

**June 22, 2016**

**MEL File No.: 2549**

**Ms. Charmian Maybury**  
**Architectural Design**  
**Advance Design Consultants, Inc.**  
998 Park Avenue  
San Jose, CA 95126

**Subject: Addendum Report / Soil Nail Walls**  
**VA Psychosocial Rehabilitation and Recovery Center (PRRC)**  
**150 Muir Road**  
**Martinez, CA**  
**Project No. 612-503**

**Reference: Geotechnical Engineering Investigation**  
**By MatriScope, MEL File No.: 2549, November 20, 2015**

**Dear Ms. Maybury:**

MatriScope Engineering Laboratories, Inc. (MatriScope) understands that new soil nail retaining wall will be built around the western corner of the project site. The existing slope will be excavated to accommodate the new retaining wall. An existing chiller tower is located near the top of the proposed wall. The wall is expected to be approximately 15 to 16 feet in height (from the top of the wall to the finished grade).

### **Geotechnical Design Parameters**

We recommend the following geotechnical parameters may be used for the proposed soil nail wall design:

- Unit weight: 125 pcf
- Effective friction angle: 35 degrees
- Effective cohesion: 0 psf
- Horizontal seismic coefficient,  $k_h$ : 0.302g (assuming a flexible wall which can tolerate a lateral movement up to 2 inches)
- Ultimate bond strength: 25 psi
- No groundwater encountered during geotechnical investigation

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## Design and Construction Considerations

The diameter, length and number/spacing of soil nails should be determined by the project structural engineer. We recommend the following for the soil nail wall design and construction considerations:

- Provide at least 2 feet embedment of soil nail wall below the finished grade in front of the wall.
- The top row of soil nail should be within 3 feet from the top of the retained soil behind the wall.
- The horizontal spacing of the soil nails should not exceed 5 feet.
- The soil nails should be evenly spaced.
- The minimum soil nail drill-hole diameter should be at least 6 inches.
- The angle of inclination of all soil nails should not be steeper than 15 degrees as measured from the horizontal (except for the top row to avoid the possible utilities issue, if any).
- Apply a temporary shotcrete facing (minimum 4-inch thickness) for the wall facing. Final wall facing thickness should be based on structural design.
- Groundwater at the site is expected to be low and special considerations of internal wall drainage are not warranted. However, the typical geocomposite drain strips, weepholes, and/or toe drains should be provided.
- The site soils are mainly sandy soils. Construction methods / procedures should consider caving which may occur during excavation and/or soil nail-hole drilling.
- Grouting of soil nail hole should be performed by inserting a tremie pipe to the bottom of the drill hole in a continuous process. During tremie pipe withdrawn, the withdraw date should be controlled to ensure that the end of tremie pipe is always below the grout surface.
- Soil nail walls should be constructed by contractor who is experienced / specialized in such wall system.

## Load Testing

Allowable capacities of the soil nails will depend on the drilling method, borehole diameter, grout pressure, and workmanship. The specialty contractor who installs the soil nails may use different types of installation procedures and the bond strength acting on the soil nails may vary with the procedure. The design soil nails capacities should be confirmed by a pullout testing program including verification load test and proof load test during construction.

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### Verification Load Testing

Verification tests should be performed on non-production, sacrificial nails prior to construction. The verification tests should be conducted on nails as considered in design and constructed with the same construction procedures to be used on production nails. Test nails should have at least 3 feet of unbonded length within the drill hole and a bonded (grouted) length. Fully grouted soil nails should not be used for load testing.

The load schedule, number and location of verification tests should be determined by the project structural engineer. A typical soil nail test load schedule is provided below for your reference:

Load	Hold Time (minutes)
AL	1
0.13 VTL	10 (movement recorded at 1, 2, 4, 5, 10)
0.25 VTL	10 (movement recorded at 1, 2, 4, 5, 10)
0.38 VTL	10 (movement recorded at 1, 2, 4, 5, 10)
0.50 VTL	10 (movement recorded at 1, 2, 4, 5, 10)
0.63 VTL	10 (movement recorded at 1, 2, 4, 5, 10)
0.75 VTL (creep Test)	60 (movement recorded at 1, 2, 4, 5, 6, 10, 20, 30, 50, 60)
0.88 VTL	10
1.00 VTL	10
AL	1 (permanent movement recorded)

Where AL is Alignment Load less than or equal to 0.025 VTL  
VTL (Verification Test Load) is maximum, Ultimate Load

Intermediate load steps during unloading are optional, but recommended to obtain an improved estimate of the permanent soil movement. Each additional load step during unloading should be held until the stable readings in the gauges are recorded.

Typical acceptance criteria for verification tests require:

- The creep movement between 1- and 10- minute readings at 0.75 VTL is less than 0.04 in.
- The creep movement between 6- and 60- minute readings at 0.75 VTL is less than 0.08 in.
- The creep rate is linear or decreasing throughout the creep test load-hold period.

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### Proof Load Testing

Similar to the verification test, proof load test nails should have at least 3 feet of unbonded length within the drill hole and a bonded (grouted) length. Fully grouted soil nails should not be used for load testing. The load schedule, number and location of proof load tests should be determined by the project structural engineer. In general, a minimum of 5 percent of the total production nails should be proof load tested. Verification tests should not be counted towards the minimum of 5 percent of the total production nails.

A typical soil nail proof test load schedule is provided below for your reference:

Load	Hold Time (minutes)
AL	1
0.17 PTL	Until movement stabilizes
0.33 PTL	Until movement stabilizes
0.50 PTL	Until movement stabilizes
0.67 PTL	Until movement stabilizes
0.83 PTL	Until movement stabilizes
1.0 PTL (creep Test)	10 (movement recorded at 1, 2, 4, 5, 6, 10)
AL	1

Where AL is Alignment Load less than or equal to 0.025 PTL  
PTL (Proof Test Load) is maximum, Ultimate Load

Typical acceptance criteria for proof tests require:

- The creep movement between 1- and 10- minute readings at PTL is less than 0.04 in.
- If this movement is exceeded, PTL should be maintained for an additional 50 minutes with movement readings recoded at 20, 30, 50 and 60 minutes.
- If the creep test is extended, the creep movement between 6- and 60- minute readings is less than 0.08 in.

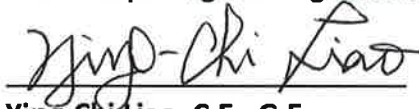
### **Construction Inspection and Performance Monitoring**

We recommend that all excavation, soil nails drilling/installation, grouting, nail load testing, and wall construction be monitored by a representative from MatriScope to verify compliance with our recommendations and the project specifications.

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If you have questions regarding this report or need additional assistance, please contact our office.

**Respectfully Submitted,**  
**MatriScope Engineering Laboratories, Inc.**



**Ying-Chi Liao, C.E., G.E.**

**Senior Engineering Manager**

