INTRODUCTION
Core drilling is one of the most effective, non-vibratory ways of drilling through reinforced and non-reinforced concrete surface. It creates holes without causing aggressive demolition or too much strain. A core drill is a power tool for boring holes through concrete, reinforced concrete, brick, block, stone and masonry. Specialized core bits – hollow steel cylinders fitted with segmented diamond teeth – grind away the surface to create a hole of any desired size. Usually, core bits range in size from 3/8” to 14” diameter. Most drill 12” deep, but longer bits, extensions and threaded barrels are available.

Bases
Traditionally, core drills are anchored to the floor before operation, by use of anchor base or vacuum base. Using an anchor base is a time-consuming process, particularly when the job requires many holes to be cut. To simplify this process, some manufacturers offer an optional vacuum base that mounts the rig to the floor. NEVER stand on the base and drill without anchoring.
Anchor base
When anchoring, make sure your core drill is secured using physical anchors rated for core drilling. You will need to drill anchor holes which will increase the time on your core. Adjust the core drill so that it is level. Check to verify the drill does not rock in place.

Vacuum base
You can use a base vacuum when the surface is smooth and the vacuum gasket is in good working order. Never use a vacuum base when drilling into a wall or ceiling. It is dangerous. Also, make sure your vacuum filter bottle has no water or debris inside it because they can harm your vacuum. Use a vacuum gauge to make sure your vacuum pressure is adequate to do the job.

Water
If you are drilling with a wet diamond core bit, it is better to use less water than more water. Less water enables the diamonds to grind away the concrete. Too much water pressure washes away the concrete grit and prevents new diamonds from being exposed. For the best results, apply water until the slurry resembles a heavily creamed coffee. A proper slurry will help the grinding process by keeping the core bit cool. The diamonds will remain exposed and stay in contact with particles in the slurry. When using water you may need a wet/dry shop vacuum to suck up extra water. Use a GFCI (ground fault circuit interrupter) when cutting with water to avoid electric shock.

Air
Dry cutting uses the air as the coolant, after a period of cutting the pressure should be release on the diamond core bit and allow it to rotate freely to let the air cool it. The period can be a few minutes to a few seconds depending on the hardness of the concrete being cut (the harder the concrete, the shorter the cutting period should be).

Diamond bits
Match the diamond bit to the application. Consider the material being drilled and the diamond bond specifications of the core bit. Too hard of a bond increases drilling time. Too soft of a bond will prematurely wear away the diamond. If the diamond glazes over, drill into an abrasive block to reveal a fresh diamond grinding surface. Here are some general tips for selecting core bits:

- Select a hard diamond matrix for softer material (brick, block, limestone, marble, and sandstone)
- Select a soft diamond matrix for harder material (concrete, reinforced concrete, flint, basalt, and granite)

Pressure
It is very important to maintain steady, even pressure. Correct pressure will help ensure maximum core bit life. Too little pressure can cause the diamonds to glaze over. Inconsistent pressure or pecking will cause the drill to glaze over. Too much pressure will overload the drill, causing damage to both the core bit and the drill motor.
Standard Operating Procedure (SOP)
Asphalt, Concrete and Masonry Core Drills

Speed
Set your motor to the appropriate revolutions per minute (RPM) to grind properly and prevent glazing the diamond segments. When set at the ideal surface speed, the core bit will cut efficiently. For example, smaller core bits require higher RPMs. If set too slow, the job will take too long and the drill may glaze. See chart A to the right for recommended speeds.

Power
To sustain the correct drilling speed, you need adequate power. Larger core bits require more power. If the drill is underpowered, it will overheat during operation and damage the tool.

Most core drills are electric-powered. When drilling, listen to the electric motor. When in use, the pitch of the motor will lower. If the motor begins screeching or the mechanical clutch slips, reduce feed pressure immediately.

See: Amperage, Extension Cord Length and Generator Use for Electric Motors

Core drills are also available in pneumatic and gas versions for special applications in a variety of environments.

Inspecting the Drill
One of the most important steps to keeping workers safe is to inspect the core drilling machine daily. Check to make sure the drill is unplugged before performing this inspection.

- Check vacuum seal for wear or damage. Replace if necessary.
- Check power cord and plug for damage. If the plug has been modified, is missing the grounding prong or if the cord is damaged, do not use
- Inspect the machine for missing, broken, or misaligned parts
- Clean any oil, grease, or dirt from handles and controls to reduce the risk of injury due to a tool or control slipping from your grip.
- Inspect the cutting edges of all drill bits for wear or damage
If any of these conditions are present, do not use the machine until any problem has been repaired. Use this opportunity to lubricate the core drilling machine according to the Maintenance Instructions.

Use drill bits and accessories that are designed for your Core Drilling Machine and meet the needs of your application. The correct tools and accessories allow you to do the job successfully and safely. Accessories designed for use with other equipment may be hazardous when used with the Core Drilling Machine. Inspect the cutting edges of your drill bits. If necessary, have them replaced prior to using the Core Drilling Machine. Bit is considered worn when the crown shows excessive wear and has become flush with tube. Dull or damaged cutting tools can lead to binding and tool breakage.

Once the machine is inspected, follow the following guidelines during operation.

The Core Drilling Machine is made to drill holes in granite, masonry and steel reinforced concrete. Follow instructions on proper use of the machine. Do not use for other purposes. Other uses or modifying this machine for other applications may increase the risk of serious injury. Do not reach across the machine or drill bit. Clothing can be caught by the machine resulting in entanglement and serious injury. Use extreme caution when drilling through floors. Provide protection of all personnel and material below the area. Cores generally drop from the drill at completion of the hole. Keep fingers and hands away from drill bit. This practice will prevent entanglement and reduces risk of being cut. Secure drill stand to the work surface. Use bolts, ceiling jack or vacuum hold-down. Do not secure with a vacuum hold-down when drilling on vertical surfaces such as walls. Drill stand must be properly secured to prevent bit damage and serious injury. When releasing carriage locking handle, maintain a firm grip on feed handle to prevent feed handle from revolving due to weight of drill. Rotating handle can result in injury. Do not force drill bit. Drill should be used at a speed and feed rate that does not overload the motor. When starting bits, do not use more than two extensions. Less likely to bind and lose control.

WORKER SAFETY
Basic protective requirements for most concrete or masonry cutting or drilling are:

- substantial footwear;
- safety goggles;
- a face shield;
- hearing protection;
- gloves to improve grip and reduce force and vibration;
where hazardous dusts or fumes cannot be eliminated, respiratory protection. Operators should avoid wearing loose fitting clothing or jewelry. Long hair worn loose and long beards can also be hazardous.

Cutting and drilling equipment, especially drill bits, should be removed from machines and stored where they will not be damaged between use.

**USING CORE DRILLS**

The performance of any diamond core bit depends heavily on the use of proper drilling techniques. Generally speaking, a hard diamond matrix, or bond, increases drilling time, while a softer bond prematurely wears away the diamond surface. If the diamond bit glazes over, drilling into an abrasive block reveals a renewed grinding surface. Although drilling conditions and materials may vary, following specific guidelines and safety precautions ensures safe, faster drilling speed and longer bit life.

**Core Drilling Techniques**

- The core drill must be securely fastened to the intended work surface (wall, deck, etc.), using anchor bolts, vacuum pad or jack screw so that there is no movement in the drill that would allow the bit to bind in the hole.
- Use extreme caution when drilling through floors. Check for electrical conduit.
- Provide protection for all personnel and materials below the areas being drilled.
- Use a sufficient supply of water to ensure that hole is constantly being flushed of abrasive cuttings.
- Slowly lower the bit into the cut so that there is no skidding or lateral movement of the drill bit. The entire circumference of the core bit should penetrate the drilling surface before additional pressure is applied to the handle.
- Exert steady downward pressure on the bit while drilling. Do not force the bit into the material.
- Do not stop the flow of water or the rotation of the bit as long as the bit is in the hole.
- If the drilling rate decreases noticeably, check the core bit. The slower penetration rate generally means that the bit is dull and needs to be reconditioned.

**TROUBLESHOOTING**

**Glazed / Polished Bits - Causes & Remedies**

Glazing is where the diamond crystals on the bit face have become completely embedded in the metal-bond matrix.

Possible Cause: Too much feed pressure

Remedy: Open the bit with an abrasive material (Such as sand pot, concrete block, cinder block, etc.)
Standard Operating Procedure (SOP)
Asphalt, Concrete and Masonry Core Drills

Possible Cause: Aggregate is too hard. (Example using a bit designed for soft abrasive material to drill concrete).
Remedy: Use a core drill bit designed with a softer bond.

Possible Cause: RPM of core drill is too high for the bit diameter. Surface speed of the bit rotation is a function of RPM and diameter. A fast rotation speed is necessary for small bits, but as bits get larger - circumference speed increases relative to $\pi$. Too fast and the bit will glaze.
Remedy: Adjust motor speed (if possible), otherwise you will need to purchase a motor with an appropriate speed.

Bent Bits - Causes & Remedies
Possible Cause: Too much feed pressure & Not enough water
Remedy: Repair the bit (if possible). Ease up on the feed pressure and increase water flow.
Possible Cause: Aggregate is too hard. (Example using a bit designed for soft abrasive material to drill concrete).
Remedy: Use a core drill bit designed with a softer bond.

Lost Segments - Causes & Remedies
Possible Cause: Cutting through a steel reinforcing rod
Remedy: Ease up on the feed pressure. Use a higher quality bit with more segments and increase the water flow.
Possible Cause: Bit too hard for the material it is drilling, causing it to pound and fatigue.
Remedy: Use a softer bond if possible: Increase motor RPM if possible.
Possible Cause: Not enough water to properly cool bit.
Remedy: Increase water flow.
Possible Cause: Drill rig is not properly anchored.
Remedy: Tighten anchor, check vacuum system for proper vacuum pressure.
Hung / Stuck Bits - Causes & Remedies
Possible Cause: Not enough water to remove slurry.
Remedy: Remove bit and drive core out with a spike through the hub. Increase water flow.
Possible Cause: Core barrel is dented because of hammering on it to remove previous hung up cores.
Remedy: Repair the barrel (if possible). Increase water flow.

How to Remove a STUCK Bit - Without Damaging it.

STEP 1: Disconnect the core rig from the bit.
STEP 2: Thread a piece of threaded rod the same diameter as the bit (Bit sizes 1.5” and smaller use 5/8-11 thread and larger bits use 1-1/4-7 thread). Thread through the hub until it hits concrete.
STEP 3: Place two hex nuts on the rod and lock them against one another so that they in turn lock themselves on the rod.
STEP 4: Turn the nuts with a wrench which will turn the rod which will push against the concrete core, pulling the bit from the hole without damaging it.

The easiest method to dislodge a stuck bit is to rotate the bit backward with your core drill wrench. This reverse action will usually release the wedge enough for you to pull the bit from the hole. Once the bit has been removed, the operator should break the core free and remove it and any loose material from the hole before resuming drilling.