

**From:** [Daly, Keith](#)  
**To:** [document.control;](#)  
**cc:** [Peppers, Nicki;](#)  
**Subject:** FW: C8078 - Dynamic Pile Testing  
**Date:** Wednesday, March 02, 2011 3:14:35 PM  
**Attachments:** [C8078-Dynamic Pile Testing.pdf](#)

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Please file this email under correspondence from the contractor on contract 8078.

Thanks,

**Keith Daly**  
**Budget Manager**

Columbia River Crossing Project | <mailto:dalyk@columbiarivercrossing.org>  
700 Washington St. Suite 300, Vancouver, WA 98660  
office: 360.816.8870 | Office: 503.256.2726 Ext. 8870  
Fax: 360.737.0294

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**From:** Vernon Uy [<mailto:vernonu@americanconstco.com>]  
**Sent:** Wednesday, March 02, 2011 1:59 PM  
**To:** Daly, Keith; Degenhart, Mark  
**Subject:** fw: C8078 - Dynamic Pile Testing

Hi Mark, Keith.

I spoke to Robert Miner just now about the PDA and CAPWAP analyses. He is swamped and has apologized for the delay in the submittal of the data/analysis.

He will have this submitted to us early next week (3/7). Once I have it, I will immediately forward it to you.

Thanks.

Vernon Uy  
American Construction Company, Inc.  
(425) 870-3217

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**From:** "Degenhart, Mark" <[DegenhartM@columbiarivercrossing.com](mailto:DegenhartM@columbiarivercrossing.com)>  
**Sent:** Tuesday, February 22, 2011 2:27 PM  
**To:** [vernonu@americanconstco.com](mailto:vernonu@americanconstco.com)  
**Subject:** C8078 - Dynamic Pile Testing

Vernon,

Attached you will see the "Dynamic Pile Testing" Specification. You will receive payment when WSDOT has received the formal, written, dynamic analysis report including the

results of the CAPWAP analyses. This is described in the contract provisions pages 104 to 106.

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1 minimum pile tip elevation specified in the Plans, and then driven with a  
2 conventional impact hammer to the ultimate bearing capacity shown in the Plans  
3 based on results of wave equation analysis performed by the Contractor. Bearing  
4 requirements indicated in the Plans, shall be met. The Contractor shall submit a  
5 wave equation analysis for all impact pile driving systems used to drive the piles.

6  
7 (\*\*\*\*\*)

### 8 **Dynamic Pile Testing**

9  
10 The Contractor shall furnishing all materials, labor, tools, equipment, services and  
11 incidentals necessary to perform Dynamic Pile Testing using the Pile Driving  
12 Analyzer (PDA) and Case Pile Wave Analysis Program (CAPWAP) on the piles as  
13 indicated in the Plans.

14  
15 CAPWAP analyses shall be required to evaluate the bearing and uplift capacity of  
16 all piles tested by the PDA. Two CAPWAP analyses shall be required for each test  
17 pile: (1) at the end of the initial driving, and (2) at restrike after the 48-hour setup  
18 period.

19  
20 Installation, monitoring, and presentation of the results of the PDA and CAPWAP  
21 shall be performed by a qualified PDA subcontractor whose name and  
22 qualifications shall be submitted to the Engineer for approval at least 7 calendar  
23 days before pile driving is to begin. All personnel who operate the PDA and analyze  
24 the output data shall have a minimum of 3 years of experience and shall have  
25 operated the PDA and analyzed the data on at least 5 projects during each of those  
26 3 years. Four qualified PDA subcontractors are as follows:

27  
28 Robert Miner Dynamic Testing  
29 Box 340  
30 Manchester, WA 98353  
31 (360) 871-5480  
32 (360) 871-5483 Fax

33  
34 GRL and Associates  
35 4535 Renaissance Parkway  
36 Cleveland, OH 44128  
37 (216) 831-6131  
38 (216) 831-0916

39  
40 GeoDesign Inc.  
41 10700 Meridian Avenue North #210  
42 Seattle, WA 98133  
43 (206) 838-9900  
44 (206) 838-9901 Fax

45  
46 Lachel Felice & Associates  
47 11411 NE 124th St, Ste 275  
48 Kirkland, WA 98034  
49 (425) 820-0800  
50 (425) 820-9892  
51

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The piles shall be made available to the PDA subcontractor for installation of instruments before and after placing the piles in the leads. In cooperation with the PDA subcontractor, the Contractor shall cease and resume driving as needed to obtain the required measurements. PDA testing shall be performed during driving of all steel test piles, including after all test pile in-lead splices. Additionally, restriking of all test piles shall occur at least 48 hours after the test piles are initially driven, as specified in the earlier section.

The Contractor shall monitor the PDA throughout pile driving operations to confirm proper hammer to pile energy transfer, and to ensure that the piles are not overstressed or damaged during pile driving. The Contractor shall notify the Engineer immediately if the PDA readings indicate non-axial driving or possible pile damage.

For each pile tested using the PDA, the PDA subcontractor shall provide a summary of the PDA results which shall include the hammer blows per minute, transferred energy, and the force and stress at the pile top. These results shall be provided at 1 foot intervals of pile penetration over the last 5 feet of driving. In addition, the pile shall be monitored with the PDA for damage and the occurrence of non axial driving. All PDA results provided by the PDA subcontractor shall be correlated to pile tip elevation and blows per foot as recorded by the Engineer.

Preliminary PDA results shall be made available to the Engineer immediately after the pile is driven.

All PDA results shall be presented in a formal, written, dynamic analysis report, including the results of the CAPWAP analyses. The report shall include an explanation of all symbols used, any background information needed to understand the data, any adjustments made to the field data to obtain the data tabulated in the report, an interpretation of the data, and typical plots of force and velocity versus time obtained near the end of driving. The report shall be submitted to the Engineer within 5 working days of completion of each analyzed pile.

**Achieving Minimum Tip Elevation and Bearing**

Section 6-05.3(11)D is supplemented with the following:

(\*\*\*\*\*)

The test piles shall be driven to ultimate bearing capacity.

The Contractor shall size the hammer to accommodate the maximum driving resistance and not result in premature refusal or pile damage.

The water elevation within the hollow pile shall be maintained at or above the water elevation outside of the pile. Water shall not be removed from the pile unless indicated. The piles will be examined for damage visually for the full length of pile above the mudline.

After the piles have been driven to bearing capacity, the Contractor shall wait 48 hours and then re-strike the test piles shown in the Plans.

**Measurement**

Section 6-05.4 is supplemented with the following:

1  
2 (\*\*\*\*\*)  
3 Dynamic pile testing will be measured per each for each dynamic pile test performed at a  
4 pile including initial reading and restrike.

5  
6 Installing confined bubble curtain systems will be measured per each by the number of  
7 impact driven piles on which the confined bubble curtain system is used.

8  
9 Installing unconfined bubble curtain systems will be measured per each by the number of  
10 impact driven piles on which the unconfined bubble curtain system is used.

11  
12 **Payment**

13 Section 6-05.5 is supplemented with the following:

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15 (\*\*\*\*\*)  
16 "Furnishing and Driving (type) Test Pile", per each.  
17 For this project, the unit contract price per each for "Furnishing and Driving (type) Test Pile"  
18 shall be full pay for furnishing and driving test piles to the ultimate bearing capacity or  
19 penetration required by the Engineer, furnishing and installing a pile tip, and vibratory driving  
20 when vibratory is specified. This price shall also include all costs in connection with moving  
21 all pile driving equipment or other necessary equipment to perform the work in the Plans and  
22 as specified.

23  
24 "Dynamic Pile Testing", per each.  
25 The unit contract price for "Dynamic Pile Testing", per each, shall be full pay for performing  
26 the work as specified, including data collection, using the Pile Driving Analyzer (PDA), using  
27 the Case Pile Wave Analysis Program (CAPWAP) and provide reports as specified.

28  
29 "Furnish Confined Bubble Curtain System", lump sum.  
30 "Furnish Unconfined Bubble Curtain System", lump sum.  
31 The lump sum contract price for "Furnish \_\_\_ Bubble Curtain System" shall be full pay for  
32 performing the work as specified, including transporting, designing, fabricating, furnishing,  
33 and removing the systems as specified.

34  
35 "Install Confined Bubble Curtain System", per each location.  
36 "Install Unconfined Bubble Curtain System" per each location.  
37 The unit contract price per each for "Install \_\_\_ Bubble Curtain System" shall be full pay for  
38 performing the work as specified, including installing and operating the bubble curtain  
39 systems.

40  
41 **DIVISION 8**  
42 **MISCELLANEOUS CONSTRUCTION**

43  
44 (\*\*\*\*\*)  
45 **PILE REMOVAL AND CLEANUP**

46  
47 **Construction Requirements**

48 Following completion of load testing and test pile inspections, the Contractor shall remove  
49 and dispose of or salvage items as listed below. The Contractor shall dispose of all items in  
50 accordance with Section 2-02.3.