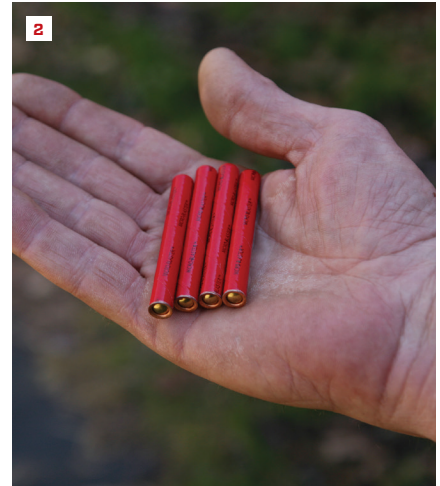


BY TIMM SCHLEIFF



1. The required $\frac{5}{16}$ -inch hole can be drilled with a gas- or battery-powered rotary hammer on a site with no power.

2. A single power cartridge requires a 10-inch-deep hole; each additional cartridge adds 2 inches more (up to a maximum 16 inches for 4 cartridges).

Rock Breaking With Micro-Blaster

I recently built a new shop for my custom wood-working business near Lewisburg, W.Va. The site I chose is not quite typical for a woodshop—it's within an old limestone quarry—but the price was right, it's within walking distance of our historic downtown, and the natural soundproofing of the quarry walls lets me run my chainsaw and band saw mill without bothering the neighbors.

The relatively flat bedrock floor also offered a solid base for a slab foundation. But before I could proceed with the formwork, I was faced with the challenge of removing about 10 cubic feet of limestone in a rear corner of what is now my shop, as well as taking out several ridges that ran through what would become my slab.

The John Deere 710B backhoe couldn't budge them, so I turned to an approach that my family's general contracting business has been using successfully for several years: A rock-breaking system called Micro-Blaster,

manufactured by a Frankford, W.Va., company called Ezebreak (ezebreak.com).

The Micro-Blaster system is quite inexpensive, easy to use, and requires no license or special training. It's very safe, and the force generated by the small explosive cartridges can be targeted so accurately that we've used it to break up concrete within the basement of an occupied home during a remodeling project.

PLACING THE CHARGES

One of the best things about Micro-Blaster is that it requires only a $\frac{5}{16}$ -inch hole—easily within the capability of an electric rotary hammer with a carbide bit. Where there is no power on site, a gas- or -powered drill will work for this step **(1)**.

Different types of rock fracture differently, but in general it's best to drill at a fairly shallow angle, with the goal of breaking loose a 6- or 8-inch-thick section of rock

3. In addition to the three-head kit shown here, the manufacturer also offers an air-operated single-head kit, as well as a lower-cost single-head kit that's activated with a pull cord.

4. Three holes are charged and ready to fire. The uppermost portion of the outcrop had already been broken free by a previous round.

5. This is an example of rock in which an exploding charge has bisected the drill hole, revealing the pocket at its bottom that held the power cartridge.



with each charge. It's important to drill the hole to the proper depth—a single charge requires a 10-inch-deep hole. If the hole is too deep, the firing pin won't be able to engage the cartridge.

Also, the hole must be clean to prevent dust from gathering between the charge and the firing mechanism. Any stone dust in the completed hole has to be blown out with an air compressor or a bulb-type syringe provided by the manufacturer. Then a stiff small-bore wire brush with a long handle is worked up and down in the hole to loosen any remaining dust, after which it's blown out one last time.

One or more paper-wrapped power cartridges—which look something like medium-size firecrackers (**2**)—are then inserted into the hole, followed by the tubular section of the blasting unit, which holds the firing pin. Pushing with 10 to 15 pounds of pressure until you feel it bottom out ensures that the firing mechanism is firmly seated against the cartridges.

THREE HEADS ARE BETTER THAN ONE

For smaller jobs, we sometimes use our original Micro-Blaster, a single-head version that is activated with a 25-foot pull cord, but we mainly use the newer Micro-Blaster IIx3 kit, which has three separate heads that can be detonated separately or simultaneously (**3**).

Rather than relying on a pull cord, though, the three-head version is activated by compressed air supplied to the heads through three 25-foot lengths of $\frac{1}{8}$ -inch air hose (**4**)—a smaller-diameter version of the hose used to power pneumatic nailers. The individual hoses connect to a three-way quick coupler that incorporates a key-operated lockout valve. A short length of hose from the valve is coupled to an air compressor or a portable air tank.

Once hoses are connected and the area is secure, unlocking and opening the valve activates the firing pins and fires the charges. When three charges are ready to fire, you have the option of setting them off individu-

ally by connecting only one of the hoses to the valve at a time. In general, though, I find that it's best to fire all three at once, since that seems to provide the most breaking power. A portable 10-gallon tank like the one I used on this project holds at least enough air for several dozen shots before it needs a refill.

SAFETY & EFFICIENCY

The explosive in the Micro-Blaster cartridges is active only at high pressures. Once the charge fractures the rock surrounding it, the pressure is relieved and the explosive reaction essentially comes to a stop (**5**). As a result, there's not a lot of surplus energy to fling rock around. Setting off a charge from 25 feet away—the length of the air hoses—feels perfectly safe (**6**). I've occasionally seen golf-ball size rocks travel 10 or 15 feet, but with no more velocity than you'd get from a gentle underhand toss. If there are vehicles close by or we are working close to a house, we will drape a section of old household carpet over the area to prevent any damage.

Although it seems counterintuitive, hard rock such as limestone usually fractures more easily than sandstone or other softer materials. Depending on the rock and how much fracturing you want, you can insert as many as four cartridges in each hole. The secret is to find the minimum number that will give you a satisfactory result. Multi-cartridge shots require you to drill 2 inches deeper for each additional cartridge, which means more time and more wear and tear on bit, drill, and operator. Cartridges themselves cost about \$2 apiece, which also adds up over time.

On the other hand, a charge that isn't sufficiently powerful may fail to break the rock or concrete enough to free it from the surrounding material, leaving you with an area of cracked fragments that are so tightly interlocked that they can't be removed.

Drilling another hole and placing an additional charge in the same area may not provide much additional fracturing because the cracks created from the first



6. With the Micro-Blaster, debris rarely travels more than half the length of the air hoses, so blasting is much safer than with traditional charges. In close quarters, a scrap of carpet is enough to contain blast debris.

charge relieve the pressure produced by the later one.

I found that double charges gave good results with the limestone under my shop. Breaking up and removing the problem outcroppings took me less than a day and cost much less than hiring a blasting contractor or renting a hammer attachment for the backhoe.

Once the problem rock was out of the way, I was ready to build the slab forms. Fitting them to the sloping surface so the tops were level throughout was the next challenge, but that's a story for another day.

Timm Schleiff (timmschleiff.com) practices sustainable woodworking and cabinet and furniture making near Lewisburg, W.Va.



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Structural Brackets for a Balcony Deck

BY MIKE RAND

For 30 years I've provided local builders with specialty building components that I fabricate in my shop in Narragansett, R.I. Last year, Pariseault Builders handed me plans for a pair of structural brackets intended to support a 5-by-8-foot second-story balcony (1). Although the plans specified custom-laminated mahogany, I had serious misgivings about the quality, workability, and ultimate performance of the rough lumber that the builder provided. Instead, I proposed laminating a thick tropical-hardwood veneer over a core of Parallam and AdvanTech.

Given the go-ahead, I located some African sapele at Dwyer Hardwoods and had them plane it to a uniform $\frac{15}{16}$ -inch (4/4) thickness. The material looked so nice that, despite this being a paint-grade project, I decided to go for appearance grade just to please myself.

ENGINEERED LUMBER CORES

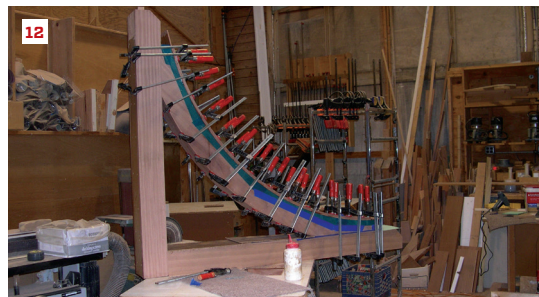
I began by cutting an accurate pattern for the curved segment of the braces out of $\frac{3}{4}$ -inch AdvanTech, in-

cluding inch-long tenons at either end. For the first piece of the five-layer layup for each bracket, I cut the prescribed 4-foot-2-inch radius using a router mounted in a trammel arm; this piece served as a pattern for the remaining ones, which I cut on a router table fitted with a bottom-bearing pattern bit.

I coated the layers with waterproof West System 105 epoxy (the only adhesive used for this project), then stapled them together using $\frac{7}{16}$ -inch by $1\frac{1}{2}$ -inch galvanized staples on 4-inch centers. Next, I glued a double layer of $\frac{1}{4}$ -inch poplar to the inner and outer curved surfaces (2); this conserved the more costly sapele, which would form only the outer $\frac{1}{4}$ -inch layer on the curves.

For the straight legs of the brackets, I cut 4x6 Parallams to length, then epoxied solid sapele blocks to the ends (3). This would simplify the veneering process because the finished ends would later be chamfered at 45°. On the opposite ends, I used a band saw to cut forks for a saddle joint of the horizontal members, and to cut reciprocal tongues on the verticals (4).

Photos: Mike Rand



FINISH LAYERS

With the aid of a plywood routing template, I cut the sapele slightly oversized for the side panels for the curved braces. To guide alignment during glue-up, I added sacrificial shoulder cuts to the ends of the template (5); a few carefully placed brad nails held them in position for clamping. After the epoxy set, I trimmed the edges flush with the core, using a bearing-under router bit.

For ease of dry-bending, I had Dwyer plane the veneer lumber for the curve laminations to a 1/4-inch thickness. Using plenty of clamps, I epoxied the outer curves first (6). I also glued solid lumber to the ends of the braces to provide a weatherproof cap.

I then dressed the side and front faces of the posts and beams with 4/4 sapele, again routing the edges flush with the core before applying the adjacent overlapping pieces. I ran these pieces long on the tongued ends and short on the forked ends to provide an additional structural overlap at the corner

joint (7). Rather than using sapele for the unseen backs and tops of the brackets, I overlapped the sides by a generous 3/4 inch, and did the same with the solid end blocks (8), creating a recessed surround into which I would later epoxy 3/4-inch MDO plywood.

To help rout pockets in the posts and beams to receive the brace tenons, I made a plywood template that fit slightly loosely around the tenons. I then used a top-bearing straight bit to cut the pockets (9). The loose fit ensured struggle-free assembly, and the epoxy filled any gaps. (Proprietary thickeners change the consistency of epoxy from “maple syrup” to “peanut butter,” or anywhere in between, so it will stay where you put it.)

The plan called for bolting the finished brackets through solid posts in the first-floor wall framing. To avoid bungs or other weather-vulnerable surface marring, I encapsulated the 1-by-12-inch galvanized machine bolts within the bracket verticals. During bracket assembly, I set one bolt at the top in a pocket

cut into the saddle joint (10) and passed another through the brace tenon at the bottom (11). I bedded all the tenons in thickened epoxy and screwed them from the back using 3 5/8-inch LedgerLok screws. For good measure, I also capped the bolts with a custom mix of sawdust and epoxy.

Now I could glue and clamp the finish faces to the inner curves (12), rout the edges flush, and fill the backs with glued-in MDO plywood. Ultimately, the engineered core material was completely encased in truly weatherproof material. A final sanding to a 150-grit surface completed my part of the job. I made an extra set of MDO in-fills to serve as drilling guides for installation and slipped them over the bolts for delivery (13).

Given the brackets’ final appearance, I made a pitch for a natural finish, but paint won the day.

Mike Rand owns Narragansett Housewrights, in Narragansett, R.I.