TOOLBOX SAFETY TIPS

TST #203

Diamond Blade RPM

Diamond blades are designed to operate within a specific range of revolutions per minute (RPM). Operating these blades outside the effective RPM range will likely result in significant blade damage and can potentially cause severe injury or death to an operator or bystander if the blade shatters.

The formula for calculating the surface feet per minute (SFM) at which a segment on the periphery of a blade is travelling is: SFM = diameter of the blade (in feet) x RPM x 3.14. Conversely, the RPM for a known SFM is determined as follows: RPM = SFM / (diameter of the blade (in feet) x 3.14).

The following table lists common blade sizes, their recommended RPM range and resulting SFM in harder aggregates with heavier steel reinforcement (above 2%) and also for softer aggregate concrete with lighter reinforcement (below 2%).

Blade Diameter in Feet (inches)	RPM Target to Achieve 8,500 – 11,000 SFM[1] for Hard Aggregate Concrete in Medium to Heavy Steel	RPM Target to Achieve 11,000 – 14,000 SFM[1] for Medium to Soft Aggregate Concrete in Medium to Light Steel
1.5 (18")	1,800 – 2,330	2,330 – 2,970
2.0 (24")	1,350 – 1,750	1,750 – 2,230
2.17 (26")	1,250 – 1,615	1,615 – 2,050
2.5 (30")	1,080 – 1,400	1,400 – 1,780
3.0 (36")	900 – 1,170	1,170 – 1,500
3.5 (42")	775 – 1,000	1,000 – 1,275
4.0 (48")	680 - 875	875 – 1,100
4.5 (54")	600 - 780	780 - 990
5.0 (60")	540 - 700	700 - 890

Recommended RPMs for Common Blade Sizes

[1] *The ANSI standard states that the maximum safe operating SFM for any blade is less than 16,000 SFM.*

These recommended RPMs are established in accordance with the following:

- Blades are tensioned by the manufacturer according to their specified operating RPM range. When the blade is installed on the saw and operated within the appropriate RPM range for its diameter, it should run smoothly and without "wobble". Heat or mechanical bending can cause a core to lose its tension and begin to operate with a noticeable "wobble" that can eventually lead to catastrophic failure.

- Blades operated at an RPM higher than recommended are subject to diamond polishing that will likely result in a blade starting to "skip" or "skate" as it is trying to cut. Skipping generates extra heat during the cutting operation (the energy being applied to cutting must go somewhere, so the skipping or skating generates heat). Heat can damage the "tension" in the core and cause the blade to become unbalanced and begin to wobble, which if allowed to continue can lead to catastrophic core failure.

- Additionally, when a blade is operated at too high an RPM for the material it is cutting and begins to “skip” or skate,” it will begin to vibrate or pound. Pounding will lead to cracks developing in the segments and/or the core. These cracks can quickly lead to a piece of segment or the core to separate from the blade, causing severe injury or death to anyone struck by debris.

- Conversely, blades operating at an RPM lower than recommended are subject to diamond crushing. Crushing will likely diminish or destroy the diamonds’ ability to cut. Diamond crushing can lead to “skipping” or “skating,” a condition occurring when there are very few diamonds left to cut and the blade metal bond is actually rubbing against the concrete. Again, the energy goes into producing heat instead of cutting. This too will damage the core.

- If an operator uses a saw that is under-powered for the available blade diamond concentration, reducing the RPM of the saw will allow more weight/torque to be applied to the diamond particles as they “scrape” through the material being cut. Many times, the diamonds in such a blade will be exposed and look “sharp,” but will have rounded tips on the diamonds that will eventually lead to “skipping” and pounding that can damage the blade.

- Conversely, if an operator uses a saw that is over-powered for the available blade, increasing the RPM (within the safe range) will help keep the limited number of diamond particles in the blade from crushing. This can avoid excessive vibration and pounding that causes core failure.

- Many of today’s saws are fitted with 3-4 speed gearboxes that can assist in bringing blades of varying diameters within a safe RPM range for the material being cutting. It is advised that operators use these gearboxes, where available, and have an operational blade shaft tachometer on the saw to monitor RPM. A separate contact or photo tachometer can also be used. In addition, the saw’s throttle or governor can be used to slow the engine RPM and consequently the blade shaft RPM. Any change in RPM should be confirmed by a tachometer.

Diamond Blade RPM Quiz

The following statements should be answered with “True” or “False.” Answers below.

1. It is acceptable for a blade to wobble as long as the operator cuts slowly.
2. Excessive heat during the cutting operation can result in catastrophic blade failure.
3. Diamond crushing is the manufacturing process used to create segments.
4. Operators should use the saw’s gearbox to confirm the actual blade RPM at all times.
5. A blade with lots of diamond particles that feel rough to the touch is a free cutting blade that is likely being operated within the correct RPM range.

Employee Name: _____

Signature: _____ Date**:** _____

Answers:

1. False
2. True
3. False
4. False
5. True