



CPWR KEY FINDINGS FROM RESEARCH

Productivity and hand vibration during hammer drilling into concrete

R2: Drilling productivity and hand vibration during hammer drilling into concrete

Lucia Botti, Bernard Martin, Alan Barr, Jay Kapellusch, Cristina Mora, David Rempel. *International Journal of Industrial Ergonomics*, 2020.

Overview

Approximately 1.6 million commercial construction workers in the U.S. use rotary hammer drills for drilling into concrete to insert anchor bolts or set rebar. Depending on handle vibration acceleration level, hand grip force, and duration of exposure, this work may lead to hand-arm vibration syndrome and other musculoskeletal disorders. Currently, however, there is little information on the relationship between feed force (FF)—that is, the push force applied by the worker—and handle vibration. To begin to fill this gap, the research team used a robotic test bench for rotary hammer drills they had previously created to evaluate the effects of different FF on handle vibration and productivity, such as penetration rate and holes drilled.

Key Findings

- Drill handle vibration increased when feed force (FF) increased from 95 to 163 Newtons (N).
- Penetration rate (mm/s) increased when FF increased from 95 to 185 N.
- Above the higher FF (163 or 185 N), there was no change in either handle vibration or productivity.
- Based on the maximum allowable duration of exposure to hand vibration, as specified by the International Standards Organization and American Conference of Governmental Industrial Hygienists Action limits, and the penetration rate, drilling productivity (in m drilled per day) is greatest for the lowest FF tested.
- Contractors and construction workers should be informed that when drilling into concrete, the lowest exposure to harmful hand vibration and the best overall productivity occurs when the lowest operational FF is applied during hammer drilling.

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See abstract:

<http://bit.ly/3ac0qxx>

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