

DESIGN OVERVIEW

Attached are sample design calculations for the permanent site soil nail retaining wall proposed at Serramonte Vista project in Daly City, CA. The design section shown is for the 70-foot tall tiered retaining wall behind Podium A.

The walls will be designed based on engineering methods typically employed by Caltrans and the federal Highway Administration (Service Load Design Method) for soil nail walls. The design and the allowable factors of safety on various components of the Administration (FHWA) "Manual for Design and Construction Monitoring of Soil Nail Walls", Report No. (FHWA-SA-96-069). The limit equilibrium computer program SNAILZ, created by Caltrans, will primarily used in the analysis. Soil nail facing design will be performed using a spreadsheet program written by Drill Tech Drill Tech Drilling & Shoring, Inc. in accordance with FHWA guidelines.

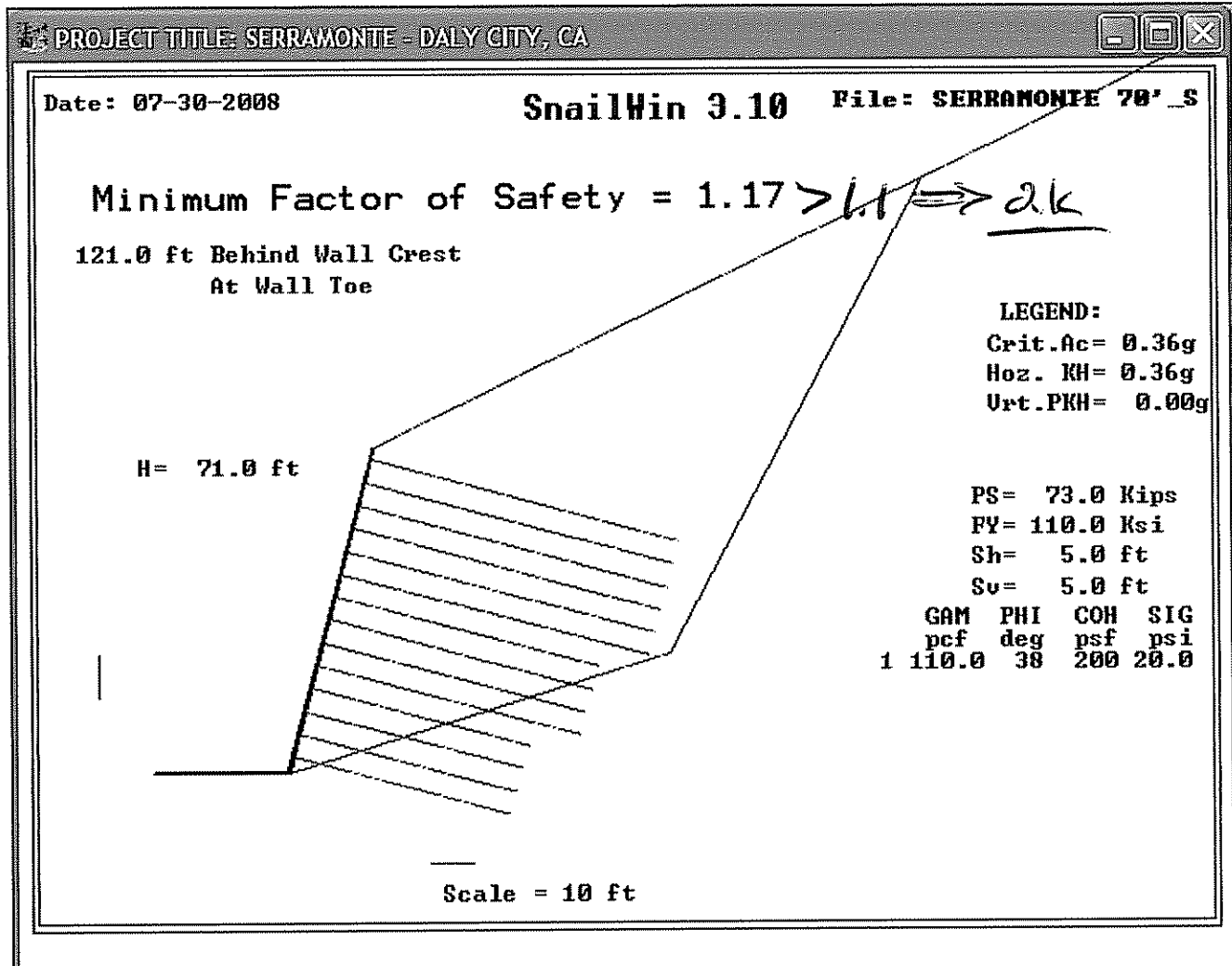
Seismic design of the soul nail walls, as recommended by the FHWA, is a pseudo-stati analysis using a seismic coefficient equal to 50 percent of the peak ground acceleration provided by the geotechnical engineer (Berlogar Geotechnical Consultants). Both static and seismic analysis will be performed for every wall section, with the minimum allowed factor of safety with respect to soil shearing being 1.5 for static conditions and 1.13 for seismic conditions. The factor of safety will be calculated using allowable stresses in the concrete and steel.

The minimum factors of safety on the various wall components are as follows:

Soil Shear (Static) -	1.50
Soil Shear (Seismic) -	1.13
Bar Tensile Stress -	1.82*
Grout to Soul Adhesion -	2.0*
Facing Strength -	1.5*

*Allowable capacities increased by 1/3 for seismic loading

SEISMIC ANALYSIS



MAX RETAINED HEIGHT BEHIND PODIUM 'A'

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*****
* CALIFORNIA DEPARTMENT OF TRANSPORTATION *
* ENGINEERING SERVICE CENTER *
* DIVISION OF MATERIALS AND FOUNDATIONS *
* Office of Roadway Geotechnical Engineering *
* Date: 07-30-2008 Time: 18:27:11 *
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Project Identification - SERRAMONTE - DALY CITY, CA

----- WALL GEOMETRY -----

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Vertical Wall Height      = 71.0 ft
Wall Batter               = 15.0 degree
                          Angle   Length
                          (Deg)  (Feet)
First Slope from Wallcrest. = 26.0   300.0
Second Slope from 1st slope. = 0.0    0.0
Third Slope from 2nd slope.  = 0.0    0.0
Fourth Slope from 3rd slope. = 0.0    0.0
Fifth Slope from 3rd slope.  = 0.0    0.0
Sixth Slope from 3rd slope.  = 0.0    0.0
Seventh Slope Angle.        = 0.0
```

----- SLOPE BELOW THE WALL -----

There is NO SLOPE BELOW THE TOE of the wall

----- SURCHARGE -----

There is NO SURCHARGE imposed on the system.

----- OPTION #1 -----

Factored Punching shear, Bond & Yield Stress are used.

----- SOIL PARAMETERS -----

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary			
					XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	110.0	38.0	200.0	20.0	0.0	0.0	0.0	0.0

* Bond Stress also depends on BSF Factor in Option #5 when enabled.

----- EARTHQUAKE ACCELERATION -----

Horizontal Earthquake Coefficient = 0.36 (a/g)
 Vertical Earthquake Coefficient = 0.00

----- WATER SURFACE -----

NO Water Table defined for this problem.

----- SEARCH LIMIT -----

The Search Limit is from 1.9 to 140.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

----- REINFORCEMENT PARAMETERS -----

Number of Reinforcement Levels = 14
 Horizontal Spacing = 5.0 ft
 Yield Stress of Reinforcement = 110.0 ksi
 Diameter of Grouted Hole = 6.0 in
 Punching Shear = 73.0 kips

----- (Varying Reinforcement Parameters) -----

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	70.0	15.0	2.5	1.25	1.00
2	70.0	15.0	5.0	1.25	1.00
3	70.0	15.0	5.0	1.25	1.00
4	70.0	15.0	5.0	1.25	1.00
5	70.0	15.0	5.0	1.25	1.00
6	70.0	15.0	5.0	1.25	1.00
7	60.0	15.0	5.0	1.25	1.00
8	60.0	15.0	5.0	1.25	1.00
9	60.0	15.0	5.0	1.25	1.00
10	60.0	15.0	5.0	1.25	1.00
11	50.0	15.0	5.0	1.25	1.00
12	50.0	15.0	5.0	1.25	1.00
13	50.0	15.0	5.0	1.25	1.00
14	50.0	15.0	5.0	1.25	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
			ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)
Toe	3.740	31.1	0.0	12.4	76.4	79.1

Reinf. Stress at Level

1 = 97.926 Ksi (Punching Shear controls..)
2 = 98.376 ksi (Punching Shear controls..)
3 = 98.826 ksi (Punching Shear controls..)
4 = 99.277 ksi (Punching Shear controls..)
5 = 99.727 ksi (Punching Shear controls..)
6 = 100.177 ksi (Punching Shear controls..)
7 = 100.627 ksi (Punching Shear controls..)
8 = 101.077 ksi (Punching Shear controls..)
9 = 101.527 ksi (Punching Shear controls..)
10 = 101.978 ksi (Punching Shear controls..)
11 = 102.428 ksi (Punching Shear controls..)
12 = 102.878 ksi (Punching Shear controls..)
13 = 103.328 ksi (Punching Shear controls..)
14 = 103.778 ksi (Punching Shear controls..)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
			ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)
NODE 2	3.224	43.2	0.0	30.3	81.1	83.8

Reinf. Stress at Level

1 = 110.000 Ksi (Yield Stress controls..)
2 = 110.000 Ksi (Yield Stress controls..)
3 = 110.000 Ksi (Yield Stress controls..)
4 = 110.000 Ksi (Yield Stress controls..)
5 = 110.000 Ksi (Yield Stress controls..)
6 = 110.000 Ksi (Yield Stress controls..)
7 = 110.000 Ksi (Yield Stress controls..)
8 = 110.000 Ksi (Yield Stress controls..)
9 = 110.000 Ksi (Yield Stress controls..)
10 = 110.000 Ksi (Yield Stress controls..)
11 = 81.054 Ksi (Pullout controls...)
12 = 79.015 Ksi (Pullout controls...)
13 = 76.975 Ksi (Pullout controls...)
14 = 109.337 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 3

2.761	55.3	12.9	39.7	78.3	81.5
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Reinf. Stress at Level

1 = 110.000 Ksi (Yield Stress controls.)
2 = 110.000 Ksi (Yield Stress controls.)
3 = 110.000 Ksi (Yield Stress controls.)
4 = 110.000 Ksi (Yield Stress controls.)
5 = 110.000 Ksi (Yield Stress controls.)
6 = 110.000 Ksi (Yield Stress controls.)
7 = 96.228 Ksi (Pullout controls...)
8 = 95.142 Ksi (Pullout controls...)
9 = 94.056 Ksi (Pullout controls...)
10 = 92.970 Ksi (Pullout controls...)
11 = 55.020 Ksi (Pullout controls...)
12 = 87.021 Ksi (Pullout controls...)
13 = 110.000 Ksi (Yield Stress controls.)
14 = 84.711 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 4

2.242	67.4	9.9	54.8	81.0	86.2
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Reinf. Stress at Level

1 = 93.567 Ksi (Pullout controls...)
2 = 91.561 Ksi (Pullout controls...)
3 = 89.555 Ksi (Pullout controls...)
4 = 87.549 Ksi (Pullout controls...)
5 = 85.543 Ksi (Pullout controls...)
6 = 83.537 Ksi (Pullout controls...)
7 = 44.667 Ksi (Pullout controls...)
8 = 42.660 Ksi (Pullout controls...)
9 = 40.654 Ksi (Pullout controls...)
10 = 38.648 Ksi (Pullout controls...)
11 = 32.556 Ksi (Pullout controls...)
12 = 73.574 Ksi (Pullout controls...)
13 = 110.000 Ksi (Yield Stress controls.)
14 = 88.198 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 5

1.858	79.5	10.2	56.6	75.2	93.5
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Reinf. Stress at Level

1 =	70.131 Ksi	(Pullout controls...)
2 =	70.055 Ksi	(Pullout controls...)
3 =	69.980 Ksi	(Pullout controls...)
4 =	69.904 Ksi	(Pullout controls...)
5 =	69.829 Ksi	(Pullout controls...)
6 =	69.754 Ksi	(Pullout controls...)
7 =	32.814 Ksi	(Pullout controls...)
8 =	32.739 Ksi	(Pullout controls...)
9 =	32.663 Ksi	(Pullout controls...)
10 =	32.588 Ksi	(Pullout controls...)
11 =	34.520 Ksi	(Pullout controls...)
12 =	75.006 Ksi	(Pullout controls...)
13 =	110.000 Ksi	(Yield Stress controls.)
14 =	87.826 ksi	(Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 6

1.570	91.6	16.2	76.3	77.9	87.1
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Reinf. Stress at Level

1 =	23.156 Ksi	(Pullout controls...)
2 =	22.205 Ksi	(Pullout controls...)
3 =	21.255 Ksi	(Pullout controls...)
4 =	20.304 Ksi	(Pullout controls...)
5 =	19.353 Ksi	(Pullout controls...)
6 =	18.402 Ksi	(Pullout controls...)
7 =	0.000 Ksi	
8 =	10.008 Ksi	(Pullout controls...)
9 =	41.526 Ksi	(Pullout controls...)
10 =	73.045 Ksi	(Pullout controls...)
11 =	67.700 Ksi	(Pullout controls...)
12 =	99.219 Ksi	(Pullout controls...)
13 =	110.000 Ksi	(Yield Stress controls.)
14 =	81.549 ksi	(Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 7

1.399	103.7	17.2	76.0	70.9	95.1
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Reinf. Stress at Level

1 = 12.939 Ksi (Pullout controls...)
2 = 14.307 Ksi (Pullout controls...)
3 = 15.675 Ksi (Pullout controls...)
4 = 17.043 Ksi (Pullout controls...)
5 = 18.411 Ksi (Pullout controls...)
6 = 19.779 Ksi (Pullout controls...)
7 = 0.000 Ksi
8 = 18.096 Ksi (Pullout controls...)
9 = 48.407 Ksi (Pullout controls...)
10 = 78.719 Ksi (Pullout controls...)
11 = 72.167 Ksi (Pullout controls...)
12 = 102.479 Ksi (Pullout controls...)
13 = 110.000 Ksi (Yield Stress controls.)
14 = 80.704 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 8

1.303	115.8	16.3	84.4	69.8	100.7
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Reinf. Stress at Level

1 = 0.000 Ksi
2 = 0.000 Ksi
3 = 0.000 Ksi
4 = 0.000 Ksi
5 = 0.000 Ksi
6 = 0.000 Ksi
7 = 0.000 Ksi
8 = 10.561 Ksi (Pullout controls...)
9 = 41.998 Ksi (Pullout controls...)
10 = 73.434 Ksi (Pullout controls...)
11 = 68.006 Ksi (Pullout controls...)
12 = 99.442 Ksi (Pullout controls...)
13 = 110.000 Ksi (Yield Stress controls.)
14 = 81.491 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 9

1.209	127.9	17.9	80.7	62.7	111.7
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Reinf. Stress at Level

1 =	0.000 Ksi
2 =	0.000 Ksi
3 =	0.000 Ksi
4 =	0.000 Ksi
5 =	3.363 Ksi (Pullout controls...)
6 =	7.510 Ksi (Pullout controls...)
7 =	0.000 Ksi
8 =	23.730 Ksi (Pullout controls...)
9 =	53.201 Ksi (Pullout controls...)
10 =	82.671 Ksi (Pullout controls...)
11 =	75.278 Ksi (Pullout controls...)
12 =	104.749 Ksi (Pullout controls...)
13 =	109.586 ksi (Punching Shear controls..)
14 =	80.115 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE10

1.175	140.0	17.2	87.9	61.7	118.1
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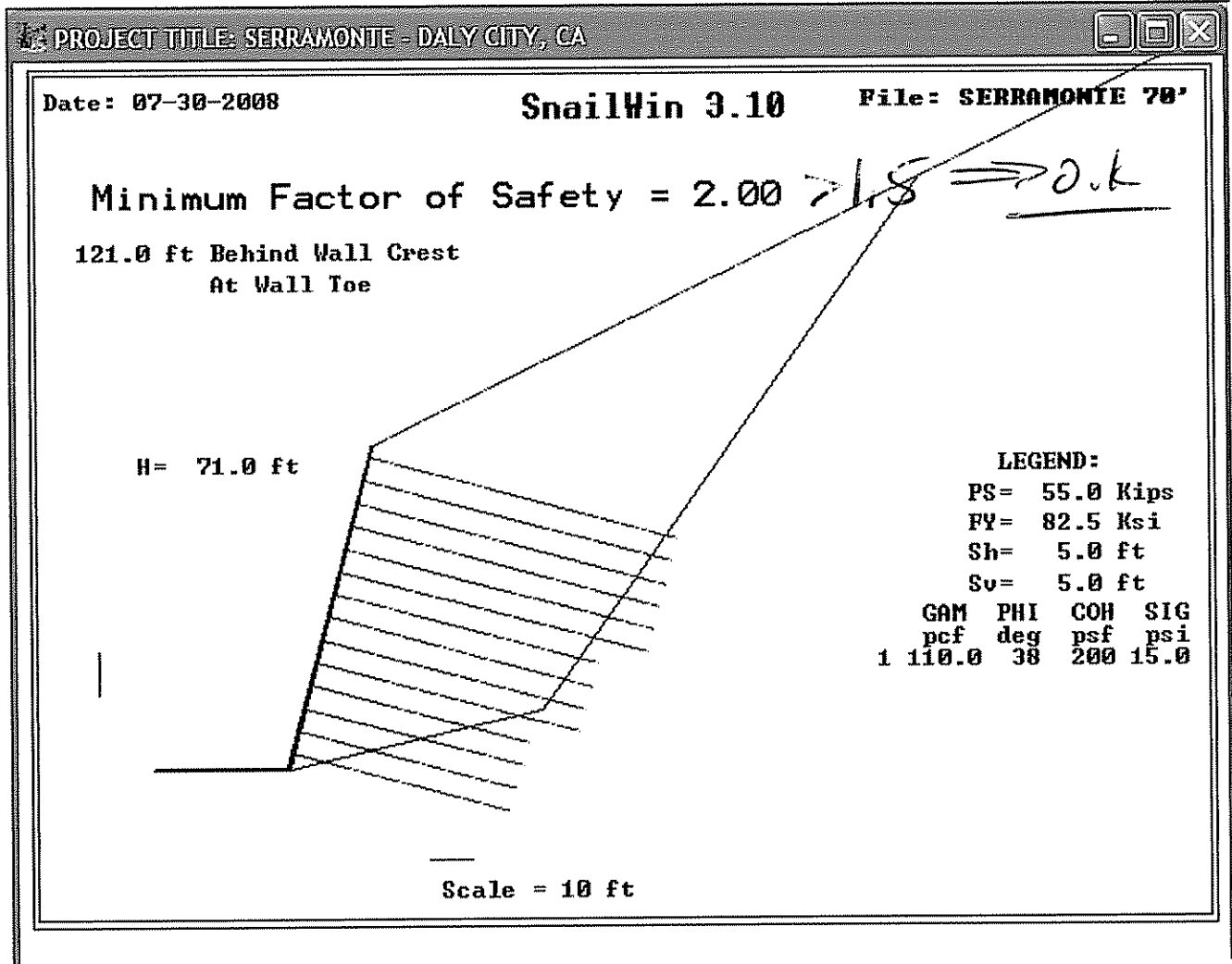
Reinf. Stress at Level

1 =	0.000 Ksi
2 =	0.000 Ksi
3 =	0.000 Ksi
4 =	0.000 Ksi
5 =	0.000 Ksi
6 =	0.000 Ksi
7 =	0.000 Ksi
8 =	18.153 Ksi (Pullout controls...)
9 =	48.456 Ksi (Pullout controls...)
10 =	78.759 Ksi (Pullout controls...)
11 =	72.198 Ksi (Pullout controls...)
12 =	102.501 Ksi (Pullout controls...)
13 =	110.000 Ksi (Yield Stress controls.)
14 =	80.698 ksi (Punching Shear controls..)

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*****
*                               *
*           For Factor of Safety = 1.0                               *
*           Maximum Average Reinforcement Working Force:             *
*                               63.327 Kips/level                     *
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STATIC ANALYSIS



MAX RETAINED HEIGHT BEHIND PODIUM 'A'

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*****
* CALIFORNIA DEPARTMENT OF TRANSPORTATION *
* ENGINEERING SERVICE CENTER *
* DIVISION OF MATERIALS AND FOUNDATIONS *
* Office of Roadway Geotechnical Engineering *
* Date: 07-30-2008 Time: 18:26:41 *
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Project Identification - SERRAMONTE - DALY CITY, CA

----- WALL GEOMETRY -----

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Vertical Wall Height      = 71.0 ft
Wall Batter               = 15.0 degree
                          Angle   Length
                          (Deg)  (Feet)
First Slope from Wallcrest. = 26.0   300.0
Second Slope from 1st slope. = 0.0    0.0
Third Slope from 2nd slope.  = 0.0    0.0
Fourth Slope from 3rd slope. = 0.0    0.0
Fifth Slope from 3rd slope.  = 0.0    0.0
Sixth Slope from 3rd slope.  = 0.0    0.0
Seventh Slope Angle.        = 0.0

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----- SLOPE BELOW THE WALL -----

There is NO SLOPE BELOW THE TOE of the wall

----- SURCHARGE -----

There is NO SURCHARGE imposed on the system.

----- OPTION #1 -----

Factored Punching shear, Bond & Yield Stress are used.

----- SOIL PARAMETERS -----

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary			
					XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	110.0	38.0	200.0	15.0	0.0	0.0	0.0	0.0

* Bond Stress also depends on BSF Factor in Option #5 when enabled.

----- WATER SURFACE -----

NO Water Table defined for this problem.

----- SEARCH LIMIT -----

The Search Limit is from 1.9 to 140.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

----- REINFORCEMENT PARAMETERS -----

Number of Reinforcement Levels = 14
 Horizontal Spacing = 5.0 ft
 Yield Stress of Reinforcement = 82.5 ksi
 Diameter of Grouted Hole = 6.0 in
 Punching Shear = 55.0 kips

----- (Varying Reinforcement Parameters) -----

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	70.0	15.0	2.5	1.25	1.00
2	70.0	15.0	5.0	1.25	1.00
3	70.0	15.0	5.0	1.25	1.00
4	70.0	15.0	5.0	1.25	1.00
5	70.0	15.0	5.0	1.25	1.00
6	70.0	15.0	5.0	1.25	1.00
7	60.0	15.0	5.0	1.25	1.00
8	60.0	15.0	5.0	1.25	1.00
9	60.0	15.0	5.0	1.25	1.00
10	60.0	15.0	5.0	1.25	1.00
11	50.0	15.0	5.0	1.25	1.00
12	50.0	15.0	5.0	1.25	1.00
13	50.0	15.0	5.0	1.25	1.00
14	50.0	15.0	5.0	1.25	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
			ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)
Toe	3.893	31.1	0.0	12.4	76.4	79.1
Reinf. Stress at Level						
			1 =	73.648 Ksi (Punching Shear controls..)		
			2 =	73.986 ksi (Punching Shear controls..)		
			3 =	74.324 ksi (Punching Shear controls..)		
			4 =	74.661 ksi (Punching Shear controls..)		
			5 =	74.999 ksi (Punching Shear controls..)		
			6 =	75.336 ksi (Punching Shear controls..)		
			7 =	75.674 ksi (Punching Shear controls..)		
			8 =	76.012 ksi (Punching Shear controls..)		
			9 =	76.349 ksi (Punching Shear controls..)		
			10 =	76.687 ksi (Punching Shear controls..)		
			11 =	77.025 ksi (Punching Shear controls..)		
			12 =	77.362 ksi (Punching Shear controls..)		
			13 =	77.700 ksi (Punching Shear controls..)		
			14 =	78.037 ksi (Punching Shear controls..)		

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
			ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)
NODE 2						
	3.926	43.2	0.0	13.0	69.9	88.2
Reinf. Stress at Level						
			1 =	82.500 Ksi (Yield Stress controls.)		
			2 =	82.500 Ksi (Yield Stress controls.)		
			3 =	82.500 Ksi (Yield Stress controls.)		
			4 =	82.500 Ksi (Yield Stress controls.)		
			5 =	82.500 Ksi (Yield Stress controls.)		
			6 =	82.500 Ksi (Yield Stress controls.)		
			7 =	82.500 Ksi (Yield Stress controls.)		
			8 =	82.500 Ksi (Yield Stress controls.)		
			9 =	82.500 Ksi (Yield Stress controls.)		
			10 =	82.500 Ksi (Yield Stress controls.)		
			11 =	82.500 Ksi (Yield Stress controls.)		
			12 =	82.050 ksi (Punching Shear controls..)		
			13 =	80.780 ksi (Punching Shear controls..)		
			14 =	79.510 ksi (Punching Shear controls..)		

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 3

3.860	55.3	0.0	11.1	63.5	99.1
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Reinf. Stress at Level

1 = 82.500 Ksi (Yield Stress controls.)
2 = 82.500 Ksi (Yield Stress controls.)
3 = 82.500 Ksi (Yield Stress controls.)
4 = 82.500 Ksi (Yield Stress controls.)
5 = 82.500 Ksi (Yield Stress controls.)
6 = 82.500 Ksi (Yield Stress controls.)
7 = 82.500 Ksi (Yield Stress controls.)
8 = 82.500 Ksi (Yield Stress controls.)
9 = 82.500 Ksi (Yield Stress controls.)
10 = 82.500 Ksi (Yield Stress controls.)
11 = 82.500 Ksi (Yield Stress controls.)
12 = 80.623 ksi (Punching Shear controls..)
13 = 77.708 ksi (Punching Shear controls..)
14 = 74.792 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 4

3.499	67.4	0.0	13.5	60.3	108.9
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Reinf. Stress at Level

1 = 82.500 Ksi (Yield Stress controls.)
2 = 82.500 Ksi (Yield Stress controls.)
3 = 82.500 Ksi (Yield Stress controls.)
4 = 82.500 Ksi (Yield Stress controls.)
5 = 82.500 Ksi (Yield Stress controls.)
6 = 82.500 Ksi (Yield Stress controls.)
7 = 82.500 Ksi (Yield Stress controls.)
8 = 82.500 Ksi (Yield Stress controls.)
9 = 82.500 Ksi (Yield Stress controls.)
10 = 82.500 Ksi (Yield Stress controls.)
11 = 82.500 Ksi (Yield Stress controls.)
12 = 82.500 Ksi (Yield Stress controls.)
13 = 82.500 Ksi (Yield Stress controls.)
14 = 80.922 ksi (Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 5

3.345	79.5	0.0	31.8	64.6	111.3
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Reinf. Stress at Level

1 =	76.811 Ksi	(Pullout controls...)
2 =	79.436 Ksi	(Pullout controls...)
3 =	82.061 Ksi	(Pullout controls...)
4 =	82.500 Ksi	(Yield Stress controls.)
5 =	82.500 Ksi	(Yield Stress controls.)
6 =	82.500 Ksi	(Yield Stress controls.)
7 =	64.912 Ksi	(Pullout controls...)
8 =	67.537 Ksi	(Pullout controls...)
9 =	70.162 Ksi	(Pullout controls...)
10 =	72.787 Ksi	(Pullout controls...)
11 =	47.764 Ksi	(Pullout controls...)
12 =	50.389 Ksi	(Pullout controls...)
13 =	53.014 Ksi	(Pullout controls...)
14 =	82.206 ksi	(Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 6

2.850	91.6	13.1	47.0	64.4	106.2
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Reinf. Stress at Level

1 =	53.673 Ksi	(Pullout controls...)
2 =	56.342 Ksi	(Pullout controls...)
3 =	59.011 Ksi	(Pullout controls...)
4 =	61.679 Ksi	(Pullout controls...)
5 =	64.348 Ksi	(Pullout controls...)
6 =	67.017 Ksi	(Pullout controls...)
7 =	42.037 Ksi	(Pullout controls...)
8 =	44.706 Ksi	(Pullout controls...)
9 =	47.375 Ksi	(Pullout controls...)
10 =	50.044 Ksi	(Pullout controls...)
11 =	38.974 Ksi	(Pullout controls...)
12 =	65.803 Ksi	(Pullout controls...)
13 =	82.500 Ksi	(Yield Stress controls.)
14 =	63.598 ksi	(Punching Shear controls..)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
			ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)
NODE 7						
	2.430	103.7	12.2	53.1	62.8	113.6
Reinf. Stress at Level						
			1 =	35.303 Ksi	(Pullout controls...)	
			2 =	38.387 Ksi	(Pullout controls...)	
			3 =	41.470 Ksi	(Pullout controls...)	
			4 =	44.554 Ksi	(Pullout controls...)	
			5 =	47.638 Ksi	(Pullout controls...)	
			6 =	50.721 Ksi	(Pullout controls...)	
			7 =	26.157 Ksi	(Pullout controls...)	
			8 =	29.241 Ksi	(Pullout controls...)	
			9 =	32.324 Ksi	(Pullout controls...)	
			10 =	35.408 Ksi	(Pullout controls...)	
			11 =	35.293 Ksi	(Pullout controls...)	
			12 =	63.117 Ksi	(Pullout controls...)	
			13 =	82.500 Ksi	(Yield Stress controls.)	
			14 =	64.294 ksi	(Punching Shear controls..)	

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
			ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)
NODE 8						
	2.234	115.8	18.8	73.4	63.9	105.3
Reinf. Stress at Level						
			1 =	8.569 Ksi	(Pullout controls...)	
			2 =	11.376 Ksi	(Pullout controls...)	
			3 =	14.184 Ksi	(Pullout controls...)	
			4 =	16.991 Ksi	(Pullout controls...)	
			5 =	19.798 Ksi	(Pullout controls...)	
			6 =	22.606 Ksi	(Pullout controls...)	
			7 =	1.212 Ksi	(Pullout controls...)	
			8 =	22.599 Ksi	(Pullout controls...)	
			9 =	43.985 Ksi	(Pullout controls...)	
			10 =	65.372 Ksi	(Pullout controls...)	
			11 =	59.110 Ksi	(Pullout controls...)	
			12 =	80.497 Ksi	(Pullout controls...)	
			13 =	81.175 ksi	(Punching Shear controls..)	
			14 =	59.789 ksi	(Punching Shear controls..)	

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE 9

2.098 127.9 11.0 65.1 60.2 128.7

Reinf. Stress at Level

1 =	0.686 Ksi	(Pullout controls...)
2 =	4.466 Ksi	(Pullout controls...)
3 =	8.246 Ksi	(Pullout controls...)
4 =	12.025 Ksi	(Pullout controls...)
5 =	15.805 Ksi	(Pullout controls...)
6 =	19.585 Ksi	(Pullout controls...)
7 =	0.000 Ksi	
8 =	0.000 Ksi	
9 =	3.276 Ksi	(Pullout controls...)
10 =	27.866 Ksi	(Pullout controls...)
11 =	29.585 Ksi	(Pullout controls...)
12 =	58.951 Ksi	(Pullout controls...)
13 =	82.500 Ksi	(Yield Stress controls.)
14 =	65.374 ksi	(Punching Shear controls..)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE		UPPER FAILURE PLANE	
		ANGLE (deg)	LENGTH (ft)	ANGLE (deg)	LENGTH (ft)

NODE10

2.001 140.0 13.1 57.5 54.3 144.0

Reinf. Stress at Level

1 =	7.517 Ksi	(Pullout controls...)
2 =	12.918 Ksi	(Pullout controls...)
3 =	18.319 Ksi	(Pullout controls...)
4 =	23.720 Ksi	(Pullout controls...)
5 =	29.121 Ksi	(Pullout controls...)
6 =	34.522 Ksi	(Pullout controls...)
7 =	12.275 Ksi	(Pullout controls...)
8 =	17.676 Ksi	(Pullout controls...)
9 =	23.077 Ksi	(Pullout controls...)
10 =	39.752 Ksi	(Pullout controls...)
11 =	38.941 Ksi	(Pullout controls...)
12 =	65.779 Ksi	(Pullout controls...)
13 =	82.500 Ksi	(Yield Stress controls.)
14 =	63.604 ksi	(Punching Shear controls..)

```

*****
*                               *
*           For Factor of Safety = 1.0           *
*           Maximum Average Reinforcement Working Force:           *
*                               13.457 Kips/level                               *
*                               *
*****
    
```