



Universal Drill Jig Adapted for Use in Commercial Building Sector

TOOL FITTED TO REDUCE AIRBORNE SILICA

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For four years, Dr. David Rempel and development engineer Alan Barr have worked to design a universal drill jig that can relieve construction workers from the extreme physical stresses endured during concrete and rock drilling. Tunnel construction and necessary seismic upgrades of large buildings have created significant demand for this task on the West Coast. The UC-San Francisco/UC-Berkeley based team met the challenge with successive versions of their new device, which reduces the fatigue associated with using by hand a heavy pneumatic or hammer drill while drilling hundreds of dowel holes into concrete.

In 2012 the UCSF team tested different versions of the jig on construction sites across the Bay Area. Worker and contractor feedback informed important improvements:

- A universal saddle that accepts large electric hammer drills and pneumatic rock hammers,
- A more reliable remote on-off switch,
- A new design that allows the drilling arm to be set to any drilling angle, without cumbersome removal and resetting of bolts, thereby reducing bending and reaching during drilling,
- A new bearing system that makes the jig easier to use and more robust,
- A drill saddle design that allows using two drills simultaneously.

The jig is gaining fans across the country. Massachusetts Electric Construction is using 10 rigs, each bearing two drills, on a year-long tunnel project in Chicago. Moreover, commercial building



Laborer at a San Francisco site using drilling jig set up for 2 drills but only drilling with one. Concrete dust is captured during drilling with a new hollow bit system.

contractors are demonstrating increased interest in the tool.

McCarthy Construction is using 10 rigs on an eight-story renovation in San Francisco. The project involves drilling over 20,000 holes over a three-month period; the jigs in use speed work by drilling two perfectly spaced holes simultaneously.

Laborers on the job not only prefer the new way of drilling, they have adopted their jig by naming it and wear t-shirts with an image of the jig!

Equally important, Rempel and Barr have enlisted the drill jig in the war against silica hazards. Tasks like dowel drilling and overhead or lateral drilling in rock or concrete can generate significant amounts of dangerous airborne crystalline silica. Workers who inhale the particles are vulnerable to silicosis and related respiratory problems, an occupational health concern severe enough that OSHA has proposed a new rule requiring more stringent workplace controls.

To reduce exposure, Rempel and Barr have incorporated a new dust capture system on the drill. Dust control is achieved by one of two methods; the most common is a dust shroud over the bit that attaches to the jig. A new innovation from Hilti, using a hollow bit with a vacuum port, was deployed on the McCarthy project. The vacuums are mounted on the jig for ease of movement.



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Users were so enthusiastic about the drill jig that they had t-shirts made with a cartoon showing the power and speed of the tool.

WHAT WE ACCOMPLISHED

- Using feedback from laborers and electricians who used the jig, the team improved its design with a universal drill saddle, an improved remote on/off switch, and a new method for rapidly adjusting drilling height and angle.
- Bay Area contractors have put the drilling jigs to use on seven commercial construction sites, including a seismic retrofit of the Bay Area Rapid Transit (BART) towers.
- New drill jig heads allow the option of drilling two holes simultaneously – one contractor successfully used the dual drill jig to install miles of electrical conduit in a tunnel in half the expected time.
- The team has presented findings to four national and local contractors' health and safety meetings, three union health and safety meetings, six scientific conferences and in an article published in the *Journal of Occupational and Environmental Hygiene*.
- A local manufacturer, Ergomek.com, is now producing a commercial version of the jig called the DrillBoss.

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