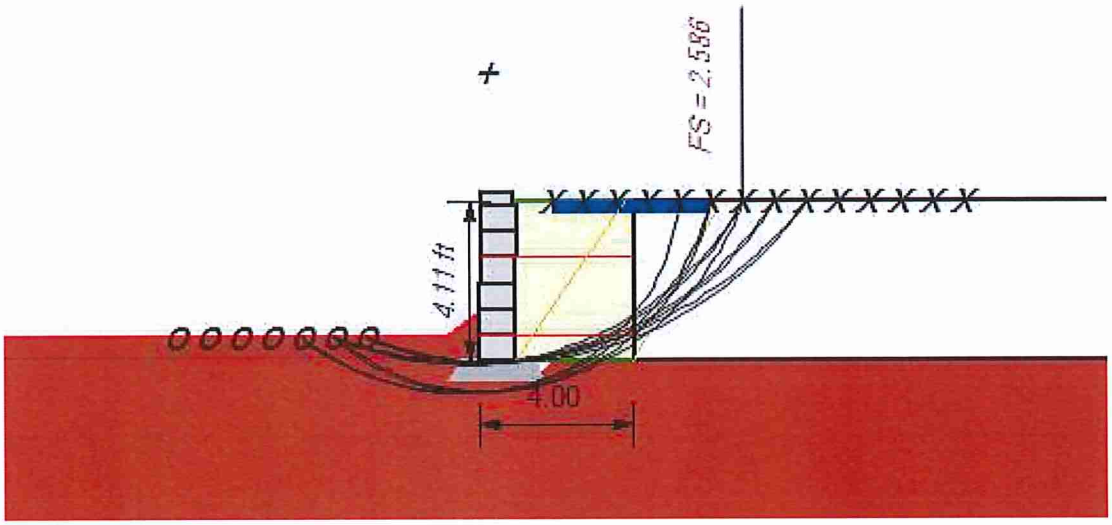
ID	Height	Length	Name	%Coverage	Pa	LL	Tcn	TaCn	FSPkCn
2	2.67	4	3XT	100	90	9	99	1314	13.25
1	0.67	4	3XT	100	125	19	143	1417	9.88


FS = 2.586
4.11 ft
4.00

GLOBAL RESULTS

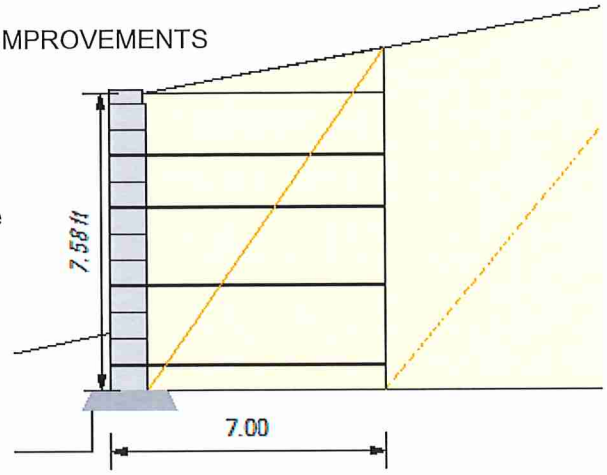
Global stability is a global analysis (Bishop) with the failure planes originating at the top of the slope / wall and exiting out below the wall in the area infront of the structure. For MSE walls, the resistance of the geogrid reinforcement is included in the resisting forces. The curve may go through the base of the wall and the wall shear would be included. In most cases the failure plane will pass below the structure.

ID	Enter Point X	Enter Point Y	Exit Point X	Exit Point Y	Center X	Center Y	Radius	Mo	Mr	FoS
1	6.82	4.11	-2.98	0.66	0.17	7.38	7.42	6026.69	15626.69	2.59
1	8.47	4.11	-3.80	0.66	0.01	10.66	10.70	9317.17	24240.40	2.59
2	6.00	4.11	-3.80	0.66	0.11	5.21	6.00	5605.16	14622.68	2.60
1	7.65	4.11	-2.98	0.66	0.35	8.48	8.50	7054.78	18408.56	2.60
1	8.47	4.11	-2.98	0.66	0.55	9.66	9.67	8102.53	21310.10	2.62
1	6.82	4.11	-3.80	0.66	-0.35	8.12	8.22	6941.72	18266.64	2.62
2	6.82	4.11	-4.62	0.66	-0.18	6.65	7.45	7543.34	19885.62	2.63
2	6.00	4.11	-4.62	0.66	-0.45	5.90	6.70	6491.68	17124.53	2.63
2	5.18	4.11	-3.80	0.66	-0.15	4.58	5.35	4740.81	12539.34	2.64
1	7.65	4.11	-3.80	0.66	-0.18	9.35	9.42	8082.00	21413.12	2.64

REA Analysis

Project:	EAST TOWN CROSSING PIONEER IMPROVEMENTS
Location:	PUYALLUP, WA
Designer:	rjr
Date:	3/24/2025
Section:	Wall 4, S_25.0_to_29.0
Design Method:	NCMA_09_3rd_Ed, Ignore Vert. Force
Design Unit:	GeoWall Plus 4.0: PL

Seismic Acc:	0.400g
Design Method:	AASHTO 2020, Kavazanjian
Design Equation:	AASHTO 2020, A11.5.1-1



SOIL PARAMETERS	Φ	coh	γ
Reinforced Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Retained Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Foundation Soil:	32 deg	50 lbf/ft2	120 lbf/ft3
Leveling Pad:	40 deg	0 lbf/ft2	135 lbf/ft3
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	7.58 ft (6.12 ft Exp.)	Live Load:	0 lbf/ft2
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	1.46 ft	LL2 Width:	0 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	0 lbf/ft2
Back Slope Angle:	10.4 deg	Dead Load Offset:	0.0 ft
Back Slope Length:	21.0 ft	Dead Load Width:	0.00 ft
Back Slope Toe Offset:	0.0 ft		
Vertical δ on Single Depth		Toe Slope Angle:	11.50 deg
		Toe Slope Length:	14.70 ft
		Toe Slope Bench:	0.00 ft

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Tension/Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Unit/Unit Shear:	1.50 / 1.13		

RESULTS (Static / Seismic)

FoS Sliding:	3.51 / [2.09]	FoS Overturning:	6.78 / [3.75]
Bearing	1,138 / [1,148]	FoS Bearing:	14.92 / [16.26]
FoS Pullout	6.47 / [2.42]		
Total Pullout	9,788	FoS Total Pullout	9.04
Total Pullout (S)	9,788	FoS Total Pullout (S)	7.97
Top FoSot:	3.57	FoS Connection:	4.30

ID	*Height*	*Length*	*Name*	*Ta_tn [Ta_tns]*	*Rc %*	*TMax [Tmd]*	*FS Tal [seis]*	*PkCn [seis]*	*PkCn/FS [seis]*	*FS SeisPO*	*FS Sldg*
4	*6*	*7*	*3XT*	*1330 [2893]*	*100*	*89 [148]*	*22.52 [12.22]*	*876 [1168]*	*14.83 [5.55]*	*6.47 [2.42]*	*13.69 [11.67]*
3	*4.67*	*7*	*3XT*	*1330 [2893]*	*100*	*180 [110]*	*11.07 [9.97]*	*922 [1229]*	*7.67 [4.77]*	*7.10 [4.41]*	*8.78 [6.94]*
2	*2.67*	*7*	*3XT*	*1330 [2893]*	*100*	*345 [132]*	*5.78 [6.07]*	*990 [1320]*	*4.30 [3.11]*	*8.30 [6.00]*	*5.70 [4.25]*
1	*0.67*	*7*	*3XT*	*1330 [2893]*	*100*	*308 [88]*	*6.48 [7.31]*	*1058 [1411]*	*5.15 [4.01]*	*16.47 [12.82]*	*4.21 [3.05]*

Column Descriptions:

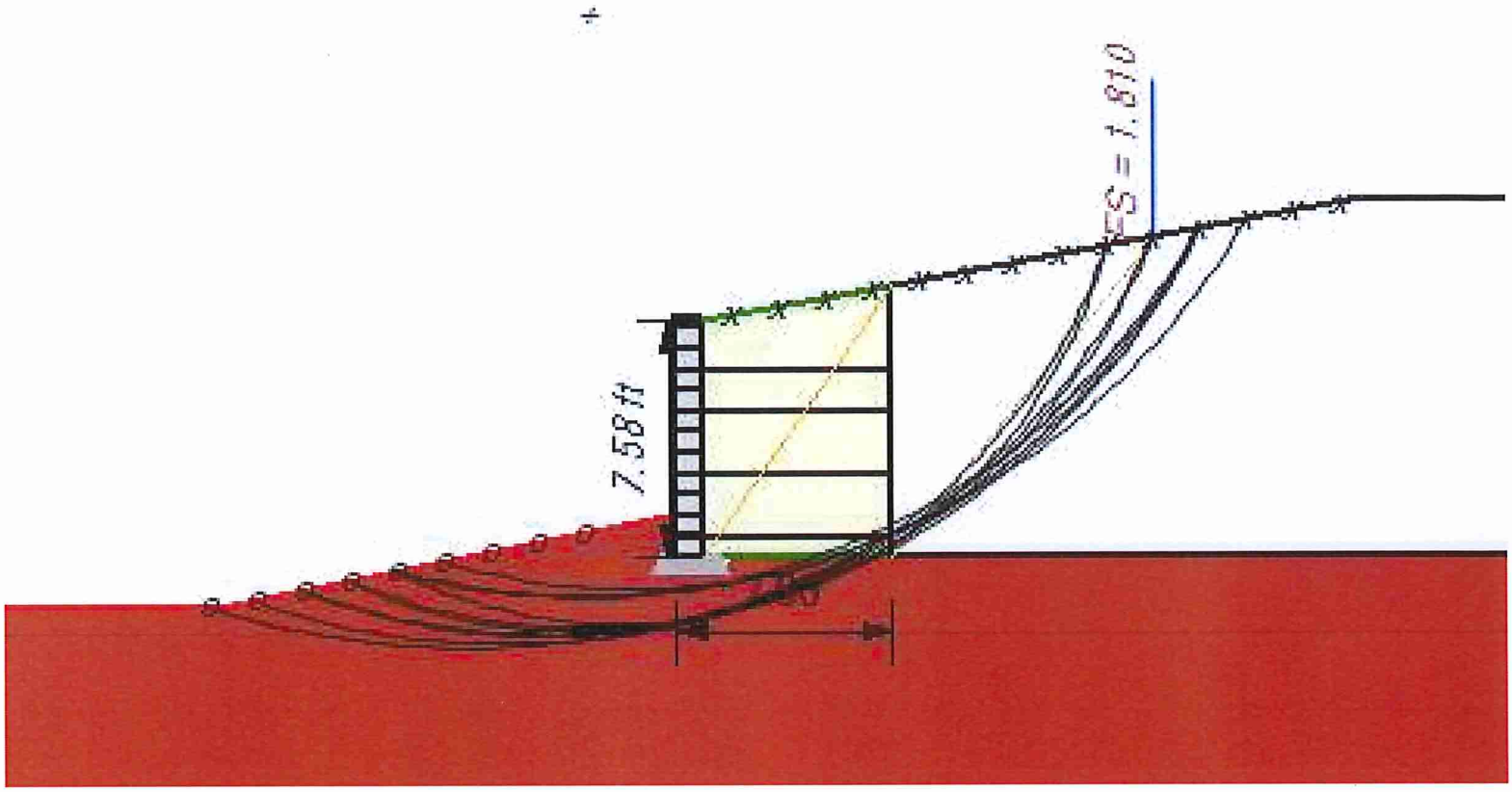
Ta: allowable geogrid strength
Rc %: percent coverage for geosynthetics
EP (Pa) internal active earth pressure
LL (Pql) earth pressure due to live load surcharge
DL (Pqd) earth pressure due to dead load surcharge
Tmax maximum earth pressure on geosynthetic layer
FSstr factor of safety on geogrid strength (LTDS/Tmax)
Ta cn allowable tension on the connection
FS Pkcn, factor of safety on the connection (PkCn/Tmax)
FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
Grid Embedment, depth of embedment beyond the theoretical failure plane.

CONNECTION RESULTS TABLE

Connection results compare the load on the connection (pullout at the face) to the resistance of the connection. In the NCMA design methodolgy the connection load accounts for the loading 'over the active zone' in the failure plane from each reinforcing layer. Note that live load (LL) in Tmax for the reinforcing layer is the load calculated from the base of the wall and maybe larger then LL for the connection (Tcn)

AASHTO design methodology (Simplified or Stiffness) the connection load, To, is equal to the Tmax in the reinforcing. In Limit equilibrium the the connection load (To) is less than the Tmax in the reinforcing layer as it is calculated at each layer of reinforcing, similar to the Trial Wedge Method using in REA software.

ID	Height	Length	Name	%Coverage	Pa	Tcn	TaCn	FSPkCn
4	6	7	3XT	100	89	89	1314	14.83
3	4.67	7	3XT	100	180	180	1382	7.67
2	2.67	7	3XT	100	345	345	1485	4.30
1	0.67	7	3XT	100	308	308	1588	5.15


FS = 1.810
7.58 ft

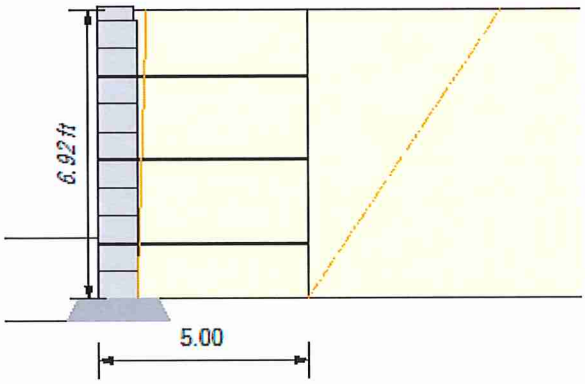
GLOBAL RESULTS

Global stability is a global analysis (Bishop) with the failure planes originating at the top of the slope / wall and exiting out below the wall in the area infront of the structure. For MSE walls, the resistance of the geogrid reinforcement is included in the resisting forces. The curve may go through the base of the wall and the wall shear would be included. In most cases the failure plane will pass below the structure.

ID	Enter Point X	Enter Point Y	Exit Point X	Exit Point Y	Center X	Center Y	Radius	Mo	Mr	FoS
3	15.48	10.27	-10.58	-0.69	-2.84	17.37	19.65	114910.75	208829.15	1.81
3	18.51	10.82	-9.06	-0.38	-2.68	23.42	24.65	139167.99	252837.93	1.81
3	16.99	10.55	-13.61	-1.31	-5.33	22.75	25.44	163446.58	298803.77	1.82
3	16.99	10.55	-7.55	-0.08	-1.39	19.35	20.38	106748.44	195665.28	1.83
3	16.99	10.55	-15.13	-1.53	-6.65	24.66	27.53	176633.63	324165.23	1.83
3	16.99	10.55	-12.10	-1.00	-3.97	20.95	23.41	147996.31	271720.56	1.83
3	13.96	9.99	-9.06	-0.38	-1.78	14.18	16.29	87375.18	160545.16	1.83
3	16.99	10.55	-9.06	-0.38	-2.79	21.18	22.46	121238.22	222829.40	1.83
3	15.48	10.27	-12.10	-1.00	-4.17	18.97	21.48	129006.72	237460.32	1.83
3	13.96	9.99	-10.58	-0.69	-3.07	15.58	17.92	99137.18	182527.54	1.83

REA Analysis

Project:	EAST TOWN CROSSING PIONEER IMPROVEMENTS
Location:	PUYALLUP, WA
Designer:	rjr
Date:	3/24/2025
Section:	Wall 5, S_159.0_to_170.0
Design Method:	NCMA_09_3rd_Ed, Ignore Vert. Force
Design Unit:	GeoWall Plus 4.0: PL
Seismic Acc:	0.400g
Design Method:	AASHTO 2020, Kavazanjian
Design Equation:	AASHTO 2020, A11.5.1-1



SOIL PARAMETERS	Φ	coh	γ
Reinforced Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Retained Soil:	32 deg	0 lbf/ft2	120 lbf/ft3
Foundation Soil:	32 deg	50 lbf/ft2	120 lbf/ft3
Leveling Pad:	40 deg	0 lbf/ft2	135 lbf/ft3
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	6.92 ft (5.47 ft Exp.)	Live Load:	250 lbf/ft2
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	-100.00 ft
Embedment:	1.45 ft	LL2 Width:	-80 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	0 lbf/ft2
Back Slope Angle:	0.0 deg	Dead Load Offset:	0.0 ft
Back Slope Length:	0.0 ft	Dead Load Width:	0.00 ft
Back Slope Toe Offset:	0.0 ft		
Vertical δ on Single Depth			

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Tension/Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Unit/Unit Shear:	1.50 / 1.13		

RESULTS (Static / Seismic)

FoS Sliding:	3.97 / [2.03]	FoS Overturning:	6.69 / [2.91]
Bearing	1,005 / [967]	FoS Bearing:	13.81 / [15.79]
FoS Pullout	1000.00 / [5.41]		
Total Pullout	5,155	FoS Total Pullout	50.97
Total Pullout (S)	5,155	FoS Total Pullout (S)	11.61
Top FoSot:	100.00	FoS Connection:	1000.00

ID	*Height*	*Length*	*Name*	*Ta_tn [Ta_tns]*	*Rc %*	*TMax [Tmd]*	*FS Tal [seis]*	*PkCn [seis]*	*PkCn/FS [seis]*	*FS SeisPO*	*FS Sldg*
3	*5.33*	*5*	*3XT*	*1330 [2893]*	*100*	*0 [137]*	*Infinity [21.08]*	*876 [1168]*	*Infinity [8.74]*	*Infinity [5.41]*	*34.89 [25.76]*
2	*3.33*	*5*	*3XT*	*1330 [2893]*	*100*	*0 [106]*	*Infinity [27.27]*	*944 [1259]*	*Infinity [10.55]*	*Infinity [16.09]*	*11.28 [8.02]*
1	*1.33*	*5*	*3XT*	*1330 [2893]*	*100*	*0 [88]*	*Infinity [32.72]*	*1013 [1350]*	*Infinity [12.26]*	*Infinity [30.61]*	*6.48 [4.53]*

Column Descriptions:

Ta: allowable geogrid strength
Rc %: percent coverage for geosynthetics
EP (Pa) internal active earth pressure
LL (Pql) earth pressure due to live load surcharge
DL (Pqd) earth pressure due to dead load surcharge
Tmax maximum earth pressure on geosynthetic layer
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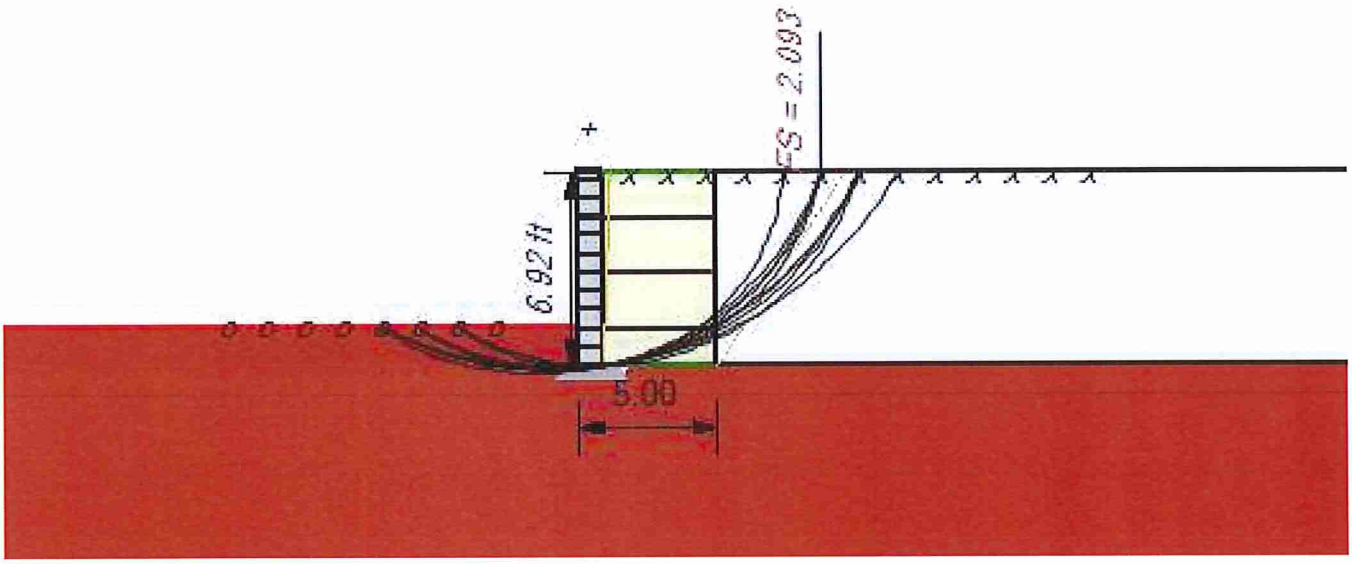
ID	Height	Length	Name	%Coverage	Pa	LL	Tcn	TaCn	FSPkCn
3	5.33	5	3XT	100	13	0	0	1314	100.00
2	3.33	5	3XT	100	28	0	0	1417	100.00
1	1.33	5	3XT	100	36	0	0	1519	100.00


FS = 2.093
6.92 ft
5.00

GLOBAL RESULTS

Global stability is a global analysis (Bishop) with the failure planes originating at the top of the slope / wall and exiting out below the wall in the area infront of the structure. For MSE walls, the resistance of the geogrid reinforcement is included in the resisting forces. The curve may go through the base of the wall and the wall shear would be included. In most cases the failure plane will pass below the structure.

ID	Enter Point X	Enter Point Y	Exit Point X	Exit Point Y	Center X	Center Y	Radius	Mo	Mr	FoS
1	8.75	6.92	-4.38	1.45	0.39	8.49	8.51	16852.20	35403.74	2.09
1	10.14	6.92	-5.77	1.45	-0.18	11.07	11.12	24192.76	50963.25	2.10
1	8.75	6.92	-5.77	1.45	-0.52	9.52	9.63	20055.90	42318.28	2.10
2	10.14	6.92	-7.15	1.45	-1.00	12.08	12.28	27637.29	59705.32	2.15
1	8.75	6.92	-7.15	1.45	-1.36	10.48	10.73	23053.33	50103.23	2.17
1	10.14	6.92	-4.38	1.45	0.75	9.82	9.82	20337.46	44457.28	2.18
1	11.52	6.92	-7.15	1.45	-0.72	14.09	14.18	32642.00	71370.81	2.18
1	7.37	6.92	-4.38	1.45	0.06	7.27	7.32	13662.86	29910.43	2.18
2	8.75	6.92	-5.77	1.45	-0.45	9.36	9.52	20008.94	43957.72	2.19
1	10.14	6.92	-7.15	1.45	-1.05	12.23	12.38	27668.83	60792.71	2.19