

Sawing Concrete



This fast, economical specialty service delivers smooth and accurate cuts with no dust

During a recent remodel of a local building, the contractor rented a gas-powered cutoff saw and attempted to cut a new opening through an 8-inch-thick concrete-block interior wall. After

by Dennis Smith and Peter Zoni

about an hour's hard labor, he'd managed to out-

line the opening to a 1-inch depth and hack out a shallow recess where the structural steel lintel would be installed. The dust generated in the process reduced visibility to near-zero and coated every surface. The job was made even more daunting by the discovery that the blocks had been solid-filled during construction. At this point, contractor and client agreed that the situation called for stronger measures and called us.

Diamonds Are a Guy's Best Friend

Diamond abrasives and concrete sawing have witnessed a technological leap in their manufacture over the past five years. The design and performance of industrial diamonds

have been dramatically improved, and diamond tool prices have come down. Concrete sawing is now so economical that some tract builders are actually pouring their foundations with blank walls, allowing the homeowners to decide later where they want their window and door openings.

Our company, Concrete Services of Cape Cod, has been wet-sawing, coring, and altering concrete structures for six years. The diamond abrasive saw blades we use yield neat, accurate cuts with a smooth, terrazzo-like surface (see Figure 1, page 3). Correcting errors in the height of a pour or sawing back a misplaced jog in a stepped foundation are all in a day's work. Foundation contractors make their share of small errors, too, like forgetting to allow for wood trimmers in a rough opening or not dropping the footing across a garage entry.

But our bread-and-butter is cutting access openings between new crawlspace foundation additions and existing foundations, and opening up walls to expand a foundation or add an exterior bulkhead entry.

We can schedule a couple of openings per day if the distance

Why Not Do It Yourself?

There are many good reasons not to rent a cutoff saw and tackle the job yourself. A major difference between dry and wet sawing is that a dry blade cuts by grinding. Forcing the blade to cut too deep or too fast will quickly wear it out. In fact, the blade should never become hotter than you can touch with your bare hand, demanding a slow, measured technique and repeated shallow passes. New blades cost \$200 and up. Burn one out and you buy it.

Unless the rental outfit thoroughly instructs you in the proper cutting techniques, you could end up damaging the tool, the saw blade, or worse, yourself. A hand-held saw

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weighs 25 to 30 pounds and becomes harder to control as you get tired. And if you should encounter a piece of rebar that just happens to align with the cut, forget trying to get through it. Without the surrounding concrete particles present in a cross-cut to mix with and clear the metal filings from the abrasive segment, you'll soon destroy the blade. But how eager are you going to be to relocate the cut and start over?

By contrast, wet sawing is just that — a steady flow of water flushes the slurry from the cut, allowing the diamond abrasives to aggressively and rapidly saw the concrete. It's a faster, cheaper, and higher-quality method.

Another issue is that the type of aggregate used in concrete varies in hardness by region. In Florida, for example, soft limestone is the local material, and saw blades go through it like butter compared to concrete mixed in New Hampshire, where hard, igneous rock is plentiful. The saw blade that comes with your rental saw may or may not be suited to the

local aggregate. A concrete sawing specialist will have the right blade for local conditions.

A concrete saw blade's segments are produced in three hardness groups. Segments are made with a mix of relatively soft metal and industrial diamonds in various degrees of friability. When the segment is properly matched to the material being cut, fresh, sharp diamond surfaces are continuously exposed in the process of sawing. Interestingly, the harder the material, the softer the segment should be. Green concrete calls for a hard segment, because the sand and aggregate are not yet fully settled and locked into the mix and so produce an abrasive grit that would rapidly degrade a too-soft segment. Fully hardened concrete presents a homogenous mass that yields more readily to the cutting action. A soft segment wears better in hard material, exposing fresh cutting edges.

It's also important to have a sufficient, directed flow of water in the cut. Merely wetting the surface to control dust can actually create an abrasive slurry in the groove that will kill a blade in short order. A wet saw is designed to throw water into the cut by centrifugal force. The slurry is constantly flushed out, effectively cleaning and lubricating the segments as they cut.

The dust produced by dry cutting is a health hazard. Silicosis is a chronic disease of the lungs, caused by inhalation of silica dust, which is often present in the aggregates used in concrete. A good dust mask is a must when you're grinding concrete. Protective eyewear is just as important.

— C.S. "Jack" Parsons, Jr.

Jack Parsons is a concrete sawing and drilling consultant for P.M.A.C. and a U.S. agent for Dimas Lamage, an industrial-grade diamond tooling manufacturer. He can be reached via e-mail at jackpmac@capecod.net.

between jobs isn't too great. The main on-site requirement is a garden hose connection. Concrete sawing calls for plenty of water to cool the blade and flush out the cut.

Track-Mounted Saw

The tool of choice for many of these cuts is our Cushion Cut diamond wall saw, which is available in hydraulic, electric, and pneumatic models (Figure 2). Our pneumatically driven saw operates at a low 90 to 100 psi, but requires the high-volume output of a heavy-duty 185 hp, trailer-mounted compressor. We can handle cuts up to 18 inches deep using this tool, but we aren't usually called on to saw anything thicker than 8 to 10 inches. Although the saw itself is rated for blade diameters from 24 to 42 inches, the largest diameter requires a lower-rpm, higher-torque motor than the one we use. Our workhorse — a 24-inch-diameter blade that costs about \$600 — is good for handling aged concrete, hard aggregate, and moderate steel reinforcement.

Embedded rebar doesn't pose a problem, unless a horizontal rod coincides with the line of cut. That tends to deflect the blade from its intended path and cause excessive wear, so we'll occasionally have to relocate a cut slightly. The manufacturer rates our 24-inch saw blade for a life span of 5,000 inch/feet, or 625 linear feet of 8-inch-thick wall. Although the brazed sawing segments (Figure 3) can be replaced when worn, it makes more sense to buy new blades — the blade blank is the cheapest part. On rare occasions, a segment will get knocked out during use and go zinging off the walls just like a ricocheting bullet, so the work can be dangerous at times. Anyone working in the vicinity should definitely wear safety glasses.

The noise of sawing isn't something you're likely to tolerate without good hearing protection. In fact, OSHA requires you to provide hearing protection for



Figure 1. Crisp edges and a smooth, terrazzo-like surface are characteristic of wet-sawn concrete.



Figure 2. The Cushion Cut diamond wall saw can handle 24- to 42-inch-diameter blades and cuts up to 18 inches deep. It takes about three passes to cut through an 8-inch wall.



Figure 3. Various combinations of metal hardness and diamond friability produce industrial diamond saw teeth, called segments, suitable for different types of aggregate and concrete hardness. Blade design ensures that water is thrown into the cut by centrifugal force.



Figure 4. Track mounts are installed and individually leveled for alignment (top). The mounts have a slotted hole that allows the track to be tapped into level after attachment (above). Four adjusting screws in each mount allow the track to be leveled or squared to the cut (inset).

noise levels of 115 dB and higher, and we're at least that loud.

Track mounting is the secret to smooth, controlled sawing. The saw's guide track attaches to adjustable mounts that are secured to the wall itself with expansion bolts. The bolts must be offset from the cut line by 8¹/₄ inches but, in most cases, they can go inside the cutout area, eliminating the need to patch the holes later. To ensure square, accurate cuts, the track mounts are trued using four adjustable set-screws. We set a torpedo level on top of each mount and tweak the screws until the bubble reads plumb and level, then we attach the track to the mounts and true it up as well (Figure 4).

Although setup takes nearly as long as the actual cut, it's time well spent, because the smooth, clean accuracy of a wall saw's cut is unmatched by other methods. An average

door opening — two vertical cuts through the wall — takes from four to five hours to complete, including travel, setup, and breakdown time. We use an ordinary socket wrench to hand-crank the saw along the track while sawing, but a remote attachment is also available that allows the operator to control the saw's operation from several feet away. Remote operation adds a margin of safety and keeps the operator drier.

Dust Control

Because the cut is continuously flushed with water from a garden hose connected to the saw, there is no free-floating dust. The damp, gritty mist that results instead is easily contained by a temporary plastic curtain. A bigger problem is the puddle of water and slurry that forms at the base of each cut. If we're working in a finished interior space, someone has to stand by with a wet-vac to suck up the runoff during the cut.

The automotive transmission fluid that's ordinarily used to lubricate the impeller blades of the pneumatic motor blows off and spatters the wall alongside the cut (Figure 5). In the case of a finished interior, this might be objectionable, so sometimes we omit the lube. The impellers will wear out earlier as a result, but they're fairly inexpensive and easy to replace.

Hand Tools

A circular blade has its shortcomings. If we're sawing through a wall and there's a framed floor overhead, we can't make a clean pass through the top of the wall (Figure 6). You could finish the cut by knocking the cutout free with a sledgehammer, but that would leave a damaged "ear" at the corner. Instead, we prefer to score the backside of the cut-line by hand with a 4-inch-diameter electric cutoff tool, then carefully complete the breakthrough with a



Figure 5. Impeller lube and concrete slurry stain the wall after sawing. The lube (automotive transmission fluid) can be omitted to reduce cleanup when altering a finished interior wall.

pneumatic chisel.

A circular blade won't complete a corner cut without overcutting, either. Whether we're restricted by aesthetics or a physical obstruction, we have to resort to other tools to complete a cut from one side of the wall.

Chainsaw. We also have a hand-held, gas-powered plunge-cutting diamond chainsaw from ICS that provides a handy way to complete corner cuts when overcutting isn't acceptable (Figure 7). The thin bar fits inside the cut made by the circular saw blade. Because the chainsaw is hand-held and has fewer cutting segments than a circular blade, it's harder and more dangerous to handle and control, but it's extremely versatile. We also use this tool to form beam pockets and make other odd cuts that are impractical for the wall-mount saw.

Heavy Waste

A door-size cutout usually breaks in two when it falls, but the pieces can weigh several hundred pounds and may require further sawing for removal. The average cost for a door cutout is around \$400 (our basic 5-hour rate), but we charge \$75 per hour for any additional cuts. Getting rid of the debris isn't usually our job — in new construction, the contractor may simply bury the cutout on site in a hole dug for the purpose or add it to the foundation backfill. Whenever possible, schedule concrete sawing to coincide with or precede excavation or backfilling to make disposal convenient. The waste can also be buried under a new floor slab as long as there's no chance of a deep freeze heaving it up through the floor. If the cutout is going to drop on a finished slab, the best way to buffer the considerable impact is to place a few unmounted rubber tires in the drop zone (Figure 8).



Figure 6. An overhead floor limits a through-cut (above). To avoid a broken "ear" at the top corner, the author scores the backside of the cut with a hand-held cutoff tool (left) and carefully completes the cut with a pneumatic chisel.



Figure 7. The authors use a gas-powered, plunge-cutting diamond chainsaw for applications where a wall saw is unsuitable, such as completing corner cuts, carving out beam pockets, and sawing through round or irregular concrete.

Figure 8. Tires break the impact of a solid-filled CMU wall section to prevent damage to the finished slab.



Figure 9. Concrete cores, 2 to 12 inches in diameter, are cut with a wet-sawing rig bolted or vacuum-mounted to the surface being cored. The resulting holes can accommodate water or sewer lines, wiring, or duct-work.



Smaller Jobs

Concrete coring — sawing circular holes from 2 to 12 inches in diameter to accommodate electric, water, and sewer lines through the foundation wall — is also in pretty constant demand (Figure 9). Coring through an 8- to 10-inch-thick wall takes only a few minutes and leaves a neat hole that can be easily sealed around the pipe or cable. If we're already on the job for a wall cut, we charge the hourly rate of \$75, which will cover quite a few holes. Otherwise, we charge \$250 for a dedicated trip and one or two holes.

Control joints. There are concrete floor saws for scoring and cutting through slabs, and we do a fair amount of this type of work, too. However, the floor tool is big, bulky, and heavy, making it unsuitable for some interior applications.

Instead, if we're sawing control joints in an interior slab, for example, we'll simply bolt the wall saw to a short, heavy wooden plank and slide the rig across the floor along a temporary guide strip.



Dennis Smith has been sawing concrete for CSCC for six years. Peter Zoni is the principal owner of CSCC, in Orleans, Mass., and an expert in all phases of light and heavy concrete construction.

Sources of Diamond Tools

Cushion Cut

2565 W. 237th St.
Torrance, CA 90505
800/421-2222
www.cushioncut.com

Dimas Lamage

P.O. Box 690
North Bay, ON P1B 8J8
Canada
800/461-9589
www.jkslamage.com

ICS, Blount

4909 S.E. International Way
Portland, OR 97222
800/321-1240
www.icsbestway.com

P.M.A.C.

P.O. Box 342
N. Chatham, MA 02650
508/945-7707