SAWING SYSTEMS INC.
2918 Cherry Arcade Street, Knoxville, TN 37917-6150
(865) 525-0600 • Telefax (865) 525-2320

Technical Service Bulletin 05T13
Blade Basics for Diamond Saws

Introduction

This paper is intended to provide a basic understanding of how diamond saw blades work and how to properly specify them for your process.

Blade Speed

Diamond blade types are made to cut at a specific surface feet per minute (SFM). Granite blades run best at 6500 SFM. If the blade were a car tire, this would be 75 MPH. This speed is true no matter how big the blade. Therefore, bigger blades must turn slower than small blades. Marble & Sandstone run best at 8500 SFM; Limestone & Concrete at 10,000 SFM.

Saw motors typically run at a fixed RPM and are set up with drive pulley ratios to achieve the correct SFM of the blade for the given diameter of the blade. If you want to cut marble with a saw set up to cut granite, you need to use a bigger blade to achieve the higher SFM. For example a saw set up for 14" granite should run an 18" marble blade. Even though they both run at the same RPM, both blades will run at their proper SFM.

Depth of Cut

Generally, the blade diameter needs to be about three times the desired depth of cut. If you are able to make sacrifices you can get more depth of cut from a given diameter.

Other considerations for the blade diameter include: Hub (saw flange) diameter, spindle pulley diameter, blade wear, clearance between top of stone and hub and pulley, and plunge depth into cutting table.

The saw flanges stabilize the blade against warping and run about 1/3 the blade diameter (or more) for smaller (14"-18") blades down to about 1/4 the blade diameter (or less) for larger blades.

Diamond blades wear during use so the depth of cut will decrease 3/8" on smaller blades up to 3/4" on larger blades over the life of the blade.

The blade height is normally adjusted to cut through the material and into the cutting table 1/4" to 1/2" deep. On the other hand, you can't cut so deep that your saw flanges hit the top of the stone. Don't plan on less than 1/2" clearance, but this figure depends on the irregularity of the stone and your comfort level with your operators and processes to not crash the saw.

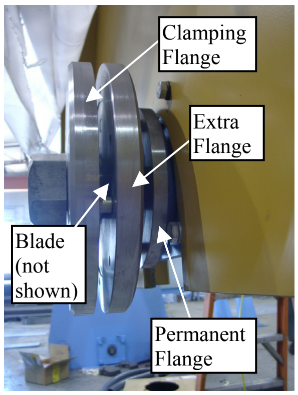
Saw Flanges

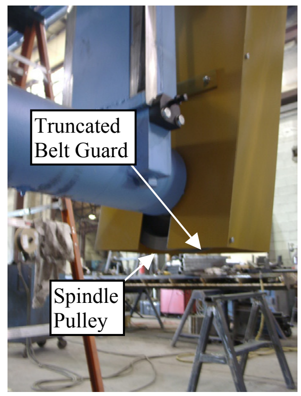
The saw flanges pinch the blade to transmit torque and support the blade to prevent distortion under high load. Larger hubs transmit more torque and provide more support to the blade to keep it tracking straight. Smaller hubs can be used if the cut rate can be sacrificed (to produce less radial force on the blade edge).

Larger spindles (511 heavy duty and up) are equipped with a small permanent flange to which is attached a full size "extra flange". The blade is installed between and fully supported by the extra flange and outside clamping or removable flange. The extra flange and clamping flange can be sized smaller for maximum depth of cut or they can be sized larger for maximum cut rate. (See picture below.)

The practical lower size limit for the flanges is the diameter of the spindle pulley. Any smaller and the spindle pulley could contact the top of the stone. Note in the picture below that the belt guard can be truncated so that it does not limit the depth of cut any more than the pulley diameter.

The minimum spindle pulley diameter is limited by the horsepower of the motor. Higher horsepower requires a larger pulley. When depth is critical, more horsepower can be transmitted to the spindle with a smaller pulley if a more expensive optional "timing" belt type pulley and belt is used.





Saws with arbor motors don't have spindle pulleys but then the motor diameter limits the depth the same way. Spindles with drive pulleys can be made smaller in diameter than an arbor motor for the same horsepower and speed.

Blade Construction

Diamond blades are made with small synthetic "grown" diamonds. The diamonds are embedded in a metal bond. The combination is called a diamond segment. The segments are brazed to the steel core of the blade.

Steel cores are available as solid steel or as a "silent" sandwich of steel and a softer metal to deaden the normal ringing.

Larger blades are made with a slight dish shape, which spins out straight at full RPM. The dish shape is made by peening one side of the blade to spread out the metal.

Diamond blades are made to wear and that is how they stay sharp. The metal bond slowly wears away to expose more diamond, which fractures to create new sharp edges.

Different stones have different hardnesses and therefore, the metal bond is made in different hardnesses so it wears at the right pace to keep the diamonds exposed and sharp.

For more information on diamonds and blade construction, go online and copy and paste this link in your browser to an article from the Concrete Sawing and Drilling Association: http://www.csda.org/associations/3719/files/DiamondsDontWearOrShouldThey.cfm This article is interesting for the many factors that affect cutting speed and blade life that seem contrary to what you might expect. One irony is cheap blades cut faster because they have fewer diamonds. Surprisingly, fewer diamonds make the blade more aggressive and cut faster. The reality is they don't last as long.

High quality domestic blades can be re-tipped. Inexpensive imports are typically thrown away.

Blade Glazing

A common problem with diamond blades is "glazing". Normally the metal bond wears down just below the diamonds to leave them exposed to do their cutting. If the blade is run too fast (high SFM) or is not pushed hard enough (don't baby your blade) or if the bond is too hard for the stone being cut (use the right blade), then the diamonds will wear flush to the bond, making the segment glassy smooth.

A glazed blade can be sharpened by cutting into a more abrasive material. To unglaze a granite or marble blade, cut into a concrete block.

The best cutting table has a cement cutting surface. The blade cuts into the surface slightly to stay sharp. The cement mix should be adjusted to the right ratio of (play)sand and cement to give it the right amount of abrasiveness to keep the blade sharp. See TSB 04T06 Cement Top Installation.