

19 November, 2008

Mr. Peter Hayden
Caruso Affiliated
101 The Grove Drive
Los Angeles, CA 90036

Subject: Noise and Vibration
Torque Down 1275 Pile Installation—The Miramar
Acentech Job No. 617131

Dear Mr. Hayden:

At your request, Acentech Inc. performed an acoustical and vibration analysis of proposed pile installation activity for The Miramar project in Montecito, California. The proposed project includes new oceanfront units that will be supported on deep foundations (120 to 170 piles) to comply with requirements in the Coastal High Hazard Zone. We understand that these piles would be installed on an approximate 13 foot by 13 foot grid pattern that extends across the approximately 500 feet of oceanfront. The nearest pile installation will be approximately 18 feet from the residential structures located on the east and west ends of the oceanfront units for the first set of three to five piles.

Because of the close proximity of these structures an alternative pile installation technique called Torque Down 1275 piles is considered and evaluated below. Torque Down 1275 piles are full-displacement piles consisting of a concrete-filled, 12.75-inch-outside-diameter steel pipe with a proprietary closed-end conical tip welded to the bottom of the pipe. The specially designed conical tip includes a single 1/2-inch-thick, 14-inch-diameter, steel-helix plate welded onto the tip along with various cutting teeth to assist in pile installation. The piles are advanced (screwed) into the ground by application of torque and downward pressure using a 560 hp Delmag RH26 Hydraulic Foundation Rig capable of providing up to 210,000 ft-lbs of torque; thus enabling the piles to penetrate into very dense sands and weathered bedrock.¹

Thresholds of Significance

The County of Santa Barbara has set forth thresholds of significance for exterior noise to be CNEL 65 dBA and states that *“the thresholds are to be used with flexibility.”*² CNEL is a 24-hour average noise level that weights nighttime and evening noise levels upward by 10 dB and 5 dB, respectively. In regards to construction noise, the County states: *“average construction noise is 95 dB(A) at a 50 ft distance from the source. A 6 dB drop occurs with a doubling of the distance from the source. Therefore, locations within 1,600 feet of the construction site would be affected by noise levels over 65 dB(A). To mitigate this impact, construction within 1,600 feet of sensitive receptors shall be*

¹ //www.substructuresupport.com/, November 12, 2008.

² Santa Barbara County Environmental Thresholds and Guidelines Manual, Published October 2008.

limited to weekdays between the hours of 8 AM to 5 PM only. Noise attenuation barriers and muffling of grading equipment may also be required. Construction equipment generating noise levels above 95 dB(A) may require additional mitigation?"

The County does not set forth thresholds of significance for vibration; therefore, those established by Caltrans are used in this evaluation.³ Groundborne vibration can cause damage to structures. The vibration threshold to protect against damage is dependent upon the type of structure and its condition. Caltrans recommends a PPV threshold of 0.3 in/sec for older residential structures.⁴ For newer residential structures Caltrans recommends a PPV threshold of 0.5 in/sec.

Analysis

In support of this analysis we contacted Structural Support, Inc. (contractor for Torque Down 1275 pile installation) regarding the noise and vibration during installation of piles. The company provided a qualitative description of the pile installation process that we used to derive conservative estimates of the noise and vibration that are reliable and adequate for the purposes of this analysis.

Installation of 120 to 170 Torque Down 1275, 12-inch diameter piles at the oceanfront units will take approximately one week. During that period, the 560 hp Delmag RH26 Hydraulic Foundation Rig will be used to advance full-displacement piles into the ground. Supporting equipment includes a forklift to maneuver steel piles and reinforcing rod and a concrete truck to fill the piles with concrete. The maximum noise level from this equipment is estimated to be 85 dBA measured at 50 ft from the equipment.⁵

The major noise source is the Delmag RH26 rig power train which would be positioned no closer than about 25 ft from these residences when installing the nearest piles. At this distance the maximum noise level is estimated to be about 91 dBA from either the rig or the equipment supporting the installation. For subsequent rows of pile installation the rig would move further away and the noise would decrease by 6 dB per doubling of distance to about 70 dBA at 300 ft. Depending upon engine load and operating minutes per hour, the average noise levels during pile placement may be less. In addition, installation of noise attenuation barriers along the beachfront property lines could reduce noise levels by 10 dB or more.

Since representative measurements of the vibration levels during installation of the Torque Down 1275 12-inch diameter piles are not available, we considered caisson drilling and a trencher as surrogate models. The reported vibration level from a trencher is about 0.097 in/sec PPV at 25 ft and caisson drilling is 0.089 in/sec PPV at 25 ft.^{6,7} The vibration produced by a trencher is a more conservative estimate for the full-displacement piles and is used as the basis of our evaluation. The following table provides structural damage thresholds for two types of residential structures and the calculated distance from the pile placement that the threshold would occur based upon the propagation of groundborne vibration with distance, shown in Figure 1. No residential structures are located within these distances.

³ *Transportation- and construction-induced vibration guidance manual*, Caltrans, Table 19 and Table 20, June 2004.

⁴ PPV - Peak Particle Velocity is the maximum rate of change with respect to time of the particle displacement in the ground.

⁵ *FHWA Roadway Construction Noise Model, Version 1.0 User's Guide*, U.S. Department of Transportation, January 2006.

⁶ Figure 16-1, *Construction Vibrations*, Charles H. Dowding, Northwest University, Evanston, IL. 2000.

⁷ *Transportation- and construction-induced vibration guidance manual*, Caltrans, Table 18. June 2004.

Table 1 Structural Damage Thresholds

Structural Type	Damage Threshold PPV, in/sec	Distance from Torque Down 1275 pile installation, feet
Older residential structures	≥0.3	7 to 8
Newer residential structures	≥0.5	4 to 5

At the nearest residential structure (a distance of 18 feet from the pile placement) the PPV is not expected to exceed 0.13 in/sec. This is compared to a conventional pile driver that would produce approximately 2.0 in/sec PPV at the same distance. Consequently, the use of the Torque Down 1275 pile installation would reduce vibration levels by over a factor of 15.

Impact Discussion

The maximum noise from the Torque Down 1275 pile installation is expected to be less than 95 dBA. Since construction hours are limited by the Montecito Community Plan to weekdays between 7 AM and 4:30 PM, the pile placement meets the County's threshold of significance. Implementation of temporary noise barriers along the beachfront property lines during the pile installation would reduce noise further, by at least 10 dB.

The vibration from the Torque Down 1275 pile installation is substantially less than conventional pile driving techniques. With this alternative pile installation method, vibration levels from the installation of the nearest Torque Down 1275 12-inch diameter piles at the oceanfront units are below the threshold of significance for structural damage for nearby residential structures.

This concludes our report. Please let us know if we can be of further assistance.

Sincerely yours,

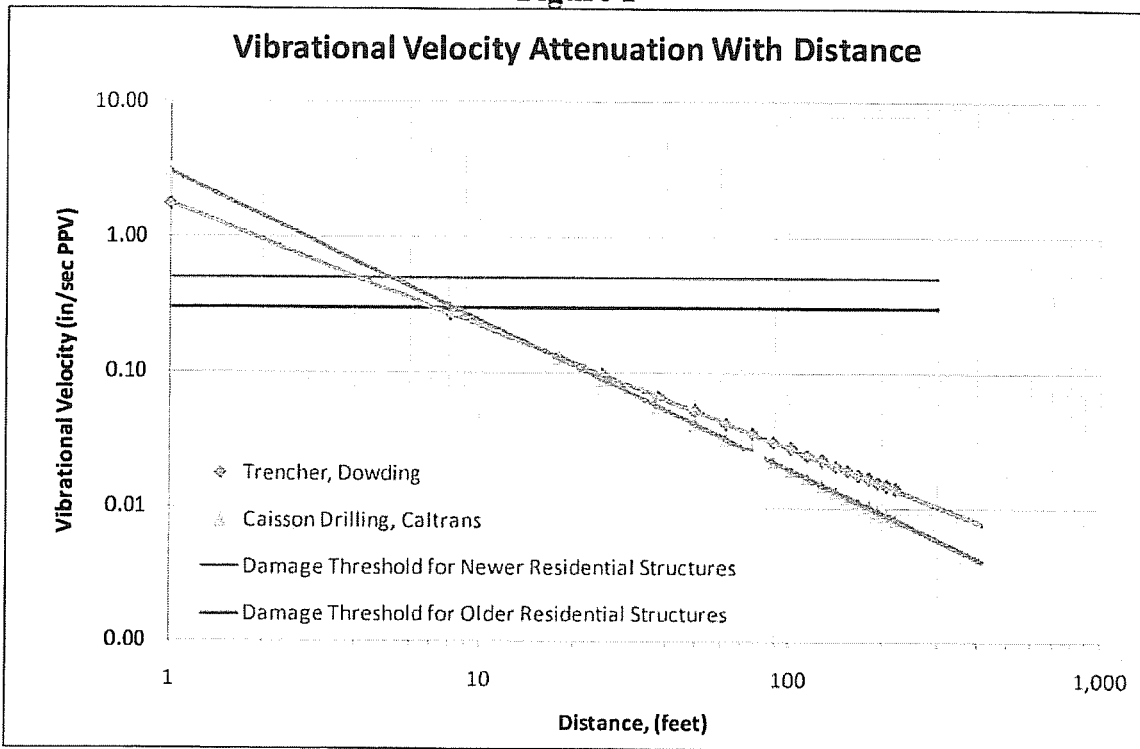
ACENTECH INCORPORATED



Ramon E. Nugent, P.E. (TX)
Director

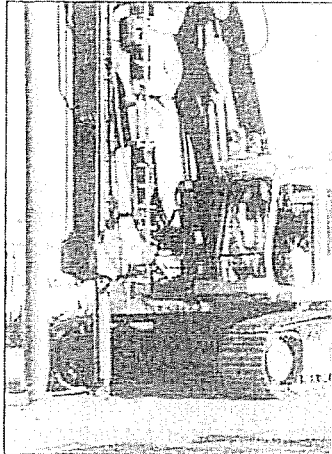
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Figure 1





TORQUE DOWN 1275 PILES



DELMAG RH26 AND
TORQUE DOWN 1275 PILE

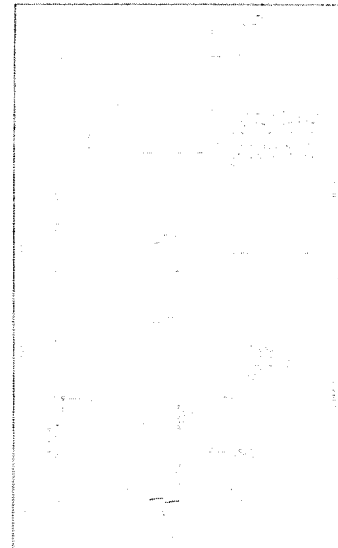
TORQUE DOWN 1275 piles are full-displacement piles consisting of a concrete-filled, 12.75-inch-outside-diameter steel pipe with a proprietary (patent pending) closed-end conical tip welded to the bottom of the pipe. The specially designed conical tip includes a single 3/8-inch-thick, 14-inch-diameter, steel-helix plate welded onto the tip along with various cutting teeth to assist in pile installation. The piles are advanced (screwed) into the ground by application of torque and crowd (downward pressure) using a drill rig capable of providing up to 210,000 ft-lbs of torque; thus enabling the piles to penetrate into very dense sands and weathered bedrock. Crowd is applied to the pile using the rig's 30-ton main winch. The method used to install the TORQUE DOWN 1275 pile results in little to no vibration and noise is limited to that of the drill rig.

CAPACITY:

The TORQUE DOWN 1275 pile is a full-displacement pile that achieves vertical capacity through a combination of end bearing and skin friction. Site-specific pile capacities depend on the soil/rock type, pile length and project requirements. TORQUE DOWN 1275 piles have been load tested in compression to 1,000 kips without failure. Typical ultimate capacity in compression ranges from 300 to 600 kips. In general, uplift capacity is at least half of the compression capacity of the pile. Lateral load capacities for the piles will not only depend on the near surface soils (upper 15 to 20 feet), but also the pile-head "fixity." The lateral loads required to deflect a TORQUE DOWN 1275 pile head 1/2 inch is generally greater than that of a 14-inch-square precast, prestressed, concrete pile since the TORQUE DOWN 1275 pile head is considered partially fixed into the pile cap, while concrete piles are not. Therefore, TORQUE DOWN 1275 piles would have a higher lateral capacity than typical concrete piles.

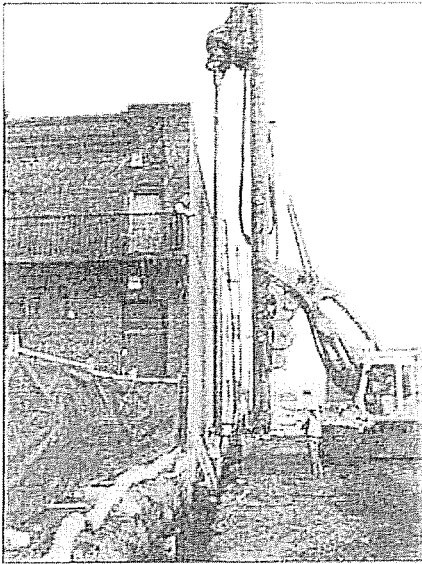
INSTALLATION PROCEDURES:

TORQUE DOWN 1275 Piles are installed using a Delmag RH26 Hydraulic Foundation Rig. A combination of torque and crowd (downward pressure) are used to screw the piles into the ground. Torque, advancement rate and pile depth are monitored throughout the installation. In general, the project geotechnical engineer observes the pile installation on a full-time basis. Depending on site conditions,



SCHEMATIC OF
TORQUE DOWN 1275 PILE

SUBSTRUCTURE SUPPORT, INC.



TORQUE DOWN 1275 PILE INSTALLATION NEXT TO BRICK BUILDING IN OAKLAND, CA

between 10 and 40 piles can be installed per day. Furthermore, piles may be installed from existing grade or at excavated pile cap locations.

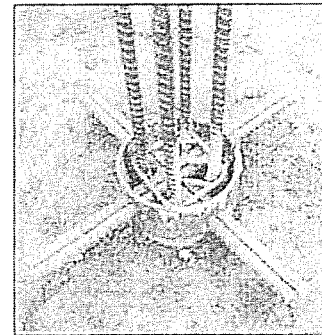
TORQUE DOWN 1275 piles may be installed in a variety of site conditions. They provide an alternative to driven piles and are superior in terms of noise pollution, vibration of adjacent improvements and site safety. TORQUE DOWN 1275 piles have been installed within two feet of sensitive historic structures with no adverse affects to the adjacent structure or occupants.

A typical pile installation consists of the following activities: Predrilling (as required), Pile Hookup, Loft, Positioning, Plumb, Drill, Splice (for piles longer than about 65 feet), Pile Disconnect, Cut-off, Reinforcement installation (as required), Concrete Placement.

Pile depth is monitored during installation using painted marks on the pile at 1-foot intervals. The depth can be verified by directly measuring the inside of the installed pipe. Torque applied to the pile during installation is shown as pressure (bars) on a gauge mounted on the cab of the rig. Advancement rate per revolution is monitored by holding a marker at a fixed position on the pile as the pile rotates, creating a spiral marking on the pile. Advancement rate is used to measure how efficiently the pile is advancing and provides an indication of density/stiffness of the subsurface soil.

Criteria for predrilling, torque and advancement rate are typically determined during an indicator and test pile program; although prior experience with similar site conditions and other project-specific requirements may negate the need for a test pile program. The need for an indicator pile program should be determined by the geotechnical engineer.

Where required, corrosion protection can be applied to the top portions of the piles in the form of a coal tar epoxy or equivalent synthetic coating during pile fabrication. Alternatively, the structural capacity of the pile may be checked given a corrosion rate (typically 1/16-inch loss of steel thickness in 50 years) as determined by a corrosion engineer.

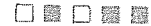


TORQUE DOWN 1275 PILE WITH TENSION CONNECTION REBAR

INDICATOR PILES:

In general, indicator pile locations are determined by the project geotechnical and structural engineer and indicator piles are installed prior to production pile installation. During indicator pile installation,

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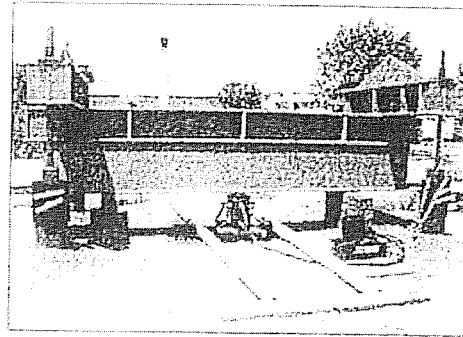


Torque and advancement rate data are compared to the anticipated subsurface conditions to evaluate gaps in the geotechnical data; generally, at least one indicator pile is performed adjacent to an existing boring or cone penetration test. Indicator piles are used to determine final depths and consistency of installation across the site. Indicator piles are also used to evaluate the need for predrilling during production pile installation.

Indicator piles are not typically filled with concrete and are removed shortly after being installed; therefore, they should be installed at least seven feet away from production pile locations. Upon request, indicator piles may be installed at production pile locations and filled with structural concrete.

TEST PILE PROCEDURES:

TORQUE DOWN 1275 piles may be tested in compression and/or in tension under the direction of the geotechnical engineer to verify the calculated allowable loads. Unlike indicator piles, test piles are typically installed at production pile locations and are filled with structural concrete. Depending on the subsurface soil, test piles should be left to set between one day and one month prior to testing; studies have shown that pile capacity can increase significantly with time, particularly in fine grained soil.



TEST PILE SETUP

The load test apparatus and procedures used to test TORQUE DOWN 1275 piles are in general conformance with the quick test presented in ASTM D1143-81 and D3689-90 for compression and tension tests, respectively.