

September 20, 2007

Mr. Dan Cadenhead
Anderson Drilling
10303 Channel Road
Lakeside, California 92040

RE: Anderson Drilling Company Deep Foundation Seminar and Site Visit, August 28 & 29, 2007

Dear Dan:

Following my visit to speak at your company seminar, and my site visit of August 28 and 29, 2007, I am writing to express my thanks to the Anderson Drilling team for making my visit such a pleasure, and in particular to Dennis Poland for being such a congenial and accommodating host.

If there was any fly in my ointment, it was only that when I was speaking to the assembled group of superintendents, project managers, and estimators on Tuesday morning, every time I mentioned a critical factor in the drilling or construction process that had a direct impact on the outcome of integrity test results, many members of the group nodded in agreement. I flattered myself that this was because they understood my point, and realized the wisdom of it.

When we visited the site to witness gamma logging of a completed shaft, and watch the semi-final stages of drilling a new hole, I began to realize that I was fooling myself, particularly with regard to my comments on safety and attention to detail. The lesson was rammed home the following morning at 3.30 AM when I joined the crew on site to watch the reinforcing cage being picked, the site being prepared for the crane walk, pump trucks, and ready-mix delivery, the placement of the reinforcing cage, the preparation of the tremie pipe, and the actual placement of concrete - in short, all the unheralded activities that go into the completion of a large drilled shaft.

It quickly became clear that they were all nodding during my presentation because they already did all of the things that I suggested! Apart from momentary but insignificant sag at the beginning of the cage pick, the entire process went very smoothly. I was particularly impressed with the cleanliness of the tremie pipe, and the methods used to achieve it. I was even more impressed by the fact that the crew started work at 3.00 AM and worked through until well past midday without taking a single break, other than to grab a few bites of burrito during natural pauses in the activity.

There seemed to be very few commands or instructions. Every man knew his job and the next step required. It was also evident that culture of safety is deeply engrained. I noticed the crew looking out for each other around moving machinery, and removing trip-and-fall hazards as soon as they occurred, without any need for explicit orders. If an academic ever contacts us looking for a field trip to give students a textbook example of how to construct a drilled shaft under slurry, this particular crew would top my list of recommendations.

Having visited your web site to brush up on Anderson Drilling before coming to San Diego, I learned a little about your key management personnel, and thought I had done my homework. It's probably no surprise to you that they exceeded my expectations when I met them in person.

During the seminar, Christie Rowan was one of the most active participants, asking several insightful questions, as you are aware.

During my site visits, superintendents Paul David and Jimmy Vildibill took the time out to answer my questions, or explain the thinking behind their actions, very frankly. From them I understood that reliable concrete supply in southern California is something of a challenge. It turned out, however, that the relationship they (or Anderson) have developed with Hanson Aggregates paid dividends.

The first of the ready-mix trucks arrived on site right on schedule, and the supply was maintained with negligible delays for the entire time that I was watching. The concrete that I observed on the back-chutes of the trucks and in the pump hopper was remarkably consistent, with no observable clumps, or 'dough-balls' of unmixed cement. I observed several slump tests performed by Harris & Associates, and all were between 8 and 9 inches – exactly where you want to be with an 8-inch slump specification. In my opinion, Anderson's specification of pea-gravel for coarse aggregate probably contributed a lot to that consistency. I believe the extra cost of such a mix is well repaid when constructing a deep foundation, particularly under slurry.

A visit to your office and yard later in the day showed the same attention to detail that I had witnessed on site. It was definitely one of the cleanest and most orderly contractor's yards that I have visited.

While we were at your offices, general conversation Dennis, Christie, Mike Blanchard and Kelly Hawes illustrated the depth of knowledge that the Anderson team has in their respective fields of expertise. For example, after what I had considered to be a virtually flawless performance by the Anderson team on site, Mike pointed out several minor safety violations that I had missed, but he had dealt with as they arose.

The one real criticism that I have of the entire process is about the design, not the execution. The current CALTRANS guidelines for Gamma/gamma logging (GGL) require that the equipment used to perform the test shall have a horizontal range of at least 3.0 inches, but less than 4.5 inches.

The PVC access tubes attached to the reinforcing cage in this case were supported by preformed reinforcing steel 'chairs' that held the tubes approximately four inches away from the interior face of the helical steel of the reinforcing cage. I understand that this is a requirement of the specification, and it was properly executed by the Anderson team. It does, however, render the GGL test incapable of detecting any significant variation in the thickness or quality of the cover concrete outside the reinforcing cage. Thus the designer has shot himself in the foot by specifying a quality control test method, then specifying an installation requirement that renders the specified test useless for monitoring one of the most critical portions of a drilled shaft, particularly in high risk zones such as seismic or marine environments – the cover concrete.

While this may appear, on the surface, to be beneficial to the drilled shaft constructor, in the event of the unthinkable happening, and the bridge collapsing during a seismic, typhoon, or flashflood event, the performance of the drilled shafts will almost certainly be called into question. If the subsequent investigation indicates that there was a lack of cover concrete (whether it contributed to the failure or not), it is my guess that the courts will saddle the foundation contractor with a large part of the blame, not the designer who rendered the quality control program inconclusive.

As I said in my lecture – examine the specification closely. If you see something that will limit your ability to deliver the required product, or will affect the quality management program, speak up before you get saddled with liability that will leave you vulnerable, either during the project, or afterward.



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From an industry advancement point-of-view, I respectfully suggest that you consider getting a semi-pro or professional video cameraman to film construction of one of the shafts on this project from beginning to end. Both ADSC and DFI are continually looking to update their educational material, and I believe that a film of a performance similar to the one that I witnessed would be beneficial to any newcomer to the deep foundations industry, whether as a supplier, contractor, designer, or engineer.

Once again, I thank you for the courtesy and warm welcome extended to me by the Anderson Drilling team, and look forward to the opportunity of working with you in the future, both in business, and in our respective professional roles within the ADSC and the DFI.

Best regards

A handwritten signature in black ink, appearing to read 'BHertlein'.

Bernard H. Hertlein, M.ASCE
Principal Scientist.

