SAFETY GUIDE

for the operation of

CARBIDE TIPPED SAW BLADES

Read Completely Before Attempting To Operate Carbide Tipped Saw Blades

This leaflet of safety and operating instructions is not intended to be and is not totally comprehensive; that is it does not and cannot cover every possible safety problem which may arise in using specialized and standard tooling on varying machines and applications. This leaflet is rather intended to generally describe many of the basic safety and operating procedures which should be followed and to describe the types of safety considerations which should be considered in operating cutting tools.

None of the statements or information presented in this leaflet should be interpreted to imply any warranty or safety protection.

The drawings do not depict any particular design, type, or size of tools equipment or machines. The drawings are illustrative only and are not to be construed to establish any exact mode, method or procedure.

All Federal and State laws and regulations having jurisdiction covering the safety requirements of cutting tools at the point of usage take precedence over the statements and information presented in this leaflet. Users of cutting tools must of course adhere to all such regulations. As an aid to cutting tools users a number of such regulations are listed below. The list does not include all regulations that may apply.

1. The Federal Register dated June 27 1974 Dept.of Labor Office of Safety and Health Administration (The OSHA Act)
2. American National Standards Institute, 01.1-1975 (Safety Regulations for Woodworking Machinery)
3. American National Standards Institute 02.1-1969 (Safety Requirements for Sawmills).
4. American National Standards Institute P1.1-1969 (Safety Requirements for Pulp Paper and Paper board Mills).
5. Other ANSI, State and/or Federal Codes and Regulations which may apply in your operation.

SAFETY RULES WHICH APPLY TO THE OPERATION OF ALL CARBIDE TIPPED CUTTING TOOLS

1. Always inspect the cutting tool completely before mounting. Never attempt to operate a tool which has chipped or bent teeth or cutting edges or teeth that are not sharp. You must be familiar with normal wear conditions for the type of tooling to be used. The tool must be completely clean to allow proper visual inspection.

2. Do not attempt to operate cutting tools or machinery with which you are not familiar or have not received operational training—get assistance from your supervisor, his designated representative, or a trainer who is familiar and properly trained and experienced on the machine to insure your safety. Become completely familiar with all of the machinery manufacturer's written instructions, guides and manuals before operating machine. You must use and be familiar with all controls safety devices and emergency stop mechanisms to operate a machine safely.

3. Never operate a cutting tool that is not properly aligned to the direction of feed. Do not allow sideward twisting or other than forward pressure on the cutting tool in feeding material into a cut.

4.Make sure the tool is mounted to rotate in the proper direction before cutting any material. The tool must rotate against, rather than with the direction of feed on all hand feed machines. Do not climb on hand feed machines.

5. Do not cut materials of a type hardness[1] or density[2] other than that which the cutting tool was designed to cut. Never attempt to cut materials with a tool unless you have personally checked with your supervisor to make sure the cutting tool was designed for the specific type of material you wish to cut and for the depth of cut desired. This is particularly important when attempting to cut "stacked" material i.e. cutting more than one piece at a time.

6. Never force-feed materials into a cutting tool such that it causes the tool or machine motor to slow down below operating speeds. A safe and proper cutting operation will not require much force in feeding material. If material begins to "ride up" on the cutting tool or requires undue pressure to feed the material into the tool or if undue vibration is experienced do not continue the cut—turn off all power and correct the condition.

7. Keep body and clothing well clear of all cutting tools and other moving parts while the machine is in operation. Use work holding fixtures and mechanical feed devices in all possible cases. When cutting material of such size shape or type that it necessitates close approximation to the cutter and mechanical feed mechanisms cannot be used, use a wood "push stick" to feed the material so that no part of your body or clothing comes close to the cutting tool .

8. Never attempt to clean a cutting tool or clear pieces of material from the cutting area while machine power is "on" or when cutting tools, material or any part of the machine is moving. Allow cutter rotation to stop by itself, or by use of a brake if supplied on the machine. Never attempt to stop or slow a rotating cutting tool by applying a hand-held or any other object to the cutter, arbor, spindle or drive as a brake.

9. Do not place your body in the rotational path of a cutting tool unless absolutely necessary and then only if there is a complete and adequate barrier between you and the cutting tool. Remember that carbide tips are very hard, and therefore brittle. The tips can break away under incorrect side thrust or twisting forces or if foreign material is allowed to contact the tips. An operator can reduce the danger of being hurt by a "kickback" of the material if he always stands **beside** the material he is feeding into the machine rather than in back of it.

10. Never leave machines unattended while cutting tools are still rotating or any part of the machine or material is moving.

11. Never operate a machine without using all of the hoods, guards, hold-downs and safety devices for the machine being operated.

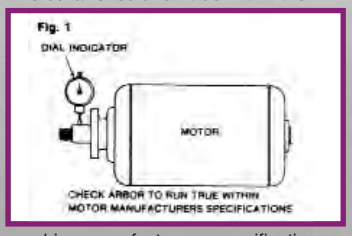
12. Machines must be maintained to the manufacturer's standards and current safety standards.

13. Always wear safety glasses or face shield to completely protect your eyes when operating cutting tools.

CIRCULAR SAW BLADES AND SAW MACHINE TOOLS MOUNTING INSTRUCTIONS

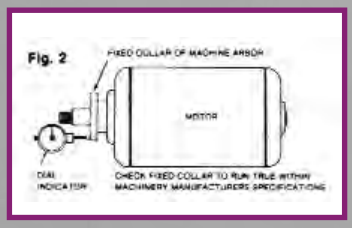
1. TURN OFF AND LOCK OUT ALL MACHINE POWER. Clean the saw arbor, saw collars, sleeve and arbor nut. Remove nicks and burrs by very lightly honing any nicked or burred area. (Do not use coarse tiles or abrasives) .

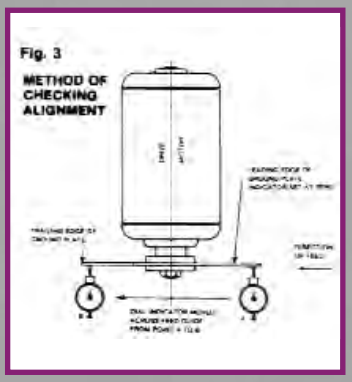
2. WITH ALL MACHINE POWER OFF AND LOCKED OUT pull and push on the machine arbor sideways in and out by hand (without rotating the arbor). There should be no feeling of movement. Next rotate the arbor by hand. If the bearings are in proper condition the arbor should turn freely with no sticking or rubbing. To check the arbor set up a dial indicator as shown in Fig.1. The arbor should run true within the motor manufacturer's specifications. Set the dial indicator to bear on the fixed collar of the arbor and turn the arbor (Fig 2) The collar should run true within the



machine manufacturer s specifications.

3. WITH ALL POWER OFF AND LOCKED OUT, align the saw blade with the direction of feed. A method of checking alignment is to mount a flat ground plate of 10 or l2 inches diameter by 1/4 inch thick on the saw arbor in the same manner as a saw blade (see Fig. 3). Set up a dial indicator





so it can be moved by hand along the guide rail or feed mechanism. Position this dial indicator so it can traverse across the plate either above or below the mounting collars. Set the dial indicator to zero at the leading edge of the plate (Position A. Fig. 3) and move it across the plate to the trailing edge (Position B Fig. 3)

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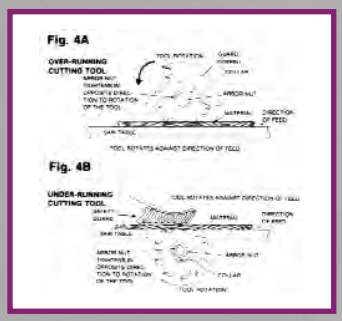
1. Hardness is the resistance of a material-to being cut or the strength of a material to resist tearing or breaking.
2. Density is the compactness of a material compared to its volume.

EVER LAST

Any error in the plate flatness can be eliminated by rotating the plate by hand so that point A is moved to point B when reading the indicator. Any deviation in angularity between the saw blade and the direction of feed should be maintained within the machine manufacturer's recommendations. On double cut-off and panel trim machines any slight angularity in alignment should be controlled so that the trailing edge of the saw blades do not re-cut the material.

4. WITH ALL MACHINE POWER OFF AND LOCKED OUT, inspect the saw blade before mounting The bore (center hole) must be the correct size and fit snugly. Do not force a saw or other type of tool on an arbor. Do not tighten mounting screws unequally or use incorrectly fitted keys. Incorrect mounting of saws or other tools can cause tool breakage and create dangerous operating conditions. Never mount a saw blade with a damaged (deeply scored or out of round) bore or arbor. Inspect the teeth carefully. Do not mount blades with damaged bodies dull or damaged (bent or chipped) teeth. Never use anything other than accurate metal shims or spacers if saw blades have to be positioned on the arbor. Never use shims to “wobble” a saw blade[3]. Be sure that all saw collars used match exactly in diameter. Closely check to see that the arbor nut threads are not worn and the wrench surfaces of the arbor nut are not rounded off.

5. WITH ALL MACHINE POWER OFF AND LOCKED OUT, mount the saw blade on the arbor making sure that the saw blade is turning in the correct rotation and that the arbor nut tightens in a direction opposite to the blade rotation (See Fig 4A & 4B) Unless the



machine is specifically designed for such cutting, never mount saw machine tools to "climb cut" (teeth cutting in the same direction of feed) on manually fed machines.. Never use saw blades on operations for which they were not designed; for example, do not use rip design blades to cut across the grain, etc.

CIRCULAR SAW BLADES AND SAW MACHINE TOOLS START-UP PROCEDURES

1. TURN OFF AND LOCK OUT ALL MACHINE POWER. Never assume previously set machine or tool conditions to be correct. Be sure that the tool is correctly mounted, properly locked on the arbor (See Fig 4A & 4B), turns freely (no foreign objects in tool rotation path) and is properly positioned for the cutting operation required(See Fig 3). Check to see that the cutting tool is not dull or damaged. Check to see that the body of the saw blade is not cracked[4]. Take special precaution to check "stacked cutters" to be sure that all bolts, pins and threaded parts are not worn or damaged, and are properly mounted. Be sure that hubs on all "split" circular tools are properly fitted and pinned and that the locking collars are in place and fit properly. Do not use locking collars that are not matched to the "split tool ". Split collars on split tools ar not recommended.

2. WITH ALL MACHINE POWER OFF AND LOCKED OUT insure that you are not attempting to operate tools that do not conform to the machine manufacturer's machine load specifications in either size or weight, or that do not mount according to the machine design limitations. Operate saw machine tools only on the type of materials, cutting loads and operation applications for which the tools were designed. (If you don't know this information, ask your supervisor) Do not operate saw blades or saw machine tools in excess of the machine or tool manufacturer’s specifications, or current applicable OSHA standards, or in excess of 18,000 sfm (surface feet per minute) [5] (See Charts A and B following)

3. WITH ALL MACHINE POWER OFF AND LOCKED OUT position the cutting tool, material guides and material hold-downs so that the material to be cut is fully supported. This will insure there will be minimal material vibration. Next, follow the machine manufacturer's instructions to mount all guards over the tools such that the guards are close to, but properly clear, the material being cut. Mount and activate all of the machine safety devices such as Anti-kickback mechanisms, spreaders, dust hoods and safety switches. Make sure all personnel and all loose or foreign objects are clear of the machine and cutting tools.

4. TURN ON MACHINE POWER, start the tool rotation slowly before feeding material. This is done by “jogging” (that is, pressing the start button and immediately after that pressing the stop button). At a safe distance, observe the operating condition of the tools (by sight and sound) as they rotate slowly. Next, **TURN ALL MACHINE POWER OFF AND LOCKED OUT,** wait until all cutting tools stop rotating by themselves (do not attempt to stop their rotation yourself unless a brake is specifically provided for that purpose on the machine), and make any necessary corrections. Go through all steps noted in paragraph 3, just above, before you **TURN THE MACHINE POWER ON.** Press the start button and allow the machine to operate at full speed for at least one minute before feeding material.

OPERATING SPEEDS FOR CARBIDE TIPPED CIRCULAR SAW BLADES

Carbide tipped circular saw blades of the types commonly used in the machining of materials typical of the toughness and density range of most wood species composition boards, medium hard plastics, and the softer non-ferrous metals must never be operated in excess of the machinery or tool manufacturer's recommendations or current applicable OSHA standards, or in excess of 18,000 sfm (surface feet per minute) whichever is lowest. Surface feet per minute (sfm) refers to the peripheral or rim speed of a cutting tool that is, the speed at which the outer cutting teeth are rotating when the tool is at full speed. This speed increases as the tool diameter and/or motor arbor or spindle rpm increase. The maximum speed of 18,000sfm is allowable only when the machinery being used is in excellent operating condition and is excellently maintained. When using older or worn machinery, or when cutting materials of an unusual toughness[6] or density[7] the surface feet per minute or material feed rate or both, should be reduced to speeds where, the tool cuts easily and freely without excessive vibration or high tooth impact shock. Most woods, plastics,and the medium-hard non ferrous metals will cut better with longer tool life at surface feet per minute ranging from 8,000 sfm to 16,000 sfm, depending on the hardness and machining characteristics of the material being cut. As the rim speed (surface feet per minute) of a circular saw blade is decreased, feed rates must be decreased accordingly to prevent the forcing of material into the cutting tool and overloading of the cutting teeth.

The method of determining the surface feet per minute (sfm) of rotary cutting tool is as follows:

.26 x D x RPM = SFM
where D = diameter of the tool in inches
RPM = rotating speed, in revolutions per minute
SFM = rim speed, in surface feet per minute
.26 = this number is used to convert the tool circumference from inches to feet (3.14 divided by 12)

Remember that changing to a larger diameter cutting tool at the same machine spindle or arbor speed increases the surface feet per minute rim speed of the tool. Never make assumptions as to any machine motor rpm since machines and individual motors can be modified. **WITHOUT ANY CUTTING TOOLS MOUNTED ON THE MACHINE** check the rpm of each motor using an rpm tachometer. Once the cutting tool diameter and motor rpm are known you can check Chart A, (following) to see if a saw blade will be operating within the 18,000 surface feet per minute maximum rim speed specified. For diameters not covered by Chart A use the sfm (surface feet per minute) formula above. For the circular sawing of magnesium, copper lead, brass or bronze, note the **LOWER** surface speed limitations on Chart B. For harder or more difficult to cut materials consult the tool manufacturer.

3. Mounting a saw blade to "wobble" means to shim the blade body unequally on one side, throwing the saw out of alignment with the arbor. This causes the saw to make a wider cut and dangerously increases pressures on the tool.

4. "All cracked saws shall be removed from service," Department of Labor OSHA Standards, Federal Register 29 CFR Part 1910 213(S) (7)

5, The term "surface feet per minute" refers to the peripheral or rim speed of a cutting tool. See "Operating Speeds for Carbide Tipped Rotary Cutting Tools" below.

6 Toughness is the resistance of a material to being cut or the strength of a material to resist tearing or breaking.

7 Density is the compactness of a material compared to its volume.

Chart A

18,000 SFM (SURFACE FEET PER MINUTE) MAXIMUM RPM
ROTATING SPEEDS FOR CARBIDE TIPPED CIRCULAR SAW BLADES
TYPICAL OF COMMERCIAL DESIGN, THICKNESS AND GRADE STANDARDS
(DO NOT OPERATE CARBIDE TIPPED CIRCULAR SAW BLADES ABOVE THE RPM ROTATING SPEEDS SHOWN)

SAW DIA. (INCHES)	MAXIMUM RPM	SAW DIA. (INCHES)	MAXIMUM RPM	SAW DIA. (INCHES)	MAXIMUM RPM
6	11538*	24	2885	44	1573
7	9890*	26	2663	46	1505
8	8654*	28	2473	48	1442
10	6923*	30	2308	50	1385
12	5769*	32	2163	52	1331
14	4945*	34	2036	54	1282
16	4327*	36	1923	56	1236
18	3846*	38	1822	58	1194
20	3461	40	1731	60	1154
22	3147	42	1648		

*Operation of saw blades in excess of 3600 RPM is not recommended and will generally result in poor tool life and cut quality.

Note: Most materials will cut better with longer tool life at speeds well below the maximum RPM rotating speed.

Chart B

MAXIMUM RIM SPEEDS, IN SURFACE FEET PER MINUTE (SFM), FOR CARBIDE TIPPED CIRCULAR SAW BLADES CUTTING THE MATERIALS LISTED BELOW

MAGNESIUM	COPPER	LEAD	UNDER 150 BRINELL BRASS	UNDER 150 BRINELL BRONZE
15,000 SFM	10,000 SFM	14,000 SFM	10,000 SFM	12,000 SFM

SOFT & MEDIUM-HARD ALUMINUM	HARD, ANODIZED ALUMINUM
18,000 SFM	12,000 SFM

Note: Most metals, including those listed, will cut better with longer tool life at speeds below the maximum surface feet per minute (sfm) rim speeds.