

WHAT TO CONSIDER WHEN SELECTING AND USING A DISC GRINDER IN REPOINTING MASONRY

BY CAROLYN SCHIERHORN

Commonly called “tuckpointers’ grinders,” small disc grinders are indispensable tools for repair contractors who do a lot of work repointing masonry (Ref. 1). These electric-powered right angle grinders allow hardened mortar to be cut out quickly and efficiently. But mention grinders at a meeting of historic preservationists, and you’re likely to see scowls and hear howls of protest. Some people think grinders should never be used on historic

model. Because they are inexpensive, “grinders like these are considered throwaway tools,” notes Justin Bales of Hitachi Koki USA Ltd. “An average tuckpointer should be able to use a grinder for about 6 months.”

Even this modest projected life span assumes some minimal maintenance steps are followed—steps busy tuckpointers may sometimes forgo. Tom Williams, owner of Bracing Systems Inc., a Carol Stream, Ill.-based construction supply firm, says that when used daily by tuckpointers, grinders last about 3 months and are then thrown out. Consequently, his customers look for low price more than anything else when they shop for grinders for masonry repointing.

Repointing is not the biggest market for 4- to 5-inch disc grinders, which come standard with an abrasive cutting wheel designed primarily for cutting metal. For repointing applications, contractors

GRINDERS FOR REMOVING MORTAR

masonry because of the risk of damaging the masonry units, while others contend that grinders can be used on historic structures but only in certain circumstances (See “Using Grinders on Historic Masonry” on page 31.) The soft lime mortar used in older masonry buildings can be removed with hand chisels; in contrast, the very hard mortar used in many modern buildings (especially those built in the 1960s and 1970s) may require the power of a grinder for removal.

The most popular disc grinders for repointing masonry have 4-, 4½-, or 5-inch cutting wheels that turn in a plane parallel to the tool and perpendicular to the plane of the rotating armature inside (hence the term **right angle grinder**). The grinder is powered by a small electric motor that delivers slightly more than 1 hp of output and a no-load wheel speed of 10,000 to 11,000 rpm.

Small disc grinders (drive motor plus basic abrasive wheel) frequently retail for under \$100 and are usually less than \$150, depending on the brand, geographic area, and power output of a particular

should generally use diamond cutting wheels,* which are purchased separately and can be more expensive than the grinder. At Bracing Systems, 4- and 4½-inch diamond blades start at about \$30 and go as high as \$180. Williams says his tuckpointer customers replace their diamond blades weekly, but diamond blade manufacturers insist that better-grade blades last longer. Nevertheless, these manufacturers admit that tuckpointers typically buy lower-priced blades and throw them out when they show signs of wear.

If small disc grinders and blades are disposable, why should a contractor give any thought to their purchase? When these tools are in constant use, small differences in power output, tool weight, and other features can make a big difference in productivity and safety.

In addition, greater awareness of the dangers of silicosis has prompted OSHA to give special emphasis to preventing this very serious disease. When grinding out mortar joints, tuckpointers should wear a respirator or use a dust-collection

* Diamond blades should not be used to remove elastomeric materials such as caulk. Carbide blades are now available for this purpose.



The Hitachi G125A 4 1/2-inch angle grinder (above left) is powered by a 6.9-amp motor and weighs 4.6 pounds. Hitachi offers a dust-collection attachment that can be used on its small disc grinders.

Hitachi Koki USA

CS Unitec Inc.



Designed for repointing applications, the 11-amp CS Unitec F 1509 FR (above right) comes with a vacuum hood for efficient dust collection and a sighting device for more exact cutting. The manufacturer recommends that the tool be used with the CS 34 K industrial vacuum (above left).



Designed for use on small angle grinders, diamond tuckpointing blades are available in a variety of styles and grades.

Diamond Products

system. However, many dust-collection devices affixed to small grinders impede the tool user's line of sight, thus creating a threat to safety and quality workmanship.

Grinder selection criteria

Although price may be the reigning criterion used by tuckpointers in selecting a grinder, other tool features should be considered as well. Look in manufacturers' literature for the tool's rated amperage. All other features being equal, a tool with a higher amp rating means less effort on the user's part to do the job. Motors for 4 1/2-inch angle grinders, for example, range from around 4.5 to 9.2 amp.

Tool weight is another important consideration. Typically, 4 1/2-inch disc grinders weigh 4 1/2 to 5 1/2 pounds and 5-inch grinders weigh up to 6 1/2 pounds. A heavier model may cause the operator to become fatigued more easily. But a lighter model may actually be more difficult for some people to control, tempting the operator to apply too much pressure and force the blade into the material. Also, keep in mind that a dust-collection device will add more than half a pound to the tool's weight—and sometimes considerably more. For example, one 5-inch repointing grinder that comes standard with a dust-collection device weighs 7 1/2 pounds.

Many features of a disc grinder affect the user's safety and the tool's longevity. Look for a double-insulated grinder, which will have a polarized plug that fits into a polarized outlet only one way. Double insulation eliminates the need for a three-wire

grounded power cord and a grounded power supply system (Ref. 2).

Select a tool that features a "soft start," which reduces the stresses that occur from a high-torque start, and overload protection. Small angle grinders manufactured by Metabo also come with an automatic safety clutch designed to protect both the user and the motor. If the grinding wheel jams suddenly, the patented friction clutch prevents dangerous kick-back. This clutch stops the spindle and cutting wheel momentarily while allowing the tool's motor to continue spinning. "When you stall out a motor, it burns up in seconds," notes Terry Tuerk, Metabo's technical services manager. The clutch thus prolongs the grinder's life.

Williams of Bracing Systems and others agree that Metabo angle grinders last longer, which is



The Bosch 1375A 4 1/2-inch angle grinder weighs only 3 3/4 pounds, including the wheel guard; its 6-amp motor delivers 11,000 rpm (no load) and 1 hp output.

USING GRINDERS ON HISTORIC MASONRY

Many preservation experts advise against using disc grinders on historic masonry (Refs. 6-9). "We steer people away from them," says David Woodham, a principal of Atkinson-Noland & Associates, a Boulder, Colo.-based engineering firm specializing in the repair and restoration of masonry structures. "I've seen the damage they've done." The blade can run off course and cut into the masonry units above or below the joint, especially if the grinder is being used on head joints in running-bond brick masonry. "Historic structures used lime mortar, which is soft and can be removed with hand chisels," Woodham adds.

Richard Kreh, the author of *Advanced Masonry Skills* (Ref. 10), warns that "great care should be taken... using a grinder. The grinder can ruin the edges of old bricks if not held exactly level. Although it takes longer and is more expensive, it is better to cut old mortar with hand tools."



Diamond Products

Manufactured by Diamond Products, a Core Cut pin grinder with 1/4- or 3/8-inch-diameter tuckpointing pins can be used to clean out mortar from head joints without damaging the masonry units above or below.

But it may be appropriate to use an angle grinder in specific situations on historic masonry—if the tool is used very carefully, the blade is the right thickness, and the operator is well-trained and not fatigued. According to Woodham, grinders may sometimes be used on stone masonry when the joints are long and thick. His-

toric masonry specialist John Speweik, a principal of Chicago-based U.S. Heritage Group, emphasizes that grinders should never be used on head joints. But, he says, a grinder can be used on bed joints if the "center-cut method" is observed and if the diamond blade is no more than half the thickness of the joint. "Use the grinder to make a cut down the center of the joint; then the top and bottom of the joint come off quite easily using a hand chisel or a pneumatic chisel," he explains.

An alternative system for carefully removing head joints (as well as bed joints) is manufactured by Diamond Products. Coated with a diamond abrasive, the company's 1/4- and 3/8-inch tuckpointing pins fit into a special pin grinder. As the tuckpointing pin rotates, it grinds out the old mortar (Ref. 9).

reflected in a retail price that is roughly \$30 more than that of similarly rated tools. The engineering of the motor is primarily what differentiates Metabo grinders from other brands, says Tuerk. For example, 8 to 12 coatings of epoxy resin cover the copper wires used in the windings.

All grinders have a cooling system to keep the motor from overheating. Air is sucked in through inlet vents and expelled through outlet vents. In repointing work, dust, chips, and other debris get pulled through the motor and can strike the rapidly rotating blades of the fan. A portion of this debris then gets thrown against the armature windings,

eroding the insulation on the winding wires. Metabo grinders have a "winding-protection grid," a fan attachment that prevents foreign matter from reaching the front of the armature, Tuerk says. "Chips are ejected with the air."

Because repointing work is inherently dirty and demanding on the tool, ease of maintenance is also a crucial aspect of choosing a grinder. Be sure to purchase a tool that can be opened and closed quickly. Consider buying a grinder with an external door that permits direct access to the motor's carbon brushes, which need to be replaced periodically.

Diamond cutting wheels

Diamond cutting wheels, or blades, should be used on repointing grinders. Tuckpointers should select segmental rim rather than continuous (smooth) rim diamond blades. "With segmental blades, you're also chipping away at the mortar [as well as grinding] so there is less dust," explains Bales. "With the continuous diamond blades, you're doing more grinding, which generates more dust."

Although price often governs the selection of a diamond blade, tuckpointers should realize that if the grinder is used several hours a day, the cost per cut may decline with the purchase of better blades. Going from a standard line to a premium line can add 20% to the cost of a blade because of the presence of more and better diamond, but the blade may last 30% to 50% longer (Ref. 3). A basic understanding of how diamond cutting wheels are made is therefore beneficial.

Diamond blade segments are made up of diamond pieces about the size of coarse salt and metal powder, called "bond", which is a mixture of iron, cobalt, carbide, tungsten, and other metals. The diamond and metal mixture is placed in a mold and heated to anywhere from 1,700° F to 2,300° F, creating hard, dense metal impregnated with diamond throughout. This blade material is then attached to the cutting wheel's steel core by either brazing or laser-welding, and ground so that it is concentric, exposing the diamonds on the outside and sides of the blade segments. These exposed diamonds do all of the grinding work in repointing masonry (Ref. 3).

The size of the diamond and the quality of the diamond and the metal bond affect the cutting wheel's performance. As the exposed diamonds in the cutting face chip away at the material, they wear flat and fracture. At the same time, the material being cut erodes the metal bond holding the diamonds, which causes the worn diamonds to fall out, exposing new sharp cutting diamonds (Ref. 3). With better-quality diamond wheels, this process can continue longer.

When selecting a diamond blade, it is important to know the compressive strength of the material to be cut and the hardness of the aggregate. A compressive strength of 3000 psi or less is considered soft,

according to diamond blade manufacturers. Soft materials wear down the blade's metal bond faster than hard materials, such as granite or quarry tile. Consequently, a diamond blade for grinding out soft abrasive materials needs a hard metal bond to resist erosion long enough for the exposed diamonds to be used. In contrast, hard-aggregate material dulls the diamond grit quickly; thus, the metal bond needs to be softer so it erodes easily and allows new sharp diamond to be exposed (Ref. 3). When purchasing a blade, be sure to check the packaging carefully for appropriate applications and specifications.

Safe operation

The silica dust produced by grinding out mortar joints can be extremely harmful to a worker's health. "Silicosis is a disabling, irreversible, and sometimes fatal lung disease caused by breathing respirable crystalline silica," states Diane Throop, the national director of technical services for the International Masonry Institute. "When people inhale crystalline silica, lung tissues react by developing fibrotic nodules and scarring around the trapped silica particles. Exposure to silica dust can lead to bronchitis, tuberculosis, chronic obstructive pulmonary disorders, and cancer" (Ref. 4).

Consequently, when using an angle grinder for repointing, it is essential to wear a respirator or use a dust-collection system. OSHA is moving toward requiring the use of dust-collection systems, but many of the dust-collection devices available for small grinders are unwieldy and obstruct the operator's view of the cutting blade and work surface. As a result, most tuckpointers won't use them. Williams of Bracing Systems notes that his construction supply house used to stock a dust-collection accessory, but sales were abysmal. "Tuckpointers didn't want it."

Hitachi offers a dust-collection shroud for small angle grinders but doesn't sell many, Bales admits, because the accessory does diminish the blade's visibility. The shroud weighs 1/2 to 3/4 pound and retails for about \$100. "I've talked with tuckpointers who are waiting for someone to come up with a good dust collection system for a small grinder," he says.

Two companies contend they have already developed such a system. CS Unitec offers the 11-amp F 1509 FR tuckpointing machine, a 7 1/2-pound 5-inch grinder that comes standard with a dust-collection unit. The machine has a special sighting device that provides a clear view of the joints for exact cutting. (See photo on page 29, upper right.) Zantech LLC manufactures the DCU-5 Dust Control Unit, a specially shaped shroud that exposes more than half of the cutting blade. This dust-collection device can be used on Metabo or Bosch angle grinders with 4 1/2- to 5-inch blades. (See "Dust-Control Shroud.")

In addition to concerns over dust generation, many other safety issues impact the use of a disc

DUST CONTROL SHROUD

The Zantech DCU-5 Dust Control Unit is designed for use on 4 1/2- to 5-inch angle grinders manufactured by Metabo or Bosch. Consisting of a hood base and cover, the shroud captures the dust that results from grinding out mortar joints, and channels it into a vacuum system. When compared to many other dust-collection devices, the shroud allows better visibility of the cutting edge and the mortar joint being cut, according to Zantech's Mike Gnazzo. "We've shaped the shroud so that only part of it is in contact with the wall," he explains. "More than half of the blade is exposed to view." In addition,



the exhaust port is positioned toward the rear of the grinder rather than in front or at the side so that the 1 1/2-inch-diameter exhaust tube will not obstruct the user's view.

These features improve the tool operator's safety, accuracy, and productivity. Retailing for \$150, the dust-control shroud can be used on a succession of grinders, as the grinders wear out and are thrown away.

For more information on the DCU-5 dust-control shroud, contact: Zantech LLC, Vernon, CT (973-686-0012), or circle 1 on the reader service card.

grinder since it is an electrically powered tool with a rapidly spinning blade. Be sure to read the instruction manual provided by the manufacturer; it will contain general safety guidelines for using a power tool, as well specific safety guidelines for using that particular grinder model. Here are some tips, but this is not a complete list:

- Always wear eye protection, ear protection, and a hard hat.
- Confirm that the diamond cutting wheel is not cracked, deformed, or worn away, and that it is firmly clamped and mounted in accordance with manufacturer's instructions.
- Never operate the grinder without its wheel guard in place.
- Before turning the grinder on, make sure there is no damage to the wheel guard, the cord, or the tool housing.
- Test the grinder before each use. Turn the tool on and make sure it runs smoothly and shows no abnormalities. Run it for at least 3 minutes when the grinding wheel is new; otherwise, run it for at least 1 minute when starting daily.
- Do not force the blade into the material; allow it to cut at its own speed. Forcing the blade may cause overheating or blade damage.
- Use the proper grinding angle (about 15 degrees) so that you are grinding only with the wheel's edge. If the wheel is flat, the grinder will be difficult to control.

REPOINTING GRINDER INFORMATION

For more information on grinders used in repointing masonry, contact:

- Bosch/S-B Power Tool Co., Chicago (773-286-7330); www.boschtools.com, or circle 2 on the reader service card.
- CS Unitec Inc., Norwalk, Conn. (800-700-5919); www.csunitec.com, or circle 3 on the reader service card.
- Dewalt Industrial Tool Co., Towson, Md. (800-433-9258); www.dewalt.com, or circle 4 on the reader service card.
- Diamond Products, Elyria, Ohio (800-321-5336); www.diamondproducts.com, or circle 5 on the reader service card.
- Hilti Inc., Tulsa, Okla., (800-879-8000); www.hilti.com/us, or circle 6 on the reader service card.
- Hitachi Power Tools, Norcross, Ga. (800-829-4752); www.hitachi.com, or circle 7 on the reader service card.
- Jepson, Torrance, Calif. (800-456-8665); www.jepsonpowertools.com, or circle 8 on the reader service card.
- Makita USA Inc., La Mirada, Calif. (800-462-5482); www.makitatools.com, or circle 9 on the reader service card.
- Metabo Corp., West Chester, Pa. (800-638-2264); www.metabo.com, or circle 10 on the reader service card.
- Milwaukee Electric Tool, Brookfield, Wis. (800-729-3878); www.mil-electric-tool.com, or circle 11 on the reader service card.

■ When grinding out mortar joints, make only small passes at a time. Be aware that kickback can occur at any time, and keep both hands on the tool for maximum control.

■ Don't overreach. Be sure to keep proper footing and balance at all times (Refs. 2 and 5).

Maintain to retain

When used daily in repointing applications, angle grinders take a lot of abuse. Basic maintenance must be followed for the tool to last more than a few months. Observe these guidelines:

■ Open the grinder at the end of each day and clean it with compressed dry air. Keep the ventilation openings and switch levers clean and free of foreign matter.

■ Angle grinder motors use carbon brushes, which are consumable parts. Make sure the carbon brushes are clean and slide freely within the brush holders. Replace a brush when it is worn in excess of the wear limit.

■ After about 300 to 400 hours of operation or at every second brush change, the bearings should be replaced at the manufacturer's factory service center. Bearings that become noisy should also be replaced at once to avoid overheating (Refs 2 and 5).

Small angle grinders may be simple, relatively inexpensive tools, but they do not need to be thrown away so soon. ■

CUTTING WHEEL INFORMATION

For more information on the primarily diamond cutting wheels used in repointing masonry, contact:

- CDP Diamond Products, Livonia, Mich. (800-521-0638), or circle 12 on the reader service card.
- Norton Diamond Products, Gainesville, Ga. (800-554-8003); www.norton.sgna.com, or circle 13 on the reader service card.
- Diamond Products, Elyria, Ohio (800-321-5336); www.diamondproducts.com, or circle 14 on the reader service card.
- Elliott Diamond Inc., Largo, Fla. (800-537-2582); www.elliottdiamond.com, or circle 15 on the reader service card.
- Hoffman Diamond Products Inc., Punxutawney, Pa. (800-444-4180); www.hoffmandiamond.com, or circle 16 on the reader service card.
- Johnstone Diamond Products, St. Paul, Minn. (800-961-7196); www.johnstonediamond.com, or circle 17 on the reader service card.
- Ned-Kut/TECC Corp., Worcester, Mass. (800-343-6086); www.nedcorp.com, or circle 18 on the reader service card.
- Pearl Abrasive Co., Bell, Calif. (800-969-5561), or circle 19 on the reader service card.
- Penhall Diamond Products, Fullerton, Calif. (800-854-3281), or circle 20 on the reader service card.
- Pro-Cut Products, Gainesville, Ga. (800-527-1403); www.norton.sgna.com, or circle 21 on the reader service card.
- Star Diamond Tools Inc., Delta, Victoria, Canada (604-943-8839); www.stardiamondtools.com, or circle 22 on the reader service card.
- Texas Diamond Tools Inc., Conroe, Texas (800-346-0646), or circle 23 on the reader service card.

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