



Pile Driving Noise

Wieland Acoustics was retained by a client who needed us to address the issue of noise caused by pile driving activities adjacent to a residential neighborhood. Piles support parking structures, bridges, overpasses, and all kinds of buildings. As members of the general public, we want to know that such structures are safe. Piles form the vertebrae of the structures' skeletal frames, and are essential to bear the immense weight and pressure of the concrete load that they support.

But getting the piles into the ground without causing a hullabaloo from local residents calls for a delicate balancing of public and private needs. Usually (to quote Spock—Mr. not Dr.), “The needs of the many outweigh the needs of the few.” Pile driving is, therefore, a necessary evil in modern construction. Most noise ordinances exempt construction activity from the noise standards so long as the activity occurs on the construction site during the permitted hours and days specified in the ordinance.

So is there anything we can do to make pile driving activity more acceptable to those people who bear the brunt of the impact (almost literally!) so close to the construction site? To address this question, we first need to look at the means by which the piles are going to be set into the ground.

There are three basic methods to accomplish this:

1. ***By pile driving***: driving the pile into the ground with a hammer,
2. ***By pile pouring***: digging a hole, inserting a rebar frame and pouring concrete onto the frame to create the pile, or
3. ***By vibration***: the pile is inserted into the ground using a vibratory hammer.

In pile driving, the major noise sources are the sound of the hammer impact on the pile, and that of the diesel engine that powers the pile driver and supports the crane. To mitigate these types of noise, we can use acoustical blanket shrouds to enclose the hammer and pile, sound absorptive enclosures for the engines (incorporating sound attenuators), mufflers for the exhaust, and perimeter walls around the worksite.

Pile pouring eliminates the impact noise and vibration of the hammer on the pile. The major noise levels associated with the pile pouring method are generated by the drill rapidly spinning above the ground surface to remove caked-on mud, and by the cement truck rapidly spinning its hopper prior to pouring the cement. Despite these noise sources, pile pouring is much quieter than pile driving—over 20 dB quieter in fact.

Considering that the human ear perceives a 10 dB reduction of noise as half as loud, this will give you some idea of the relief provided by a 20 dB decrease. That's the good news. The bad news is that it's not always possible to use this method, and it's much slower than traditional pile driving.

The vibratory hammer may be the quietest of all. It does away with the sharp impact noise of the pile-driving hammer. Since the vibratory hammer “shakes” the pile into the ground, no cement truck is needed either, so another noise source is eliminated.

However, the problem here is that instead of creating a noise problem, ground vibration can exceed generally-accepted guidelines unless a resonance-free driver is used. And as with the pile pouring method, the vibratory hammer can only be used under certain soil conditions.

So there is, unfortunately, no easy answer to this problem. While it’s important to acknowledge the public’s concerns, with whichever method you choose, it’s best to just get it over with quickly, and use good PR to sell the benefits!

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