

# SITE



## TECHNICAL MEMORANDUM

DATE: July 7, 2008

TO: Harvey Friend, Northwest Steeplejack & Painting Company

CC: Ronald Vandehey, P.E., Miller Consulting Engineers

FROM: Brad L. Hupy, PE

RE: Foundation Anchor Design  
2204 SW Hoffman Ave. 3228/4  
Portland, OR  
City of Portland Application 07-149662-REV-01-CO  
PSI Project: 704-85110-1

*151E 04 DD 90001*

City of Portland Site Development Checksheet dated May 15, 2008 includes four line items. This memorandum provides our recommendations for micro piles and Injection Bore (IBO) anchors in response to item 2. Overall responsibility for item 1 "Soils Special Inspection Program Checksheet" rests with the applicant, we have signed Part C of the checksheet. Items 3 and 4 require response by the project structural engineer.

### **Checksheet Item 2 Geotechnical engineering for pipe piles:**

Additional foundation support for dead and live building loads is being added to the condominium at 2204 SW Hoffman Avenue in Portland. We met with NW Steeplejack and Ronald Vandehey, P.E. of Miller Consulting Engineers on June 30, 2008 to discuss a geotechnical design for the lateral support of the proposed repair.

We were provided with the following drawings and reports for the project :

- Structural drawings prepared by Miller dated April 9, 2008.
- Geotechnical report prepared by Dames and Moore titled "Geotechnical Investigation, Proposed Condominiums, Hoffman Avenue, Portland, Oregon" dated December 5, 1978. The report provides four test pit logs that show soil conditions prior to construction of the building.
- Geotechnical letter from Irvin A. Cooper dated April 24, 1980 reviewing site conditions reported by Dames and Moore.
- Project site plan and structural notes prepared by the project Architect, William N. Keefer dated April 30, 1980.

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We understand the new loads are those from the lowest two floor levels. Vertical loads will be placed at six locations onto 3-inch diameter steel pipe micro piles. Two horizontal rows with three piles per row will be constructed. An ultimate axial capacity up to 16 kips has been assumed by the structural engineer for each pipe pile.

The structural engineer stated that the piles are to be double extra strong 3-inch diameter steel pipe driven to refusal using a 140 pound impact hammer. Refusal was defined as less than 1-inch penetration per minute of continuous driving for 3 minutes.

The lateral loads are to be resisted by the new foundations in the cross-hill directions only. We understand that lateral loads in the downhill-uphill direction will be resisted by other elements of the structural system. The drawings show that ultimate lateral load in each row total 5.8 kips.

Our analysis showed the pipe piles will not provide sufficient lateral resistance for the loads to be applied. We recommend that the cross-hill lateral loads be resisted by self boring hollow anchors. The anchors will be placed at the location of the center pile in each of the two rows of piles. Lateral loads will be tied across the building by the structural system.

### **Subsurface Soil Conditions**

The foundations will be placed on steeply inclined ground beneath the existing building. Test pit logs in the Dames & Moore geotechnical report show a surficial layer of silt from the ground surface to approximately 1 ½ to 10 feet below ground surface. The silt is underlain by weathered basalt rock that transitions to intact rock.

### **Analysis and Design Recommendations**

Our analysis shows that the 3-inch outside diameter pin piles, driven to refusal as described by the structural engineer will develop an ultimate axial downward capacity of 16 kips.

Resistance to lateral loads can be resisted by 30 mm outside diameter steel IBO-TITAN threaded anchor bars. The anchors have a guaranteed ultimate tensile strength of 49.5 kips.

Anchor holes should be drilled at a  $45 \pm 5^\circ$  to the horizontal using a minimum 1-½ -inch diameter bit. The anchors should be drilled and grouted a minimum distance of 60 inches into the unweathered basalt rock layer.

Following the drilling and installation of anchor, sand grout shall be pressure injected into the borehole and allowed to cure for a minimum of 48 hours. Twenty-eight day compressive strength of the grout shall be a minimum 3,000 psi.

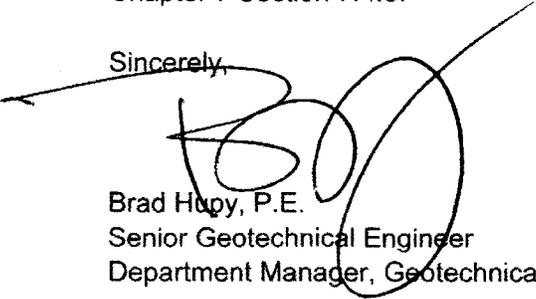
### Geotechnical Special Inspections

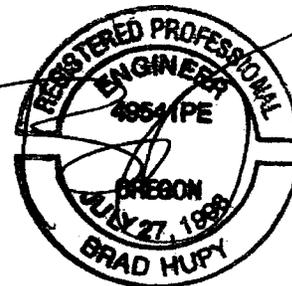
Conditions during construction of the micro piles and anchors may be different that we have assumed and we may need to change our recommendations after construction has started. Accordingly, our recommendations are conditional on the requirement that PSI be retained to perform geotechnical special inspections of the micro pile and anchor installation.

In order to confirm our analysis for the pipe piles, one pile should be tested in axial compression to 150 percent of the design load using the building for reaction. It will be necessary to build cribbing under the floor framing to accept the test load. Alternatively, the pipe pile could be tested by installing two vertical IBO anchors for use in the testing.

Testing of the IBO anchors will include laboratory strength testing of the grout and proof testing of the anchors after they are installed. The tests will be made in general conformance to the FHWA Geotechnical Engineering Circular Number 4, "Ground Anchors and Anchored Systems, Chapter 7 Section 7.4.3.

Sincerely,

  
Brad Hupy, P.E.  
Senior Geotechnical Engineer  
Department Manager, Geotechnical/Environmental Services



EXPIRES: JUNE 30, 2008

**TECHNICAL MEMORANDUM**

DATE: July 24, 2008

TO: Harvey Friend, Northwest Steeplejack & Painting Company

CC: Ronald Vandehey, P.E., Miller Consulting Engineers

FROM: Brad L. Hupy, PE

RE: Foundation Anchor & Pin Pile Testing  
2204 SW Hoffman Ave.  
Portland, OR  
City of Portland Application 07-149662-REV-01-CO  
PSI Project: 704-85110-1

City of Portland Site Development Checksheet dated July 18, 2008 asks for testing and acceptance requirements for both foundation anchors and pin piles that will be installed for the project. This memorandum provides our recommendations

**Checksheet Item 2 Geotechnical engineering for pipe piles:**

**Pin Pile Testing and Acceptance:**

3-inch diameter steel pin piles have been designed for an allowable load of 10.4 kips for each pile. One pile should be proof tested to 150% of the allowable load in general accordance with ASTM D 1143 Standard Test Method for Piles Under static Axial Compressive Load. Use the following schedule and acceptance criteria.

LOAD INCREMENT	LOAD (kips)	HOLD TIME (min)
1	2.5 Seating	1
2	5.0	1
3	7.5	1
4	10.0	1
5	12.5	1
6	15.6	30

The allowable vertical axial movement at each load increment shall not be greater than .05 inches except the first increment which shall be not greater than 0.10 inch.

**Ground Anchor Testing and Acceptance:**

30 mm outside diameter steel IBO-TITAN threaded anchor bars will be installed to resist allowable lateral loads of 5.4 kips for each anchor. A proof load test to 150 percent of the allowable load shall be conducted for each ground anchor. Use the following schedule and acceptance criteria.

LOAD INCREMENT	LOAD (kips)	HOLD TIME (min)
1	1.5 Seating	1
2	3.0	1
3	4.5	1
4	6.0	1
5	7.5	1
6	8.2	10

Record movement of anchor with respect to a fixed reference for a period of 10 minutes at load of 8.2 kips. Record movement at 1 minute, 2, 3, 4, 5, 6, and 10 minutes. If movement exceeds 0.040 inches hold for an additional 50 minutes and record movement at 10 minute intervals. Plot movement against logarithm of time. If movement is less than 0.080 inches between 6 and 60 minutes the tests anchor is accepted. Anchors that do not satisfy acceptance criteria will be replaced or redesigned and retested.

Brad Hupy, P.E.  
Senior Geotechnical Engineer  
Department Manager, Geotechnical/Environmental Services



**EXPIRES: JUNE 30, 2008**