By the Authority Vested By Part 5 of the United States Code § 552(a) and Part 1 of the Code of Regulations § 51 the attached document has been duly INCORPORATED BY REFERENCE and shall be considered legally binding upon all citizens and residents of the United States of America. **HEED THIS NOTICE:** Criminal penalties may apply for noncompliance.

**Document Name:** ANSI O1.1-1961: Safety Code for Woodworking Machinery

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THE EXECUTIVE DIRECTOR
OFFICE OF THE FEDERAL REGISTER
WASHINGTON, D.C.
American National Standard
Safety Requirements for Woodworking Machinery

Approved August 23, 1971
American National Standards Institute, Inc
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Foreword

(This Foreword is not a part of American National Standard Safety Requirements for Woodworking Machinery, O1.1-1971.)

The revision of the original Safety Code for Woodworking Machinery was approved in 1944. In 1952 the Standards Committee was reorganized, and the scope was changed to exclude the manufacture of structural plywood, and to include a comprehensive revision of the cooperage machinery section and an entirely new section dealing specifically with radial-type saws. The resulting standard was issued in 1954.


Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

The OI Committee on Safety Code for Woodworking Machinery, which reviewed and approved this standard, had the following personnel at the time of approval:

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David Zabriskie, Secretary

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American Society of Safety Engineers
Associated Cooperage Industries of America
American Insurance Association
Industrial Safety Equipment Association
International Association of Governmental Labor Officials
National Forest Products Association
National Safety Council
United Brotherhood of Carpenters and Joiners of America
Woodworking Machinery Manufacturers Association
U.S. Department of Labor, Bureau of Labor Standards
Power Tool Institute, Inc
Rockwell Manufacturing Company

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American National Standard Safety Requirements for Woodworking Machinery

1. General

1.1 Scope. Specifications for the safe installation, operation, and maintenance of woodworking machinery and accessory equipment, including cooperage and veneering operations.

1.2 Application and Exceptions. The purpose of this standard is to provide reasonable safety for life, limb, and health.

NOTE: It is suggested that, when exceptions are asked, the enforcing authority consult with the Committee on Safety Code for Woodworking Machinery, in care of the American National Standards Institute, 1430 Broadway, New York, N.Y., 10018. Such consultation will tend to bring about uniform application of the standard and will keep the committee informed of criticisms which should be considered.

2. Related Standards

This standard is intended for use in conjunction with the following American National Standards (see Section 10):

American National Standard National Electrical Code, C1-1971
American National Standard Safety Requirements for Sawmills, O2.1-1969
American National Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1-1961
American National Standard for Ventilation Control of Grinding, Polishing, and Buffing Operations, Z43.1-1966
American National Standard Safety Requirements for Industrial Head Protection, Z89.1-1969

3. Definitions

point of operation. The term "point of operation" shall be understood to mean that point at which cutting, shaping, boring, or forming is accomplished upon the stock.

push block. The term "push block" shall mean a short block of wood, provided with a handle similar to that of a plane and a shoulder at the rear end, which is used for pushing short stock over revolving cutters. (See A3 of the Appendix.)

push stick. The term "push stick" shall mean a narrow strip of wood or other soft material with a notch cut into one end and which is used to push short pieces of material through saws.

"shall" and "should." The word "shall" is to be understood as mandatory; the word "should" as advisory.

4. Plant Layout

4.1 Machine Layout

(1) Machines should be arranged in a manner that will permit an even flow of materials and eliminate backtracking and criss-crossing. Sufficient space should be provided to handle the material with the least possible interference from or to workmen or other machines. Machines should be so placed so that it will not be necessary for an operator to stand in or near an aisle,
and the layout of machines should allow for easy maintenance and repair.

(2) To prevent overturning or unintentional movement, woodworking machinery shall be firmly secured. Small units shall be secured to benches, tables, or stands of adequate strength and design. This rule does not apply to portable hand electric and pneumatic tools.

NOTE: Wherever plant layout permits, it is advisable to locate heavy-duty machines on the ground floor.

(3) Machines should be located, with respect to sources of natural and artificial light, so that light of sufficient intensity will fall on the work. Supplementary illumination at the point of operation shall be provided where necessary. Direct or reflected glare and shadows should be avoided.

NOTE: For specific requirements see American National Standard, Practice for Industrial Lighting, A11.1-1965 (R1970). (See A4.1 Lighting of the Appendix.)

(4) Provision should be made for the removal of dust, shavings, and waste material, automatically or semiautomatically, if possible.

NOTE: For specific requirements, see American National Standard, Regulations for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1-1961.

4.2 Floors and Aisles

4.2.1 Floor Maintenance. All floors shall be kept in good repair and shall be free from protruding nails, splinters, holes, unevenness, loose boards, and other tripping hazards.

4.2.2 Nonslip Floors. Floors in the working area about all woodworking machines shall be provided with effective means to prevent slipping. (See A4.2.2 of the Appendix for suggestions for nonslip floors.)

4.2.3 Aisles and Walkways. Aisles and walkways should be as straight as possible, with corners rounded or diagonal. Aisles for one-way traffic shall be not less than the width of the widest vehicle or load, plus three feet. For two-way traffic, the minimum width of aisles shall be not less than twice the width of the widest vehicles or loads, plus three feet. Lines marking aisles shall be painted on the floor, or some similar method employed to mark them.

5. Machines and Equipment

5.1 Machine Construction, Drive, Feed, Speed, and Control (See A5.1 of the Appendix)

5.1.1 Machine Construction

(1) The height of a table, working surface, or machine shall be related to the worker. Either the equipment shall be adjustable or the worker provided with a means to adjust to the equipment. (See A5.1.1 of the Appendix for a guide.) Provisions shall be made so that large or unwieldy material can be handled in a safe manner.

(2) Each machine shall be designed, constructed, and mounted in a manner which will eliminate hazardous vibration at any operating speed while using any tool designed for the machine.

(3) Arbors and mandrels shall be constructed so as to have firm and secure bearing and shall be free from excessive end-play that would cause a condition hazardous to workmen.

(4) Band-saw wheels shall be designed and manufactured so that they will be capable of withstanding the strains imposed. Band wheels seven inches or more in width shall have a minimum rim thickness of 5/8 inch if made of cast iron or 1/2 inch if of cast steel, except for a distance not to exceed one inch from either edge.

(5) Where employees are exposed to their hazards, automatic cut-off saws that stroke continuously, without the operator being able to control each stroke, shall not be used.

(6) Saw frames shall be provided with permanent means to limit the size of the saw that can be mounted.

(7) Fences, material guides, and spreaders shall be designed and constructed in a manner which allows them to be properly secured to the table or table assembly and to remain in alignment with the cutting blade. Fences, material guides, and spreaders on cutting machines with tilting tables or tilting arbors shall also remain in alignment with the cutting blade in any position.

(8) Grooves or tracks for sliding material guides shall be accurately machined parallel to insure alignment with the blade for all positions of the guide.

(9) Hinged or tilting tables shall be so constructed that the table can be firmly secured in the desired position and in alignment with the cutting tool.

5.1.2 Machine Drive

(1) Whenever possible, driving power for woodworking machinery should be provided by individual motor or motors mounted on the machine, or on a separate base adjacent to the machine. All belts, pulleys, gears, shafts, and other moving parts shall be guarded in accordance with the specific requirements of American National Standard Safety Code for Mechanical Power-Transmission Apparatus, B15.1-1953 (R1958).

(2) Electrically driven woodworking machinery shall be grounded in accordance with American National Standard National Electrical Code, C1-1971.

(3) Each power-driven woodworking machine shall
be provided with a positive disconnect from the source of power which can be secured in the off position.

(4) Exposed non-current-carrying metal parts of portable electric equipment operated at more than 50 volts to ground shall be grounded according to the requirements of American National Standard National Electrical Code, C1-1971. For purposes of this rule, any cord-connected and plug-connected equipment shall be considered portable.

(5) Hand-held, power-driven tools shall be provided with "dead man" control, such as a spring-actuated switch, valve, or equivalent device so that the power will automatically shut off or disconnect whenever the operator releases the control.

5.1.3 Machine Control
(1) Each machine, whether mechanically or electrically driven, shall be provided with a device which will make it possible for the operator to cut off the power supply to the machine without leaving his normal operating position.

(2) On machines driven by belts and shafting, belt shifters shall be easily accessible, protected from accidental contact, and within reach of the operator. They shall be equipped with a locking device to prevent accidental shifting.

(3) Electrically driven equipment shall be controlled with magnetic switches or other devices which will prevent automatic restarting of the machine after a power failure, if automatic restarting of the machine would create a hazard.

(4) On equipment which uses steam, air, hydraulic, or a power source other than electric, the valves or power supply controls shall automatically be positioned to OFF when the source of power is interrupted, in order to prevent automatic restarting or completion of the cycle.

(5) Power controls and operating controls shall be located within easy reach of the operator while he is at his regular work location. They shall be positioned so as to make it unnecessary for him to reach over a hazardous area to actuate the control.

(6) On machines operated by electric motors or other sources of power, positive means of lockout shall be provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machines they control.

(7) Each operating control shall be protected against unexpected or accidental activation.

5.1.4 Self-Feed. Feeder attachments, such as feed rolls, chains, sprockets, gears, or other moving parts which create a hazard shall be adequately safeguarded.

5.1.5 Speeds. The operating speeds shall be etched or otherwise permanently marked on all circular saw blades and shall not be run at a speed in excess of that recommended by the manufacturer. For blades without a manufacturer's recommendation, see A5.1.5 of the Appendix.

6. Woodworking Machinery

6.1 Circular, Rip, Crosscut, Resaw, and Swing Cut-Off Saws

NOTE: It is recognized that the standards for saw guards in this section are not universally applicable to all operations for which saws are used. The standards given are those which are generally accepted in the industry. Since there are a number of situations not satisfactorily covered by these standards, the enforcing authority should exercise latitude in allowing the use of other devices which afford adequate protection.

6.1.1 Guarding of Saws Beneath and Behind Tables. The exposed portion of the saw blade either beneath or behind the table shall be covered with an exhaust hood, or with a guard or other arrangement that shall be so arranged as to prevent accidental contact with the blade.

6.1.2 Hand-Fed Rip Saws
(1) Each circular hand-fed rip saw shall be provided with a hood-type guard that will cover the blade at all times when not in use. This may be accomplished by the use of a guard which will automatically adjust to the thickness of the material being cut, or by a fixed or manually-adjusted guard. If a fixed or manually-adjusted guard is used, the space between the bottom of the guard and the material being cut shall not exceed 3/8 of an inch if 1-1/2 inches or more from the blade, and 1/4 inch if closer than 1-1/2 inches.

(2) When in use, the hood-type guard shall enclose that portion of the blade above the material.

(3) Hood-type guards shall be so designed and constructed as to resist blows and strains incidental to reasonable operation, adjusting, and handling, in order to protect the operator from flying splinters and broken saw teeth.

(4) The hood shall be so mounted as to insure that its operation will be positive, reliable, and in alignment with the saw. The mounting shall be adequate to resist any reasonable side thrust or other force that would disrupt alignment.

(5) Where a hood-type guard cannot be used because of unusual shapes or cuts, a jig or fixture which will provide equal safety for the operator shall be used. On the completion of such operations, the guard shall be immediately replaced.

(6) A push stick shall be used when cutting short or narrow stock.

(7) Each hand-fed circular rip saw shall be equipped
with a spreader to minimize the possibility of material squeezing the saw or of material kickbacks. The spreader shall be made of tempered steel, or its equivalent, and shall be slightly thinner than the saw kerf. It shall be of sufficient width to provide adequate stiffness or rigidity to resist any reasonable side thrust or blow tending to bend or throw it out of position. The spreader shall be attached so that it will remain in true alignment with the blade, even when either the saw or table is tilted, and should be placed so that there is not more than 1/2-inch space between the spreader and the back of the blade when the recommended saw blade is in its maximum "up" position. If a blade smaller than the maximum permissible size is used, the spreader shall be moved to within 1/2 inch of blade. The provision of a spreader in connection with grooving, dadoing, or rabbing is not required. On the completion of such operations, the spreader shall be immediately replaced.

(8) Each hand-fed circular rip saw shall be provided with antikickback devices so located as to oppose the thrust or tendency of the saw blade to pick up the material or throw it back toward the operator. They shall be designed to provide holding power for all the thicknesses of material being cut.

6.1.3 Hand-Fed Crosscut Table Saws (Including Trimmer Saws)

(1) Each circular crosscut saw shall be guarded by a hood which shall meet all the requirements of this section for hoods.

(2) Each circular crosscut saw shall also be provided with a spreader which shall meet the requirements of 6.1.2(7).

6.1.4 Revolving Multiple Arbor Saws. Revolving multiple arbor saws shall be fully guarded in accordance with all the requirements of this section.

6.1.5 Circular Resaws

(1) Each circular resaw shall be guarded by a hood or shield above the saw that meets all requirements of this section.

(2) Each circular resaw (other than self-feed saws with a roller or wheel at back of the saw) shall be provided with a spreader fastened securely behind the saw. The spreader shall be slightly thinner than the saw kerf.

6.1.6 Self-Feed Circular Saws

(1) Hoods—In addition to guards over blades as specified in this section, feed rolls shall be protected by a hood or guard to prevent the hands of the operator from coming in contact at any point with the inrunning roll nip. The bottom of the guard shall come down to within 3/8 inch of the plane formed by the bottom or working surfaces of the feed rolls and be at least 1-1/2 inch from the nip point. This distance (3/8 inch) may be increased to 3/4 inch, provided the lead edge of the hood is extended to be not less than 5-1/2 inches in front of the nip point between the front roll and the work.

(2) Antikickback Devices—Each self-feed circular rip saw shall be provided with sectional antikickback devices for the full width of the feed rolls. They shall be located in front of the saw blade and so arranged as to be in continual contact with the stock being fed.

6.1.7 Swing Cut-Off Saws and Sliding Cut-Off Saws Mounted Above the Table (For Radial Saws, see 6.1.9)

(1) Hood—Each saw shall be provided with a device that will completely enclose the upper half of the blade, the arbor end, and the point of operation at all positions of the saw. The device shall be constructed in such a manner as to protect the operator from flying splinters and broken saw teeth. This device shall be so designed that it will automatically cover the lower portion of the blade, so that when the saw is returned to the back of the table, the hood will rise on top of the fence, and when the saw is moved forward, the device will drop on top of and remain in contact with the table or material being cut.

(2) Counterweights—Each swing cut-off saw shall be provided with an effective device to return the saw blade automatically to the back of the table without rebound when released at any point of its travel. Where the counterweight is exposed to contact, it shall be enclosed by a guard to the floor or a safety device that will hold twice the weight of the counterweight.

(3) Limit Stops—A limit chain or other equally effective device shall be provided to prevent the saw blade from swinging beyond the front or back edge of the table.

6.1.8 Inverted Swing Cut-Off, Jump Saws, Underhung Saws. A hood-type guard, as required in 6.1.2(3), shall be securely fastened to the table that will cover the blade and shall extend at least two inches in front of the saw teeth when the blade is in "back" position. In addition, a traveling guard shall move with the blade over the material and cover the exposed part of blade above the material. The width of the hood of jump saws shall be limited so as to provide not more than 1/4-inch clearance on each side of blade.

6.1.9 Radial Saws

(1) Hoods and Guards—Each saw shall be provided with a device that will completely enclose the upper portion of the blade down to a point that will include the end of the saw arbor. The upper hood shall be so constructed to protect the operator from flying splinters, broken saw teeth, and will deflect sawdust away from the operator. The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of the stock and remain in contact with stock being cut.
(2) Spreaders—When radial saws are used for ripping, a spreader shall be provided and shall be aligned with the saw blade.

(3) Antikickback Devices—Antikickback devices located on both sides of the saw blade on the outfeed side, so as to oppose the thrust or tendency of the blade to pick up the material or to throw it back toward the operator, shall be used on each radial saw used for ripping. They shall be designed to provide adequate holding power for all the thicknesses of material being cut.

(4) Adjustable Stops and Return Devices—(a) An adjustable stop shall be provided to prevent the forward travel of the blade beyond the position necessary to complete the cut in repetitive operations. A limit chain or other equally effective device shall be provided to prevent the saw blade from sliding beyond the edge of table, or extend the table to eliminate over-run. (b) Installation shall be in such a manner that the front end of the unit will be slightly higher than the rear, or other devices installed so as to cause the cutting head to return gently to the starting position when released by the operator. CAUTION! Return system shall not allow rebound.

(5) Direction of Feed—Ripping and ploughing shall be against the direction in which the saw turns. The direction of the saw rotation shall be conspicuously marked on the hood. In addition, a permanent label not less than 1-1/2 inches by 3/4 inch shall be affixed to the rear of the guard at approximately the level of the arbor, reading as follows:

**DANGER: DO NOT FEED MATERIAL INTO CUTTING TOOL FROM THIS END.**


6.1.10 Portable Circular Saws. All portable, power-driven saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the blade to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the blade to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to covering position.

6.2 Band Saws and Band Resaws

6.2.1 Enclosing Band Saw Blades. All portions of the saw blade shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. Band saw wheels shall be fully encased. The outside periphery of the enclosure shall be solid. The front and back of the band wheels shall be either enclosed by solid material or by wire mesh or perforated metal. Such mesh or perforated metal shall be not less than 0.037 inch (U.S. Gage No. 20), and the openings shall be not greater than 3/8 inch. Solid material used for this purpose shall be of an equivalent strength and firmness. The guard for the portion of the blade between the sliding guide and the upper-saw-wheel guard shall enclose the saw blade at the front and outer side. This portion of the guard shall be self-adjusting to raise and lower with the guide. The upper-wheel guard shall be made to conform to the travel of the saw blade on the wheel, and the top member of the guard should have at least a two-inch clearance outside the saw blade and be lined with smooth material, preferably metal. Effective brakes shall be provided to stop the wheel in case of blade breakage.

6.2.2 Tension. Each hand saw machine should be provided with a tension control device to indicate proper tension for the standard saws used on the machine.

6.2.3 Feed Rolls. Feed rolls of band resaws shall be equipped with guards to prevent the hands of the operator from coming into contact with the roll nip points. The edge of the guard shall come to within 3/8 inch of the plane formed by the inside face of the feed roll in contact with the stock being cut and the work table.

6.3 Jointers and Planers

6.3.1 Point of Operation

(1) Each hand-fed planer and jointer with horizontal or vertical head shall be equipped with a cylindrical cutting head, the knife projection of which shall not exceed 1/8 inch beyond the cylindrical body of the head.

(2) Square cutting heads shall not be used.

(3) The opening in the table shall be kept as small as possible. The clearance between the edge of the rear table and the cutting head circle or knives shall be not more than 1/8 inch. The table throat opening shall be not more than 2-1/2 inches when tables are set or aligned with each other for zero cut.

6.3.2 Automatic Guards

(1) Each hand-fed jointer shall have an automatic guard which will cover all the sections of the cutting head on the working side of the fence or guard. The guard shall be designed to prevent accidental contact with the revolving knives and shall automatically adjust itself to cover the unused portion of the head and shall remain in contact with the material at all times.

(2) Each hand-fed jointer with horizontal cutting head shall have a guard which will cover the section of the head back of the gage or fence.
6.3.3 Vertical-Head Jointers. Each wood jointer with vertical head shall have either an exhaust hood or other guard so arranged as to enclose completely the revolving head, except for a slot of such width as may be necessary for the application of the material to be jointed.

6.4 Tenoning Machines
6.4.1 Guarding of Cutting Heads
(1) Each tenoning machine shall have all cutting heads, and saws if used, covered by guards. These guards shall cover at least the unused part of the periphery of the cutting head.

(2) Where an exhaust system is used, the guard may form part or all of the exhaust hood.

6.4.2 Feed Chains and Sprockets
(1) Feed chains and sprockets of all double end tenoning machines shall be completely enclosed, except for that portion of chain used for conveying the stock.

(2) At the rear ends of frames over which feed conveyors run, sprockets and chains shall be guarded at the sides by plates projecting beyond the periphery of sprockets and the ends of lugs.

(3) Where space permits, the rear end of the frame over which the feed conveyors run should be so extended that the material, as it leaves the machine, will be guided to a point within easy reach of the person “taking away” at the rear of the tenoner.

6.4.3 Hand-Fed Tenoners. Hand-fed tenoning machines shall be provided with a clamping or “hold-down” device on the fixture.

6.5 Boring and Mortising Machines
6.5.1 Chucks. Chucks with projecting set screws shall not be used.

6.5.2 Chain Mortiser. The top of the cutting chain and driving mechanism shall be enclosed.

6.5.3 Counterweights. Where there is a counterweight, suitable means shall be used to prevent its dropping.

6.5.4 Universal Joints. Universal joints on spindles of boring machines shall be guarded in such a way as to prevent accidental contact by the operator.

6.6 Wood Shapers and Similar Machines
6.6.1 Guarding of Cutting Heads
(1) The cutting heads of each wood shaper, hand-fed panel raiser, or other similar machine not automatically fed, shall be enclosed with a cage or adjustable guard so designed as to minimize operator contact with cutter head. The diameter of circular shaper guards shall be greater than the diameter of the cutter. In no case shall a warning device of leather or other material be attached to the spindle.

(2) Cylindrical heads should be used whenever the nature of the work will permit. Single cutter knives in shaper heads shall not be used unless properly balanced.

(3) Templates, jigs, and fixtures which will remove the operator’s hands from the point of operation shall be used whenever the nature of the work will permit.

6.6.2 Single Starting and Stopping Devices. All double-spindle shapers shall be provided with a spindle starting and stopping device for each spindle.

6.7 Planing, Molding, Sticking, and Matching Machines
6.7.1 Guarding of Cutting Heads
(1) Each planing, molding, sticking, and matching machine shall have all cutting heads and saws, if used, covered by a guard to minimize accidental contact with the cutting head.

(2) Where an exhaust system is used, the guards may form part or all of the exhaust hood.

6.7.2 Feed Rolls
(1) Feed rolls shall be provided with a guard or hood to minimize operator contact with the roll nip points. The guard shall remain in adjustment for any thickness of stock.

(2) Surfacers or planers used in processing multiple pieces of material simultaneously shall be provided with sectional infeed rolls having sufficient yield in the construction of the sections to provide feeding contact pressure on the stock, over the permissible range of variation in stock thickness for which the machine is designed.

6.8 Profile and Swing-Head Lathes (Including Wood Heel Turning Machines)
6.8.1 Guarding of Cutting Heads
(1) Each profile and swing-head lathe shall have all cutting heads covered by a guard to minimize accidental contact with the cutting head.

(2) Cutting heads on wood-turning lathes, whether rotating or not, shall be covered as completely as possible by hoods or shields.

(3) All automatic wood-turning machines of the rotating knife type shall be equipped with guards enclosing the cutter blades completely, except at the contact points while the stock is being cut.

(4) Lathes used for turning long pieces of wood stock held only between the two centers shall be equipped with long curved guards extending over the tops of the lathe in order to prevent the work piece from being thrown out of the machine if it should become loose.

(5) Guards covering the work piece in wood-turning lathes should be so constructed to permit observation of the turning operations.

(6) Wood-turning lathes shall be equipped with suction hoods, properly connected to efficient exhaust systems that will remove, at their point of origin, the chips and dusts produced.
(7) An exhaust system may form part or all of the guard.
(8) Tool rests shall be securely fastened to avoid accidental movement.

6.9 Sanding Machines

6.9.1 Feed Rolls. Feed rolls of self-feed sanding machines shall be protected with a semicylindrical guard to prevent the hands of the operator from coming in contact with the roll nip points. The guard and its mounting shall be designed to remain in adjustment for any thickness of stock. The bottom of the guard should come down to within 3/8 inch of a plane formed by the bottom or contact face of the feed roll where it touches the stock.

6.9.2 Drum Sanding Machines. Each drum sanding machine shall have an exhaust hood, or other guard, so arranged as to enclose the revolving drum, except for the working portion of the drum above the table.

6.9.3 Disk Sanding Machines. Each disk sanding machine shall have the exhaust hood, or other guard, so arranged as to enclose the revolving disk, except for that portion of the disk above the table.

NOTE: The distance between the disk and the table edge shall be kept at a minimum.

6.9.4 Belt Sanding Machines

(1) Belt sanders shall have all pulleys enclosed including sides and periphery. This does not include the working end of an edge sander. An exhaust hood may be part of the guard.

(2) The edges of the unused run of the belt shall be guarded.

6.10 Combination or Universal Woodworking Machines. For combination or universal woodworking machines, each point of operation shall be guarded as specified in the rules of this standard for each separate machine. Such machines shall be provided with a separate stopping and starting device at each point of operation.

6.11 Routers. The pulleys, spindles, and cutting tools shall be guarded. Turn plates, jigs, and fixtures which require the operator's hands to be removed from the point of operation may be used as a point of operation guard.

6.12 Glue Spreaders (Feed Roll Type). Where there is a hazard to the operator, the feed roll shall be guarded at all nip points. The bottom of the guard at the in-feed side shall come to within 3/8 inch of a horizontal plane formed by the bottom or contact face of the feed roll and the top surface of the stock and at least 1-1/2 inches away from the contact point. It is recommended that a reversing bar or switch, or a kickplate be used in addition to the nip guard.

6.13 Guarding Operating Treadles. Each operating treadle shall be covered by a device which is adequate to avoid accidental activation or tripping.

6.14 Other Machines Not Excluded. The mention of specific machines in 6.1 through 6.12 inclusive, is not intended to exclude other woodworking machines from the requirement that suitable guards and exhaust hoods be provided. Reduce to a minimum the hazard due to the point of operation of such machines.

7. Veneer and Plywood Machinery

7.1 Steaming Equipment and Soaking Pits

7.1.1 Steam Vats and Soaking Pits

(1) Steam vats shall be protected by standard guard rails or sides extending to a height of not less than 42 inches above the floor, working platform, or ground.

(2) Large steam vats divided into sections shall be provided with a substantial walkway between sections, equipped with a standard guardrail on each exposed side. These guardrails may be of the removable type if necessary for specific operations and shall be replaced immediately following the completion of the operation.

NOTE: Provided the size of stock handled will permit, it is advisable to keep the size of the vat sections to eight feet or less.

7.1.2 Loading and Unloading. Steam vats and soaking pits:

(1) The floor surface at the sides being used shall be so constructed as to minimize slipping, and all employees working at the vats shall be provided with and shall be required to wear footwear having soles and heels of such composition as to minimize slipping.

(2) The employee working at a steam vat or soaking pit shall be provided with and required to wear a safety belt attached to a lifeline. The lifeline shall be attached to a traveling trolley on a monorail or to a fixed anchorage or similar arrangement. The lifeline shall be permanently adjusted so that the employee, in the event of slipping, falling, or tripping, cannot fall into the vat or soaking pit.

(3) Mechanical handling or conveying equipment shall be provided and so designed that the logs can be removed without requiring manual assistance from an employee at the edge of the vat.

(4) Safe and adequate means shall be provided for draining the liquid. No employee shall be permitted to stand on the vat, and no unloading shall be started until the liquid has been drained from the vat.

7.1.3 Ventilation

(1) Insofar as possible, vats should be located in buildings, or in special sheds, heated in cold weather to
keep the amount of steam at a minimum.

(2) Adequate means shall be provided for ventilation of buildings in which steam vats are located. High ceilings with roof ventilators or louvers are desirable. Where ceilings or roofs are low, exhaust fans shall be provided.

7.2 Log Handling Equipment

7.2.1 Cranes, Log Trolleys, Etc. All gears, sprockets, and other dangerous parts shall be enclosed with standard guards. (See American National Standard Safety Code for Mechanical Power-Transmission Apparatus, B15.1-1953 (R1958)).

NOTE: The use of log trolleys or cranes is urgently recommended except where the stock handled is very small.

7.2.2 Barker. An enclosure shall be constructed for the Barker operator to protect him from being struck by flying bark. Similar protection shall be provided for personnel walkways near the Barker. (Refer to 4.4 of American National Standard for Mechanical Power-Transmission Apparatus, B15.1-1969.)

7.2.3 Conveyors. Reversing switches shall be provided for conveyors, and such switches properly identified.

7.2.4 Stairways, Walkways, and Ladders. Stairways, walkways, and ladders in and around machinery shall be kept free of debris, cans, tools, etc., and kept in good repair. Necessary guardrails shall be provided.

7.3 Saws

7.3.1 Log Cut-Off Saws. Saws shall be so located as to give safe clearance for passage when the saw is at the extreme end of the stroke, or if such clearance is not obtainable, the saw and its driving mechanism shall be provided with a standard enclosure.

7.3.2 Circular Cut-Off Saws. The operator shall be provided with an enclosure as protection against sawdust and flying chips.

7.4 Veneer Lathe

7.4.1 A mechanical lock shall be provided to prevent the back-up roll from closing until activated by the operator.

7.4.2 A guard or positive interlock and necessary hydraulic or air controls shall be provided to prevent forward movement of the charger, if such movement may be hazardous.

7.4.3 Positive means shall be provided to hold the head in the open position while servicing the knife.

7.4.4 A protective device for the knife edge shall be provided for use when transporting the knife.

7.4.5 Where there is a hazard from "exploding" logs, both lathe operator's and charger operator's stations shall be protected against flying slabs and chips.

7.4.6 Means shall be provided in knife grinding area to drain cleaning or cooling liquids from the work station.

7.4.7 Knives and other cutting equipment shall have planned storage areas.

7.4.8 The area under the elevating ramp (tipple) from the lathe to the stock trays shall be guarded to prevent entrance while the lathe is in operation.

7.5 Veneer Slicer. Knife shall be guarded at front and rear to prevent accidental contact with the knife edge.

7.6 Veneer Clipper

7.6.1 Clippers shall be provided with a guard on both in-feed and out-feed sides to protect the operator and helper.

7.6.2 Guarding Operating Treadles. Each operating treadle shall be covered by a device which is adequate to avoid accidental activation or tripping.

7.6.3 Power-Driven Guillotine Veneer Cutters (Except Continuous Feed Trimmers). These shall be equipped with the following:

(1) A starting device which requires the simultaneous action of both hands to start the cutting motion, and at least one hand on a control during the complete stroke of the knife; or

(2) An automatic device which will remove the hands of the operator from the danger zone at every descent of the blade used in conjunction with one-hand starting devices which require two distinct movements of the device to start the cutting motion.

(3) All power-driven veneer cutters shall be so designed that the knife positively returns to the starting position after each complete cycle of the knife.

(4) Where two or more workers are employed at the same time on the same power-driven guillotine veneer cutter equipped with two-hand control, the device shall be so arranged that each worker shall be required to use both hands simultaneously on the controls to start the cutting motion, and at least one hand on a control to complete the cut.

(5) In addition to the brake or other stopping mechanism, a nonrepeat device shall be provided which will prevent the machine from operating in the event of a mechanical failure.

(6) Where no other device serves as protection, a guard running the length of the knife shall be installed on the in-feed side.

(7) A protective device, such as side shields, shall be provided on the out-feed side.

(8) A protective device for the knife edge shall be provided for use when transporting the knife.

(9) Positive means of opening and locking the control circuit and supporting the mechanism in the "up" position shall be provided for use during knife changes.
7.7 Tray System

(1) The tray system shall be equipped with controls at each end so that the system cannot be operated unless both switches are in the "on" position.

(2) A walkway shall be constructed the entire length of the trays so that the top tray can be reached in the event of a "plug-up" without having to climb up the frames.

7.7.1 Dryer Feed. A standard stairway and catwalk across the tray lines shall be constructed to provide safe access in the event of a "plug-up," and dryer feed controls, including a positive lock out, shall be provided at the feeders' station.

7.8 Veneer Glue Spreaders. Spreaders shall be equipped with an automatic reverse device which will work on both the in-feed and out-feed sides, and so arranged that the spreader will be automatically reversed in the event contact is made with the device on either side of the machine.

7.9 Veneer Dryer

(1) Warning signs on doors and means of pressure relief shall be provided to prevent injury from hot steam, gases, or smoke from normal operation or fire conditions.

(2) Steam lines outside the dryer which may be contacted by personnel shall be insulated or enclosed.

7.10 Core Saw and Fishtail Saw. Where a band saw is used to trim panel core, it shall be guarded in accordance with provisions of 6.2.1.

7.11 Hot Press or Veneer Press

(1) Steam lines which may be contacted by personnel shall be insulated or enclosed.

(2) Standard guard rails shall be provided on the ends of loading and unloading elevators or hoist platforms or both. (See American National Standard for the Installation and Operation of Pulverized-Fuel Systems, Z12.1-1961.)

(3) Hot-press hoists shall be provided with a braking and holding mechanism which will operate automatically in case of failure of lifting chains or cables.

(4) On a hot press equipped with an automatic charger, an electrically interlocked gate or chain shall be provided across the opening between the charger and the press which, when opened, will open the circuit to prevent the charger from moving.

(5) Where two workers are employed in loading the press, closing control devices shall be provided within reach of each work station, so interconnected as to require activation of both controls to operate the press, and a quick opening device shall be provided at each station on the press hoist platform.

7.12 Veneer Stripsaw. An antikickback device and hood guard shall be provided as covered in 6.1.2.

7.13 Patch Machine. A guard shall be provided to prevent operator's hands from entering the punch area and the foot treadle shall be guarded as in 7.6.2.

7.14 Veneer Chippers and Hogs

(1) The top feed roll shall be equipped with a guard and a shield or panel shall be provided on the operator's side to prevent operator from reaching the roll.

(2) Where there is a possibility of the operator falling into the opening of a hog or chipper, a lifeline and safety belt shall be provided.

7.15 Electronic Laminating Press and Edge Gluer

(1) Interlocked gates shall be provided on in-feed and out-feed sides of batch-type presses which are interlocked to prevent power being activated until gates are completely lowered.

(2) Shielding shall be provided to protect against harmful exposure to radiation that may be emitted.

(3) All screens and filters shall be equipped with interlocks which will shut off all power in the event they are removed.

7.16 Edge Gluer Jointer

(1) A barrier shall be installed at the end of a travel of the head to prevent flying splinters from injuring personnel.

(2) A gate shall be installed to prevent access between the edge gluer jointer and the grasshopper so arranged that when the gate is opened, all electricity, air, and hydraulic lines will be shut off and the cylinders bled.

7.17 Crowder. A device should be positioned across the front of the in-feed nip point, so arranged as to shut off the equipment if contact is made with it.

7.18 Sanders. Wide-belt sanders shall be equipped with nonkickback fingers and a barrier at the in-feed side adjusted to prevent more than one panel entering the sander at a time.

7.19 Scissor Lifts. All scissor lifts, regardless of size, shall be provided with a mechanical means of supporting the lift in a raised position independent of the
8. Cooperage Machinery


8.2 Saws

8.2.1 Heading Bolt Sawing Machine

(1) Each heading saw blade shall be guarded by a hood curved to the contour of the blade. The hood shall cover the saw at least to the depth of the teeth, except for that portion actually used in making the cut. The exhaust hood shall be so arranged and maintained as to guard effectively the bottom portion of the blade. The hood shall be made of adequate strength to resist strains incidental to reasonable operation, adjusting, and handling and to protect the operator from flying splinters and broken saw teeth.

(2) The balance wheel shall be covered to enclose the rim and outside portion of the wheel.

(3) The swing carriage shall be provided with an effective device that will return the carriage automatically to a position in front of the saw.

(4) A limit stop shall be provided to prevent the carriage from swinging too far back and thereby exposing the unguarded portion of the blade to contact.

8.2.2 Hand-Fed Flat Table-Type Heading Saw. The saw blade shall be guarded by a hood curved to the contour of the blade and mounted on the table top in such a manner as to completely cover the blade when it is not engaging the material.

8.2.3 Bolt Equalizer, Stave, and Heading Saws (Tilting Table Style)

(1) All heading and stave bolt equalizer saw blades shall be guarded by hoods, curved to the contour of the saws. The hood shall cover the blade at least to the depth of the teeth, except for that portion actually used in making the cut. The exhaust hood shall be so arranged and maintained as to guard effectively the bottom portion of the blades.

(2) Hoods shall be attached to each end of the tilting table and shall extend forward to cover the portion of the blades which cannot be enclosed by a stationary guard.

(3) A limit stop shall be provided to prevent the table from coming too far back and thereby exposing the unguarded portion of the saw blades to contact.

(4) Hydraulically operated saws should be guarded as outlined in 8.2.3 (1).

8.2.4 Barrel Stave Saws (Cylindrical Saws)

(1) Each machine of this type shall have the saw blade and the revolving part (head) to which the saw blade is bolted enclosed with a hinged guard to prevent accidental contact, except for that part of the saw blade immediately adjacent to the carriage, which is the point of operation of the saw.

(2) The exhaust hood shall be so arranged and maintained as to guard effectively the bottom portion of the blade. The hood shall be made of adequate strength to resist strains incidental to reasonable operation.

8.2.5 Hand-Fed Staves and Heading Ripsaws

(1) Each circular hand-fed stave and heading ripsaw shall be provided with a hood-type guard that will cover the blade at all times when not in use.

(2) When in use, the hood-type guard shall enclose that portion of the blade above the table and that portion of the blade above the material by adjusting automatically to the thickness of the material being cut.

(3) Hood-type guards shall be so designed and constructed as to resist blows and strains incidental to reasonable operation, adjusting, and handling and to protect the operator from flying splinters and broken saw teeth.

(4) Each hand-fed circular stave and heading ripsaw shall be equipped with a spreader.

8.2.6 Radial Saws. The upper hood shall completely enclose that portion of the blade down to a point that will include the end of the saw arbor. The upper hood shall be constructed in a manner that will protect the operator from flying splinters, broken saw teeth, and will deflect sawdust away from the operator. The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of stock and remain in contact with the stock being cut.

8.2.7 Self-Feed Stave and Heading Equalizer Saws

(1) Self-feed equalizer saw blades shall be guarded with a hood guard which will cover the top and sides of the saw blades. The hood shall adjust itself automatically to the thickness of, and remain in contact with, the material being cut.

(2) The hood shall be constructed of material sufficiently heavy to serve as a hold-down device while the stave is passing between the blades.

(3) The portion of the saw blade extending beneath the arbor shall be enclosed in an exhaust hood and be easily accessible for changing blades.

8.3 Stave and Heading Planers (Single and Double Heads)

8.3.1 Guarding of Cutter Heads. The exhaust hood, or other guards if no exhaust system is required, shall be so arranged and maintained as to guard effectively
against accidental contact with all cutting heads and knives.

8.3.2 Point of Operation

(1) Feed rolls, except for such portion as may be necessary to admit stock, shall be completely enclosed. Sectional feed rolls shall be provided for heading planers. Effective anti-kickback device should be provided for all heading planers, regardless of the type of feed rolls.

(2) Pressure bars or hold-down arrangements shall be provided to assure correct pressure and clearance at all times.

8.4 Stave Jointing Wheels. Requirements for guarding double independent stave jointer wheels, double jointer stave wheels, single jointer stave wheels, and all kinds of keg stave jointer wheels are as follows:

(1) Stave jointer wheels shall be covered on both sides with a removable metal hood connected to the exhaust system, except for that portion where the stock is applied to the knives.

(2) A limit stop shall be provided to prevent any part of the carriage from coming in contact with any moving part of the wheel.

8.5 Guarding of Heading Jointer and Doweler Machine (Wheel)

(1) Each heading jointer shall be equipped with a guarding hood covering the upper half of the wheel, except for that portion where the stock is applied to the knives.

(2) The lower portion of the wheel shall be guarded to prevent accidental contact with the knives.

(3) Dowel bit pulleys and belts shall be guarded.

8.6 Guarding of Heading Rounder. The cutter head shall be enclosed in a hood attached to the exhaust system, except for that portion of the cutting head where the stock is applied.

8.7 Guarding of Power Windlass Machine. Windlass machines having counterweights shall operate with the weights in a stationary casing. On all machines having a friction gear, the gear shall be properly guarded.

8.8 Crozing Machines (Stationary Heads). Requirements for guarding all types of barrel, keg, bucket, tub, and individual stave crozers, chamfering, and doweling machines are as follows: Feed chains and sprockets shall be completely enclosed.

8.9 Guarding of Gear-Driven Heading-Up Machines. Drive gears for the racks shall be completely guarded.

8.10 Guarding of Head-Chartering Machine. All tripping mechanisms shall be completely guarded.

8.11 Bilge- and Head-Truss Hoop Ring-Removing Machines. Guarding of horizontal and upright-type machines shall be as follows:

(1) Both eccentric cam and gear works on horizontal machines shall be guarded.

(2) Combined fly wheel and gear shall be completely enclosed.

8.12 Guarding of Hoop Elevators and Conveyors. Lower sprockets and chains shall be guarded by complete enclosure to a height of at least seven feet.

8.13 Guarding of Barrel-Sanding Machine. Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs onto a pulley. This guard may be a part of the exhaust system. The unused run of the sanding belt shall be enclosed.

8.14 Hoop Drivers and Trussers. Requirements for guarding keg hoops, tin barrel hoops, truss hoops, and both screw and pinion-type hoop drivers are as follows: All friction pulleys shall be enclosed by a guard. A hinged gate should be provided for that portion of the guard covering adjustments to the friction blocks.

8.15 Head-Sanding Machine

8.15.1 Hand Sanders. Portable electric hand sanders shall be properly grounded. (See 5.1.2 (4) of this standard.)

8.15.2 Machine Sanders. The exhaust hood of automatic horizontal disk-head sanders shall be so arranged as to enclose each disk, except for that portion necessary for the application of the heads being finished.

8.16 Hand Jointer. All horizontal hand-fed jointers shall comply with 6.3 of this standard.

8.17 Hoop-Punching and Coiling Machine. Guarding of horizontal hoop-punching, upright hoop-punching machine and coiling machine shall be as follows: Miter gears, spur gears, drive pulley, and pulley for coiling attachment shall be guarded.

8.18 Hoop-Riveting Machine. Guarding of automatic, single, and double hoop riveters shall be as follows: The balance and drive wheels shall be effectively guarded.

8.19 Guarding of Hoop Flaring and Expanding Machine. Gearing shall be completely enclosed.

8.20 Bung-Boring Machine. The reamer shall be completely enclosed when not engaging the wood.
8.21 Hogs

(1) Hog Mills shall be so designed and arranged that from no position on the rim of the chute shall the distance to the cutter knives be less than forty inches.

(2) Hog Feed Chutes shall be provided with suitable and approved baffles, which shall minimize material from being thrown from the mill.

(3) Employees feeding hog mills shall be provided with safety belts and lifelines, unless guarded.


8.23 Dust Bin. All dust storage bins shall be equipped with side and top openings for entrance by personnel when “Punching Down” material that has arched over or must be loosened. Workers required to enter the bin for the above reason shall be equipped with an approved airline mask assembly attached to a fixed air supply and an approved safety harness equipped with spark-resistant fittings and lifeline, attended by an employee outside the bin.

9. Operating Practices

9.1 Inspection and Maintenance

9.1.1 Inspection

(1) Emphasis is placed upon the importance of maintaining systematic inspection of all woodworking machines and safety equipment to assist in the discovery or detection of developing defects and to permit their prompt correction. Inspections to be performed by a plant safety engineer, foreman, or supervisor. Inspection shall determine that safety equipment is in working condition and in place, that noise/time exposure levels are within allowable limits, that the machine operator is properly trained in safe operating procedures of the equipment, and that the operator and machine are equipped with the safety accessories suitable for the hazards of the operation.

(2) Each machine is to be inspected at least every six months, and a (rugged) tag or card affixed to the machine. It shall contain a minimum of the following: machine number, inspection date, period of validity, and signature of a qualified person familiar with the machinery.

9.1.2 Maintenance

(1) Dull, badly set, improperly filed, or improperly tensioned sawblades shall be immediately removed from service before they result in causing the material to stick, jam, or kick back when it is fed to the saw at normal speed. Sawblades to which gum has adhered on the sides shall be cleaned before its thickness is approximately two-thirds the tooth set. It is strongly recommended that users obtain and follow instructions from the sawblade manufacturers for proper maintenance of all sawblades. Band saw wheels should be kept clean and free from accumulations of sap, gum, or resins.

(2) All knives and cutting heads of woodworking machines shall be kept sharp, properly adjusted, and firmly secured. Cutting heads shall not generate sensible vibration.

(3) Mounted cutting tools or cutting tool arbors or both shall be free of excessive lateral and radial play. Bearings shall have proper lubrication.

(4) Sharpening or tensioning of saw blades or cutters shall be done only by persons of demonstrated skill in this kind of work.

(5) Cleanliness around woodworking machinery is to be maintained to insure proper functioning of guards, bearings, motors, and electrical equipment, and to prevent generation of fire hazards.

9.2 Selection of Machines, Tools, and Equipment

9.2.1 Machines

(1) Work should be scheduled to avoid frequent adjustments of machines and altering of position of guards.

(2) Machines shall not be used for work beyond the stated capacity or use (type operation) as outlined by the machine manufacturer.

9.2.2 Tools. No sawblade, cutterhead, or tool collar shall be placed or mounted on a machine arbor, unless the tool has been accurately sized and shaped to fit the arbor.

9.2.3 Equipment and Accessories


(2) Only accessories (or attachments) of the type recommended by the machine manufacturer for use on the machine shall be employed.

9.3 Operation of Machines, Tools, and Equipment

9.3.1 General. Machine shall not be operated unless all guards are in place and in working order.

9.3.2 Circular Saws

(1) Cracked sawblades shall be removed from service and shall not be used until they have been inspected and repaired by a skilled sawsmith. If a skilled saw-
smith is not available, sawblades should be returned to the manufacturer for welding, slotting or tensioning as required for safe operating speed and service.

(2) Sawblade teeth must have sufficient clearance (set or hollow ground) to prevent burning.

(3) The sawblade shall be balanced or tensioned or both to avoid sensible vibration and cracking and to be stable throughout the design speed range.

(4) The practice of inserting wedges between the sawblade and the collar to form what is commonly known as a wobble saw shall not be permitted.

(5) Push sticks or push blocks shall be provided at the work place in several sizes and types suitable for the work to be done.

9.3.3 Band Saw

(1) Before starting a band saw machine not equipped with a tension indicator, the blade shall be tested for proper tension.

(2) Back thrust shall be adjusted to the normal position of the saw blade.

(3) To secure satisfactory operation, means should be provided for preventing the accumulation of dust on the rim of band wheels.

(4) Using a small saw for large work or forcing a wide saw to cut on a small radius is poor practice. The saw blade should in all cases be as large as the nature of the work will permit.

(5) Saws should not be stopped too quickly, or by thrusting a piece of wood against the cutting edge of the teeth when the power is off.

(6) To avoid vibration, brazed joints shall be the same thickness as the saw blade.

(7) Band saw blades shall be periodically examined to avoid use of cracked blades or blades which indicate probability of breakage.

9.3.4 Jointers

(1) The hazard of jointing pieces which are too short is excessive. Minimum length of the piece jointed should be not less than four times the width of the bed opening. Neither half of the jointer table shall be adjusted horizontally so that the clearance between the edge of the table and the revolving knives is more than 1/4 inch. The knife blade shall be so installed and adjusted that it does not protrude more than 1/8 inch beyond the cylindrical body of the head. Push sticks or push blocks shall be provided at the work place in the several sizes and types suitable for the work to be done.

(2) Except for rabbeting operations, a guard shall cover the unused portion of the cutter head on the working side of the fence (guard shall be checked regularly for proper operation). The unused portion of the cutter head behind the fence shall be appropriately guarded.

9.3.5 Lathes. See A9.3.5 of the Appendix.

9.4 Personal Protective Equipment

9.4.1 Clothing. See A9.4.1 of the Appendix.

9.4.2 Eye and Face Protection. Eye and Face Protection, in accordance with American National Standard Practice for Occupational and Educational Eye and Face Protection, Z87.1-1968, shall be provided where there is a reasonable probability of injury that can be prevented by such protection. In such cases, employers or educational authorities shall make conveniently available suitable protectors (devices), and employees or students shall use such protectors.

9.5 Occupational Noise Exposure. Protection against the effects of noise exposure shall be provided when the sound levels exceed the latest state or federal regulations or both and any American National Standards pertaining to noise requirements.

9.6 Respiratory Protection. (See Section 7 of American National Standard Practices for Respiratory Protection, Z88.2-1969.) In the control of those occupational diseases caused by breathing air contaminated with harmful dust, fogs, fumes, mists, gases, sprays, or vapors, the primary object shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements:

(1) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee.

(2) The employer shall provide the respirators which are applicable and suitable for the purpose intended.

(3) Three shall be regular inspection and evaluation to determine the continued effectiveness of the program.

9.7 Selection and Training of Operators. Before a workman is permitted to operate any woodworking machine, he shall receive instructions in the hazards of the machine and the safe method of its operation. Refer to A9.7 of the Appendix.

10. Revision of American National Standards Referred to in This Document

When the standards referred to in this document are superseded by a revision approved by the American National Standards Institute, the revision shall apply.
Appendix

(The Appendix is not a part of American National Standard Safety Requirements for Woodworking Machinery, 01.1-1971, but is included for information purposes only.)

The sections and subsections of this Appendix are numbered to correspond with those of the standard. Since appendix material has not been provided for every item of the standard, the numbering of this Appendix is nonconsecutive.

A3. Definitions

Push blocks should be at least 3/8-inch thick, if made of hardwood, or 3/4-inch thick, if made of softwood. Wherever space permits, the block should be at least 10 inches by 6 inches so as to give protection to the hand pushing down on the work.

A4.1 Machine Layout

Operator Space. In order to give each operator sufficient space in which to handle the material with the least possible interference from or to other workmen or machines, it is suggested that the following conditions be maintained:

1) For rip and crosscut bench or table saws, the minimum distance or clearance on each working side of the saw table should be equal to three feet more than the longest material handled.

In a production shop which uses jigs and fixtures, definite space either at the saw or in a storeroom should be provided for storing these fixtures.

It is also important in the location of a rip saw to be sure that no other employee is regularly working in line with the saw where he might be hit by material in case of a kickback. If it is necessary to locate a machine in such a position, a heavy metal or plank barricade should be erected to protect the workman.

2) For band saws, the minimum distance or clearance on three sides of the table should be equal to a circle with the point of operation of the saw blade as a center and a radius equal to twice the diameter of the band wheels.

3) For jointers, the minimum distance or clearance should be at least three feet greater than the length of the longest material worked on the machine.

4) For shapers, the minimum distance or clearance should be at least three feet greater than the length dimension of the material worked on the machine. It is vitally important to both safety and production to protect shaper operators from interference. To this end, shaper machines should be so set that the operator faces the aisle and is protected at the back by a partition or railing.

Lighting. Proper lighting is of vital importance. It is a widespread belief among men experienced in accident-prevention work that improper lighting is a factor in perhaps 25 percent of all avoidable accidents in the country. Too much light is often as bad as insufficient illumination.

American National Standard Practice for Industrial Lighting, A11.1-1965 (R1970), gives values of intensities. It is also important that proper attention be given to the maintenance of all lighting equipment, for example, cleaning and adjustment of reflectors. Dust accumulated on the lamp bulbs quickly cuts down the intensity of the light. Makeshift reflectors, or those whose adjustment has been impaired, have a tendency to spoil the efficiency of any carefully worked out lighting system. Recent investigations indicate that the color of ceilings, walls, floors, and equipment has a definite bearing on the absorption of light and the amount of energy required for the seeing task. In general, it is suggested that preference be given to colors which absorb less light and that important or dangerous parts of equipment be in a contrasting color in order that they will be seen easily.

A4.2.2 Nonslip Floors. Suggestions for treatment of smooth slippery floors about woodworking machines:

1) Paint the floor with glue or paint and throw on sharp sand or abrasive grains and, after the glue or paint has set, remove the material which does not adhere.

2) Some manufacturers now make a paint which includes an abrasive, making it nonslip.

3) If a nonslip platform, mat, or other nonslip material is placed about the machine, the edges should be beveled to not more than 1/8-inch high at the point or edge of the bevel, or the floor should be recessed so that the material will be flush with the floor. Excellent maintenance to avoid tripping hazards is essential.

4) Wood chips and sawdust, particularly on top of a wooden floor, may in themselves cause a slipping or a tripping hazard. The continued rubbing or sliding of chips and sawdust over a wooden floor may also cause the floor itself to become very smooth and slippery. It is therefore important that provisions should be made for collecting chips or sawdust so that they will not get on the floor, or the floors should be thoroughly cleaned at frequent periods.

A5.1 Machine Construction, Drive, Feed, Speed, and Control. In order to attain the safest and most efficient
operation, the proper type of saw blade should be used for plastics, plywood, and synthetic boards.

A5.1.1 Machine Construction. For maximum efficiency, it is recommended that for operators of average stature, the height of the table or point of operation above the floor for various machines be approximately as shown in Table A1.

Whenever machines are used by persons of other than average stature, suitable adjustments should be made in the heights specified in Table A1.

### Table A1

**Recommended Above-Floor Height for Table or Point of Operation**

<table>
<thead>
<tr>
<th>Machine</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circular Saws (band fed)</td>
<td>36 inches</td>
</tr>
<tr>
<td>Circular Saws (power fed)</td>
<td>32 inches</td>
</tr>
<tr>
<td>Band Saws</td>
<td>46 inches</td>
</tr>
<tr>
<td>Shapers</td>
<td>36 inches</td>
</tr>
<tr>
<td>Jointers</td>
<td>33 inches</td>
</tr>
<tr>
<td>Lathes</td>
<td>41 inches</td>
</tr>
<tr>
<td>Sanders</td>
<td>36 inches</td>
</tr>
<tr>
<td>Radial Arm Saws</td>
<td>39 inches</td>
</tr>
</tbody>
</table>

NOTE: Heights are recommended by the following:


A5.1.5 Speeds. In the absence of specifications by the saw blade manufacturer, Table A2 shows revolutions per minute for various speeds of saws when the peripheral speed is 12,000 feet per minute.

### Table A2

**Saw Speeds at 12,000 Peripheral ft/min**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>r/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 inches</td>
<td>5729</td>
</tr>
<tr>
<td>9 inches</td>
<td>5093</td>
</tr>
<tr>
<td>10 inches</td>
<td>4584</td>
</tr>
<tr>
<td>12 inches</td>
<td>3820</td>
</tr>
<tr>
<td>14 inches</td>
<td>3374</td>
</tr>
<tr>
<td>16 inches</td>
<td>2863</td>
</tr>
<tr>
<td>18 inches</td>
<td>2546</td>
</tr>
<tr>
<td>20 inches</td>
<td>2292</td>
</tr>
<tr>
<td>22 inches</td>
<td>2083</td>
</tr>
<tr>
<td>24 inches</td>
<td>1910</td>
</tr>
<tr>
<td>26 inches</td>
<td>1763</td>
</tr>
<tr>
<td>28 inches</td>
<td>1637</td>
</tr>
<tr>
<td>30 inches</td>
<td>1528</td>
</tr>
</tbody>
</table>

A6.1.2 Hand-Fed Rip Saws

Circular-Saw Hood Mountings. Saws are used for many operations that it is doubtful if any one type of mounting will fit all possible conditions. For efficiency and serviceability of the guard, mountings are recommended in the following order:

1. Hood mounted on spreader attached to throat piece (throat piece should be locked in position)
2. Other spreaders attached to frame, carriage or table
3. Arm mounting attached to table or frame
4. Ceiling, side-suspension, or floor-stand mountings should be used only when other types of mounting are impractical

Discussion of Mountings

1. If the hood is mounted on spreader, it can be used even if material being cut extends beyond the sides of the saw table, but this mounting is not practical for grooving, dadoing, or rabbing operations.
2. If the hood is mounted on an arm attached to the side of the table, it can be used on most grooving, dadoing and rabbing operations, but this arm will restrict the size of work that can be cut on that side of the table.
3. The design and quality of material used will also affect the amount of supervision needed to be sure that the guards are properly used. Attachments should be such that it is easy to attach the mounting the right way or in the right position, but, at the same time, difficult or impossible to attach it the wrong way or out of line with the saw. If counterweights are used to make it easier for the workman to lift the hood, then extra supervision may be required to see that the counterweight is not altered or adjusted to keep the hood in a raised position at all times.
4. It will be an added advantage in some operations if the hood and mounting can be designed so that the hood will prevent the material being cut from being raised off the table by the upward force of the saw in case of pinching or binding before material reaches the spreader.
5. For tilting-arbor or tilting-table saws, the hood should be mounted on the saw frame or carriage so that the hood will remain in line with the saw when the saw or table is tilted at an angle.
6. For multiple saws such as equalizer saws, hoods should be mounted so that they will be adjusted to true alignment with the saw whenever the location of the saw is changed. When these machines are provided with individual motors for each saw, the hood should be mounted to the same frame as the motor so that it will automatically move with each new location of the saw.

Circular-Saw Spreaders. Each spreader should be so shaped on the side toward the saw that it will follow the curve of the saw approximately and should be not
APPENDIX

less than 3 1/2 inches wide at the level of the table. In some special cases, this width cannot be obtained, but it should be not less than 2 inches.

The value of a spreader depends on its location directly behind the saw. If a saw machine is regularly used with a saw blade smaller than the maximum size permissible on the machine, serious consideration should be given to the possibility of locating the spreader within 1/2 inch of the clearance of the saw blade regularly used on the machine, even though this would require moving the spreader if the machine were to be used for the maximum size saw.

The design of the spreader mounting should provide for ease in attaching the spreader in the correct location and should make it difficult or impossible to mount the spreader in an incorrect or dangerous position.

For operations which do not permit the use of a spreader, serious consideration should be given to the use of jigs or fixtures to hold the work so that the hands of the operator are removed at least 12 inches from the point of operation. A spreader mounted on the saw arbor frame, and no higher than the saw teeth, may be used to good advantage in certain operations, such as grooving.

Circular-Saw Antikickback Devices. Kickbacks on rip saws are usually caused by one of the following:

1. Failure to provide spreader
2. Improperly conditioned saw, allowing material to pinch on saw and rise from the table
3. Improper alignment of gage or fence
4. Improperly conditioned or twisted-grain lumber
5. Improper design or mounting of antikickback devices.

Some antikickback devices are so designed as to be very effective for one thickness of material but have very little holding power when used on either much thicker or much thinner material. Other antikickback devices have very good holding power but are so located that they do not come in contact with the material when it is in position to be thrown upward by the saw. Where fingers or dogs are used as an antikickback device they should be maintained in a sharp condition.

A6.1.3 Hand-Fed Crosscut Table Saws (Including Trimmer Saws)

Filler Piece. In order to use the hood guard effectively on circular rip saws when cutting narrow strips, a filler piece should be used. This should be made of wood about 2 inches wide. It should be about 3/4 inch thick, or slightly thinner than the thickness of the material being cut. It should be provided with cleats or brackets at the ends, so that it will either fit down over the front and back ends of the table or can be quickly attached to the fence or gage.

Special consideration should be given to the use of jigs or fixtures when cutting irregular pieces or oblique angles. A special application of this principle is the jig for cutting wedges and pointing stakes.

A6.1.9 Radial Saws

Blade Coasting after Power Shutoff. It is recommended that a braking device to stop coasting or a warning signal to indicate that the blade is still in motion be provided. The practice of stopping blade rotation by placing a piece of wood against the rotating blade should be prohibited.

A6.6.1 Guarding of Cutting Heads

Shapers

1. Knife blades and collars for shaper heads should be precision ground so as to give uniform pressure on all knife blades and keep them from flying out while the machine is in motion.

2. It is recommended that collars be provided with "stop-pins" and that knife blades have a recess cut in them for the pin. Serrated collars and knives are an accepted alternate. This is an added precaution to keep the blades from flying out.

3. Attention is called to the desirability of incorporating an automatic brake in order to stop the revolving heads as soon as possible after the power is shut off.

A9.3.5 Lathes

1. Particular care should be taken to have all material fastened to faceplates or held properly between centers.

2. Work shall be performed on the lathe within the size capacity and speed ranges recommended by the manufacturer.

3. Rotate workpiece by hand to check clearance before engaging power.

4. Before performing faceplate turning, rough out workpiece to obtain rough balancing on a band saw or other machine.

A9.4 Personal Protective Equipment

9.4.1 Clothing

1. Where the wearing of gloves creates a possible hazard, they shall not be worn.

2. Long hair shall be confined.

3. Loose flowing garments, sleeves, neckties, etc., offer a decided accident hazard and shall not be worn by operators of machines.

4. Where there is a danger of kickback from any operation, antikickback aprons shall be provided and worn.

5. Where there is danger from flying or falling material, hard hats shall be provided and worn.

6. Where there is danger from materials falling on the worker's feet, safety shoes should be required.

### Table A3
Permissible Noise Exposures

<table>
<thead>
<tr>
<th>Duration per Day (Hours)</th>
<th>Sound Level (dBA)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>1-1/2</td>
<td>102</td>
</tr>
<tr>
<td>1</td>
<td>105</td>
</tr>
<tr>
<td>1/2</td>
<td>110</td>
</tr>
<tr>
<td>1/4 or less</td>
<td>115</td>
</tr>
</tbody>
</table>

*Sound level measured on the A weighting scale of a sound level meter meeting the requirements of American National Standard S1.4-1971.

When employees are subjected to sound exceeding those limits in Table A3, feasible administrative or engineering controls shall be utilized.

If such controls fail to reduce sound levels within the levels of Table A3, personal protective equipment shall be provided and used to reduce sound levels within the levels of Table A3.

In all cases where the sound levels exceed the values shown in Table A3, a continuing, effective hearing conservation program shall be administered.

A9.7 Selection and Training of Operators

Operation of Machines, Tools, and Equipment—General

1. Learn the machine’s applications and limitations, as well as the specific potential hazards peculiar to this machine. Follow available operating instructions and safety rules carefully.
2. Keep working area clean and be sure adequate lighting is available.
3. Do not wear loose clothing, gloves, bracelets, necklaces, or ornaments. Wear face, eye, ear, respiratory, and body protection devices, as indicated for the operation or environment.
4. Do not use cutting tools larger or heavier than the machine is designed to accommodate. Never operate a cutting tool at greater speed than recommended.
5. Keep hands well away from sawblades and other cutting tools. Use a push stock or push block to hold or guide the work when working close to cutting tool.
6. Whenever possible, use properly locked clamps, jig, or vise to hold the work.
7. Combs (feather boards) shall be provided for use when an applicable guard cannot be used.
8. Never stand directly in line with a horizontally rotating cutting tool. This is particularly true when first starting a new tool, or a new tool is initially installed on the arbor.
9. Be sure the power is disconnected from the machine before tools are serviced.
10. Never leave the machine with the power on.
11. Be positive that hold-downs and antikickback devices are positioned properly, and that the work piece is being fed through the cutting tool in the right direction.
12. Do not use a dull, gummy, bent, or cracked cutting tool.
13. Be sure that keys and adjusting wrenches have been removed before turning power on.
14. Use only accessories designed for the machine.
15. Adjust the machine for minimum exposure of cutting tool necessary to perform the operation.
American National Standards

The standard in this booklet is one of nearly 4,000 standards approved to date by the American National Standards Institute, formerly the USA Standards Institute.

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