



Reducing the Pain and Fatigue of Overhead Drilling

New tool wins support of workers and contractors

The Challenge

Drilling overhead into concrete or metal ceilings is punishing work. Electricians, plumbers, pipefitters, sheet metal, and other construction workers use 6- to 12-lb. hand-held rotary hammer drills to bore holes in ceilings where anchor bolts will be placed. Workers may drill hundreds of holes, one after another, spending up to two minutes per hole. The resulting sore hands, arms, shoulders, and backs help explain why the construction sector has the highest rates of non-traumatic soft tissue injuries to these areas.

“Drilling overhead into concrete is like holding a noisy, vibrating 50-lb. box above your shoulders while dust drops into your face and eyes—while you’re standing on a ladder.”

— Dr. David Rempel describes the traditional method



The Response

When Dr. David Rempel heard workers at a safety conference identify overhead drilling as a vexing issue, he began envisioning solutions. Rempel, an MD and engineer, heads the graduate ergonomics program at the University of California San Francisco and UC Berkeley.

His team began researching ways to minimize stress on the body and keep workers off ladders when drilling overhead. Partnering with Rempel’s team were more than 20 contractors and labor unions representing workers in a range of trades. More than 100 workers in California, Oregon, and Washington took part in field testing. The team designed and built four generations of the tool through tests and improvements.

The Results



Through research and collaboration, the Inverted Drill Press evolved to have a tripod base on locking wheels, a telescoping vertical column with a drill-mounting saddle on top, alignment devices, and gears and a handwheel that extends and retracts the column. It can be assembled on-site in about 30 seconds, weighs 90 lbs. with a drill, and is compatible with scissor and other lifts. This new device keeps workers safer by allowing them to perform all tasks from ground-level: drill target marks can be placed on the floor instead of the ceiling, and the telescoping column raises the drill to heights of up to 15 feet.

To test the device, workers drilled an equal number of holes using the old and new methods. They compared the two methods on fatigue, device usability, and ease of use during drilling.

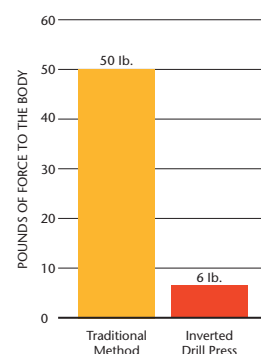
Workers rated the Inverted Drill Press superior in many areas. It diminished fatigue in the neck, shoulders, hands, arms, lower back, and legs. During drilling, workers reported better control, stability, and handling with the new device.

The study demonstrated that the Inverted Drill Press reduced force to the body by 90 percent—from 50 lbs. with the traditional method to just 6 lbs. with the new tool.

Field tests showed no appreciable reduction in productivity, even among first-time users. Set-up and adjustments take somewhat longer with the new device, but drilling itself is routinely faster. Over time, productivity should steadily improve with the Inverted Drill Press.

Additional benefits include a decreased risk of falls by eliminating the need for a ladder to mark the ceiling and a vacuum system that captures hazardous silica dust.

**INVERTED DRILL PRESS
REDUCES FORCE TO
THE BODY BY 90%**



The CPWR IMPACT

Tool now available through Telpro Inc.*

U.S. manufacturer Telpro Inc. is now developing and marketing the tool for industry buyers. The company modified the original design, changing the base from a tripod to a smaller, four-wheel device, and fashioned a proprietary dust suppression system for the tool.

The buzz created by users of the original tool has had dramatic results:

- Workers' compensation insurers are interested in seeing if the device can help accommodate return-to-work for injured employees.
- The UC Ergonomics Program has fielded requests from contractors since 2009 to borrow or purchase the device, which it offered at cost.
- Two large contractors have used the researchers' design plans to fabricate their own site-specific versions of the Inverted Drill Press.
- *Engineering News-Record* honored Dr. Rempel as one of its Top 25 Newsmakers of 2010.

“Our experience with the Drill has been nothing but good. A job that would have taken four or five workers two weeks ended up taking three guys four-and-a-half days. Everybody who saw the Inverted Drill Press asked where they could get one.”

—Dr. Marco Pedone, President & CEO, Environmental Management Solutions of New York

Telpro's modified design

**CPWR does not endorse any specific equipment or product.*



What made it a success?



The Inverted Drill Press is a sterling example of the success that can come when research is laser-focused for adoption in the workplace. Stepping-stones to success include:

- Listening to workers' suggestions—and acting on them
- Partnering with contractors
- Field-testing extensively and modifying based on findings
- Reaching out to manufacturers and exploring their concerns
- Applying the lessons learned to related projects.

Rempel's team is using a similar approach in its new project: a rock drill support tool that cuts force and vibration to the driller's body while increasing speed and quality.

“We performed field testing with over 100 workers—and they all gave us an earful. Only through repeated testing, and listening to workers, can you get a successful product.”

— David Rempel, MD, MPH, Director of the Ergonomics Program at University of Calif. San Francisco and UC Berkeley