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# NOISE FROM CONSTRUCTION EQUIPMENT AND OPERATIONS, BUILDING EQUIPMENT , AND HOME APPLIANCES

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# NOISE FROM CONSTRUCTION EQUIPMENT AND OPERATIONS, BUILDING EQUIPMENT, AND HOME APPLIANCES

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Prepared by

BOLT, BERANEK AND NEWMAN
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Office of Noise Abatement and Control
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from about 70 to 80 dB(A), with pumps typically at the low end of this range. Stationary equipment, because of its fixed location and constant speed and/or load operation, may be quieted more easily than mobile equipment; engine mufflers can be more effective, and use of enclosures becomes feasible. [In fact, noise from some air compressors, has already been reduced by about 10 dB(A) by use of appropriate enclosures.]

The greatest near-term abatement potential for all current equipment powered by internal combustion engines lies in the use of better exhaust mufflers, intake silencers, and engine enclosures (in conjunction with appropriate cooling system and fan design). Reductions of 5 to 10 dB(A) appear to be achievable, usually without great difficulty. Practical long-term abatement [of about 15 to 20 dB(A)] can probably be achieved by basic engine design changes. Of course, replacement of the internal combustion engine by a quieter prime mover, such as a gas turbine or electric motor, would eliminate the reciprocating-engine noise source altogether.

*Impact Equipment and Tools*

Conventional pile drivers are either steam-powered or diesel-powered; in both types, the impact of the hammer dropping onto the pile is the dominant noise component. With steam drivers, noise is also generated by the power supply (a boiler) and the release of steam at the head; with diesel drivers, noise is also generated by the combustion explosion that actuates the hammer. Noise levels are difficult to measure or standardize, because they are affected by pile type and length, but peak levels tend to be about 100 dB(A) (or higher) at 50 ft.

Impact-noise is absent in the so-called "sonic" (or vibratory) pile drivers. These do not use a drop hammer, but vibrate the pile at resonance. The noise associated with pile vibrations typically occurs around 150 Hz and is barely audible. The power source, which generally consists of two gasoline engines, is the primary noise source.

Abatement can be accomplished best by substituting use of a sonic pile driver for an impact machine where possible. (Unfortunately, sonic pile drivers are useful only for some soils.) Impact noise reduction at the source generally is very difficult. Substitution of nonimpact tools offers the best practical abatement potential; otherwise, reductions of perhaps 5 dB(A) may be obtained by use of enclosures.

Most impact tools, such as jack hammers, pavement breakers, and rock drills are pneumatically powered, but there are also hydraulic and electric models. The dominant sources of noise in pneumatic tools are the high-pressure exhaust and the impact of the tool bit against the work. Noise levels at 50 ft typically range from 80 to 97 dB(A).

An exhaust muffler on the compressed air exhaust can lower noise levels from the exhaust by up to about 10 dB(A). Pneumatic exhaust noise, of course, is absent in hydraulic or electric impact tools. Reduction of the impact noise from within a tool can be accomplished by means of an external jacket, which can contribute perhaps a 5 dB(A) reduction. Reduction of the noise due to impact between the tool and material being worked upon generally is difficult and requires acoustic barriers enclosing the work area and its immediate vicinity. Depending on the impacted structures, such barriers may reduce noise by 3 to 10 dB(A).

Small hand-held pneumatic tools, such as pneumatic wrenches, generate noise of levels between 84 and 88 dB(A) at 50 ft. The exhaust and the impact are the dominant noise sources. Because of the obvious weight and size limitations to which hand tools are subject, only small and light mufflers can be used with them, limiting the achievable noise reduction to 5 dB(A) at best. The best practical means for reducing the noise from impact tools consists of using other types of tools to accomplish the same functions.

### 2.1.3 Site noise characteristics

To characterize the noisiness – i.e., the average noise annoyance potential – of the various types of construction sites during each phase of construction, a Noise Pollution Level (NPL) was calculated for each type of site and each construction phase. The NPL used here was taken as the same measure that was used for similar evaluation of traffic noise [2]. The NPL (in dB) is defined as the sum of the A-weighted average sound pressure level and 2.56 times the standard deviation of the A-weighted sound pressure level*; thus, NPL accounts for the effect of steady noise, plus the annoyance due to fluctuations.

Although a thorough study relating NPL to subjective descriptors of annoyance (e.g., acceptable, unacceptable) has not been accomplished, a provisional interpretation of NPL in such terms can be suggested. On the basis of an evaluation of domestic and

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*A-weighting refers to a standard weighting of the various frequency components, approximating the behavior of human hearing. The average sound pressure level is computed on the basis of the time-average root-mean-square sound pressure, whereas the standard deviation is calculated from the time-variation of the dB(A) values.

TABLE IV. IMMEDIATE ABATEMENT POTENTIAL OF CONSTRUCTION EQUIPMENT

| Equipment | Noise Level in dB(A) at 50 ft | | Important Noise Sources[2] | Usage[3] |
|---|---|---|---|---|
| | Present | With Feasible Noise Control[1] | | |
| Earthmoving | | | | |
| front loader | 79 | 75 | E C F I H | .4 |
| backhoes | 85 | 75 | E C F I H | .16 |
| dozers | 80 | 75 | E C F I H | .4 |
| tractors | 80 | 75 | E C F I W | .4 |
| scrapers | 88 | 80 | E C F I W | .4 |
| graders | 85 | 75 | E C F I W | .08 |
| truck | 91 | 75 | E C F I T | .4 |
| paver | 89 | 80 | E D F I | .1 |
| Materials Handling | | | | |
| concrete mixer | 85 | 75 | E C F W T | .4 |
| concrete pump | 82 | 75 | E C H | .4 |
| crane | 83 | 75 | E C F I T | .16 |
| derrick | 88 | 75 | E C F I T | .16 |
| Stationary | | | | |
| pumps | 76 | 75 | E C | 1.0 |
| generators | 78 | 75 | E C | 1.0 |
| compressors | 81 | 75 | E C H I | 1.0 |
| Impact | | | | |
| pile drivers | 101 | 95 | W P E | .04 |
| jack ha mers | 88 | 75 | P W E C | .1 |
| rock drills | 98 | 80 | W E P | .04 |
| pneumatic tools | 86 | 80 | P W E C | .16 |
| Other | | | | |
| saws | 78 | 75 | W | .04 |
| vibrator | 76 | 75 | W E C | .4 |

Notes:

1. Estimated levels obtainable by selecting quieter procedures or machines and implementing noise control features requiring no major redesign or extreme cost.

2. In order of importance:

| | |
|---|---|
| T Power Transmission System, Gearing | P Cooling Fan |
| C Engine Casing | W Tool-Work Interaction |
| E Engine Exhaust | H Hydraulics |
| P Pneumatic Exhaust | I Engine Intake |

3. Percentage of time equipment is operating at noisiest mode in most used phase on site.