

STATE OF NEW JERSEY
DEPARTMENT OF LABOR & INDUSTRY
~~XXXXXXXXXX~~, Commissioner
Percy A. Miller, Jr.

ACCIDENT PREVENTION STANDARD
RULES AND REGULATIONS
governing the safe installation, operation and maintenance of
WOODWORKING MACHINERY

BUREAU OF ENGINEERING AND SAFETY
C. GEORGE KRUEGER, Deputy Director

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FOREWORD

The last revision of the safety code for woodworking plants, approved in 1934, was applicable to wood-working plants only. It will be noted that the present revision includes any place of employment where wood-working machinery is located.

With regard to the prime consideration of safety to the life and limb of operatives on woodworking machinery requiring hoods for the guarding of cutting heads which contain revolving knife blades such as tenoners, planers, molders, matchers, profile and swing-head lathes, it is felt that adequate protection is provided to anyone who might fall against or come in contact with such a guard.

However, the question of the adequacy of such hoods holding or retaining a broken or loose knife blade which could fly out of the head with the machine in motion has not been determined. An adequate answer will be available only after continued research on hood design has been undertaken and analyzed.

These rules and regulations are an adaptation of American Standard Safety Code for Woodworking Machinery, approved February 25, 1944 and after careful review and study by the sub-committee on Codes, Rules and Regulations they were recommended for acceptance by the Commissioner by the New Jersey State Industrial Safety Committee at a regular meeting held in Newark, N. J. on June 1, 1949. They have been promulgated by the authority of the Commissioner of Labor and Industry as set forth in Revised Statutes 34:1-20, and become effective upon filing a copy thereof in the office of the Secretary of State as required by law. Certification by the Secretary of State, dated February 2, 1950, to this effect is on file in the office of the Deputy Director.

1.1 *Purpose* - The purpose of these rules and regulations is to provide reasonable safety to life and limb to workers employed on woodworking machinery.

1.2 *Scope* - These rules and regulations govern the safe installation, operation and maintenance of woodworking machinery, including cooperage operations and the making of veneer and deal primarily with point of operation hazards of woodworking machinery.

1.3 *Exceptions* - In the case of practical difficulty or unnecessary hardship, the Commissioner may grant exceptions from these rules and regulations provided that a request for such exceptions has been made in writing to the Deputy Director of the Division. Exceptions can only be granted where it is clearly evident that satisfactory safety is achieved but cannot be granted in any case where conflict would be created with mandatory requirements of the law.

1.4 These rules and regulations are supplemented by other existing rules, regulations and codes, such as:-

Safety Code for the Safeguarding of Mechanical Power Transmission Apparatus.

Rules and regulations governing sanitation, ventilation and lighting in places of employment.

1.5 *Definitions*

1.5.1 - *Commissioner* - the Commissioner of Labor and Industry of the State of New Jersey or his authorized representative.

1.5.2 - *Approved* - approved by the Commissioner.

1.5.3 - *Bureau* - Bureau of Engineering and Safety of the Department.

1.5.4 - *Block* - A short block of wood provided with a handle similar to that of a plane and having a shoulder at the rear end and used for pushing short stock over revolving cutters.

1.5.5 - *Point of Operations* - that point at which cutting, shaping, boring, or forming is accomplished upon the stock.

1.5.6 - *Push Stick* - a narrow strip of wood or other soft material with a notch cut into one end and used to push short pieces of material through saws.

1.5.7 - *Shall* - the word "shall" is mandatory.

1.5.8 - *Should* - where used is indicative of a practice recommended by the bureau.

2. PLANT LAYOUT

2.1 *Machinery*

2.1.1 *Machine layout*

2.1.1.1 Machines shall be so located that there will be sufficient space in which to handle the material with the least possible interference from or to workmen or machines.

2.1.1.2 Machines should be so placed that it will not be necessary for anyone to stand in or so near an aisle as to be liable to hazard.

2.1.1.3 Woodworking machinery shall be firmly secured by its own weight or fastened to substantial floors or foundations.* Small units, except portable hand tools, shall be secured to benches, tables, or stands of adequate strength and so designed as to prevent overturning or unintentional movement.

2.1.1.4 Machines shall be so located, with respect to sources of both natural and artificial light, 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 including moving shadows shall be avoided.

Note: For specific requirements see rules and regulations governing lighting in places of employment.

2.1.1.5 Provision shall be made for the removal of shavings and dust and all such materials shall be removed in an approved manner.

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

Note: For specific requirements, see rules and regulations for the installation of blowers and exhaust systems for such materials.

2.2 Floors and Aisles

2.2.1 Floors Kept Repaired. All floors shall be kept in good repair and shall be free from protruding nails, splinters, holes, unevenness, and loose boards.

2.2.2 Non-slip Floors. Floors in the working area about all woodworking machines should be provided with effective means to prevent slipping.

2.2.3 Aisles. Aisles for one-way traffic shall be not less than the width of the widest vehicles or load plus 3 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 3 feet. Lines shall be painted on the floor or some similar method shall be employed to mark aisleways.

3. MACHINES AND EQUIPMENT

3.1 Machine Construction, Drive, Feed, Speed, and Control

3.1.1 Machine Construction

(a) The height of the table or working surface of each machine shall be designed to provide the best efficiency and least amount of fatigue for the operator.

(b) Each machine shall be so constructed as to be free from sensible vibration when the largest size tool is mounted and run idle at full speed.

(c) Arbors and mandrels shall be constructed so as to have firm and secure bearing and be free from radial play.

(d) The use of wooden band-saw wheels other than those of approved manufacture shall be prohibited.

(e) Oscillating saws (automatic cut-off machines where two or more saw arbors are rotated about each other continuously) shall not be used.

(f) Saw frames or tables shall be constructed with lugs cast on the front of the frame or with an equivalent means to limit the size of saw that can be mounted, so as to avoid overspeed due to mounting a saw larger than intended.

(g) Rip saw gauges or fences shall be so constructed that they can be positively secured to the table without changing their alignment with the saw.

(h) Crosscut saw gauges or fences shall be so constructed as to slide in grooves or tracks that are accurately machined to insure exact alignment with the saw for all positions of the guide.

(i) Hinged saw tables shall be so constructed that the table can be positively secured in any position and in true alignment with the saw.

(j) All belts, pulleys, gears, shafts, and moving parts shall be guarded in accordance with specific requirements of existing Department of Labor and Industry rules and regulations.

(k) Proper flanges shall be provided for mounting saws and shall be of equal size so that pressure will be the same at all points

3.1.2 Machine Drive. Driving power for woodworking machinery should be direct-connected individual motors.

3.1.3 Machine Control

(a) A mechanical or electrical power control shall be provided on each machine which will make it possible for the operator to cut off the power from each machine without leaving his position at the point of operation. Starting button shall be of the type to prevent starting on accidental contact.

(b) On machines driven by belts and shafting a locking-type belt shifter or an equivalent positive device shall be used.

3.1.4 Self Feed. Automatic feeding devices on machines should be installed wherever the nature of the work will permit.

3.1.5 Circular saws under load shall not be operated at peripheral speeds less than 8,000 feet per minute, nor in excess of the recommended speed of the saw manufacturer. (See General Information for table of revolutions per minute of various sizes of saws to produce 10,000 peripheral feet per minute).

3.1.6 On all circular sawing machines operating at 3600 RPM or higher the maximum diameter saw shall be 18". The saw shall be of proper gage for the work and shall be tensioned by the manufacturers or a reliable saw fitter for the speed at which it is intended to run and these facts shall be stamped or etched, or both, on the saw blade.

4. WOODWORKING MACHINERY

4.1 Circular, Rip, Crosscut, Resaw, and Swing Cut-Off Saws.

Note: The standards given herein for saw guards are not applicable to all operations for which saws are used. The use of other devices affording adequate protection may be approved upon written application to the Deputy Director.

4.1.1 Guarding of Saws Beneath and Behind Tables. For all circular saws where conditions are such that there is a possibility of contact with the portion of the saw either beneath or behind the table, that portion of the saw shall be covered with an exhaust hood, or an approved guard shall be so arranged as to prevent accidental contact with the saw.

4.1.2 Hand-Fed Rip Saws

4.1.2.1 Hoods

4.1.2.1.1 Each circular hand-fed rip saw shall be guarded by a hood which shall completely enclose that portion of the saw above the table, and that portion of the saw above the material being cut. The hood and mounting shall be so arranged that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut, but it shall not offer any considerable resistance to insertion of material to saw or of passage of material being sawed. The hood shall be made of adequate strength to resist blows and strains incidental to reasonable operation, adjusting, and handling, and shall be so designed as to protect the operator from flying splinters and broken saw teeth. It shall be made of material that is soft enough to be unlikely to cause tooth breakage. The material should not shatter when broken, should be non-explosive, and should be no more flammable than wood. The hood shall be made that the operator can see his line of cut when he is in proper position to feed the saw.

4.1.2.1.2 The hood shall be so mounted as to insure its operation to be positive, reliable, and in true alignment with the saw; and the mounting shall be adequate in strength to resist any reasonable side thrust or other forces tending to throw it out of line.

4.1.2.2 Spreaders

4.1.2.2.1 Each hand-fed circular rip saw shall be furnished with a spreader to prevent material from squeezing the saw or being thrown back on the operator. The spreader shall be made of saw steel or tool steel, or its equivalent. 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 so attached as to remain in true alignment with the saw even when either the saw or table is tilted and should be so placed that there is not more than $\frac{1}{2}$ inch space between the spreader and the back of the saw measured at the diameter when the largest saw is mounted in the machine.

4.1.2.2.2 The provision of a spreader in connection with grooving, dadoing, or rabbeting is not required. On the completion of such operations, the spreader shall be immediately replaced.

4.1.2.3 Non-Kickback Fingers or Dogs.

4.1.2.3.1 Each hand-fed circular rip saw shall be provided with one or more non-kickback fingers or dogs mounted and so located as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator. They shall be designed to provide adequate holding power for all thicknesses of materials being cut.

4.1.3 *Hand-Fed Crosscut Table Saws (Including Trimmer Saws).*

4.1.3.1 Each circular crosscut table saw shall be guarded by a hood which shall meet all the requirements of 4.1.2.1 for hoods for circular rip saws.

4.1.3.2 Each circular crosscut saw should also be provided with a spreader which should meet all the requirements of 4.1.2.2.

4.1.3.3 Hoods for trimmer saws with the mechanical feed should remain in contact with the material being cut but this is not mandatory.

4.1.4 *Revolving Double Arbor Saws.* Revolving double arbor saws shall be fully guarded in accordance with all the requirements for circular crosscut saws or with all the requirements for circular rip saws according to the kind of saws that are mounted on the arbors.

4.1.5 *Circular Resaws*

4.1.5.1 Each circular resaw shall be guarded by a standard hood or shield above the saw. Such hood or shield shall be so designed as to guard against danger from flying splinters or broken saw teeth.

4.1.5.2 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.

4.1.6 *Self-Feed Circular Saws*

4.1.6.1 Hoods. Feed rolls and saws shall be protected by a hood or by semicylindrical guards to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be constructed of heavy material, preferably metal, and 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.

4.1.6.2 Non-Kickback Fingers. Each self-feed circular rip saw shall be provided with sectional non-kickback fingers for the full width of the feed rolls. They shall be located in front of the saw.

4.1.7 *Swing Cut-Off Saws.* The requirements of 4.1.7 are also applicable to sliding cut-off saws mounted above the table.

4.1.7.1 *Hood.*

4.1.7.1.1 Each swing cut-off saw shall be provided with a hood that will completely enclose the upper half of the saw, the arbor end, and the point of operation at all positions of the saw. The hood shall be constructed in such a manner and of such material that it will protect the operator from flying splinters and broken saw teeth and will afford the operator a clear view of the cutting edge of the saw at all times. Automatic means shall be provided to prevent rebounds.

4.1.7.2 *Counterweights.* Each swing cut-off shall be provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel. Such device shall not depend for its proper functioning upon any rope, cord, or spring. If there is a counterweight, the bolts supporting the bar and counterweight shall be provided with cotter pins; and the counterweight shall be prevented from dropping by either a bolt passing through both the bar and counterweight, or a bolt put through the extreme end of the bar, or, where the counterweight does not encircle the bar, a safety chain attached to it.

4.1.7.3 *Limit Stops.* Limit chains or other equally effective devices shall be provided to prevent the saw from swinging beyond the front or back edges of the table, or beyond a forward position where the gullets of the lowest saw teeth will rise above the table.

4.1.8 *Inverted Swing Cut-Off Saws (Jump Saws)* Inverted swing cut-off saws shall be provided with a hood that will cover the part of the saw that protrudes above the top of the table or above the material being cut. It shall automatically adjust itself to the thickness of and remain in contact with the material being cut.

4.1.9 *Portable Circular Saws.* All portable, power-driven saws shall be equipped with guards which will automatically adjust themselves to the work when in use, so that none of the teeth are exposed to contact above the work; and when withdrawn from the work, the guard shall completely cover the saw to the depth of the teeth. A spreader shall be an integral part of all such saws.

4.2 *Band Saws, Band Resaws and Band Ripsaws.*

4.2.1 *Enclosing Band Saw Blades.*

4.2.1.1 All portions of the saw blade shall be enclosed or guarded, except the working side of the blade between the guide rolls and the table. Bandsaw wheels shall be fully encased.

4.2.1.2 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 either enclose the saw blade or protect the saw at the front and both sides. This portion of the guard shall be designed to raise and lower with the guide.

4.2.1.3 The upper wheel guard shall be made to conform to the periphery of the wheel and the top member of the guard should have at least a 2-inch clearance outside the wheel and be lined with smooth material, preferably metal.

4.2.2 *Automatic Tension.* Each band-saw machine should be provided with an automatic tension control device to prevent breakage of saw blades due to improper tension.

4.2.3 *Feed Rolls.* Feed rolls of band resaws shall be protected with a semicylindrical guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be constructed of heavy material, preferably metal, and 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.

4.3 *Jointers*

4.3.1 *Point of Operation.* Each hand-fed planer and jointer with horizontal head shall be equipped with a cylindrical cutting head, the throat of which shall not exceed 7/16 inch in depth nor 5/8 inch in width. It is strongly recommended that no cylinder be used in which the throat exceeds 3/8 inch in depth or 1/2 inch in width.

4.3.2 *Automatic Guards*

4.3.2.1 Each hand-fed jointer with a horizontal cutting head shall have an automatic guard which will cover all the section of the head on the working side of the fence or gauge. The guard shall automatically adjust horizontally, for edge jointing and vertically for surface work, and shall remain in contact with the material at all times.

4.3.2.2 Each hand-fed jointer with horizontal cutting head shall have a guard which will cover the section of the head back of the gauge or fence.

4.3.3 *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 a slot of such width as may be necessary and convenient for the application of the material to be jointed.

4.4 *Single and Double End Tenoning Machines and End Matchers*

4.4.1 *Guarding of Cutting Heads*

4.4.1.1 Each tenoning machine shall have all cutting heads, and saws if used, covered by metal guards. These guards shall cover at least the unused part of the periphery of the cutting head. If such guard is constructed of sheet metal, the material used shall be not less than 1/16 inch in thickness and if cast iron is used, it shall be not less than 3/16 inch in thickness.

Note: It is not contemplated that the above hoods will retain a thrown or broken knife.

4.4.1.2 Where an exhaust system is used, the guard shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than the above.

4.4.2 *Feed Chains and Sprockets*

4.4.2.1 Feed chains and sprockets of all double and tenoning machines shall be completely enclosed, except that portion of chain used for conveying the stock.

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

4.4.2.3 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.

4.4.3 *Hand-Fed Tenoners.* Hand-fed tenoning machines should be provided with a clamping or "hold-down" device to help the operator to hold the material being cut.

4.5 *Boring and Mortising Machines*

4.5.1 *Chucks.* Safety-bit chucks with no projecting set screws shall be used.

4.5.2 *Boring Bits.* Boring bits shall be provided with a guard that will enclose all portions of the bit and chuck above the material being worked.

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

4.5.4 *Counterweights.* If there is a counterweight, one of the following or equivalent means shall be used to prevent its dropping:

4.5.4.1 It shall be bolted to the bar by means of a bolt passing through both bar and counterweight;

4.5.4.2 A bolt shall be put through the extreme end of the bar;

4.5.4.3 Where the counterweight does not encircle the bar, a safety chain shall be attached to it;

4.5.4.4 Other types of counterweights shall be suspended by chain or wire rope and shall travel in a pipe or other suitable enclosure designed to retain the weight.

4.5.5 *Universal Joints.* Universal joints on spindles of boring machines shall be completely enclosed to prevent injury to operator.

4.5.6 *Guarding Operating Treadles.* Each operating treadle shall be covered by an inverted U-shaped metal guard, fastened to the floor or machine base, of adequate size and strength to prevent accidental tripping of treadle.

4.6 *Wood Shapers, including Hand and Automatic Feed Shapers*

4.6.1 *Guarding of Cutting Heads*

4.6.1.1 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 keep the operator's hands away from the cutting edge. The diameter of circular shaper guards shall be not less than the greatest diameter of the cutter. In no case shall a warning device of leather or other material attached to the spindle be acceptable.

4.6.1.2 Cylindrical heads should be used wherever the nature of the work will permit. Templates, jigs, and fixtures which will remove the operator's hands from the point of operation should be used wherever the nature of the work will permit. It is recommended that set-ups should be designed with the work on the table and the form or pattern on top of the work.

4.6.2 *Spindle Starting and Stopping Devices.* All double-spindle shapers shall be provided with a separate starting and stopping device for each spindle.

4.7 *Planing, Molding, Sticking, and Matching Machines, etc.*

4.7.1 *Guarding of Cutting Heads*

4.7.1.1 Each planing, molding, sticking, and matching machine shall have all cutting heads, and saws if used, covered by a metal guard. If such guard is constructed of sheet metal, the material used shall be not less than 1/16 inch in thickness; and if cast iron is used, it shall be not less than 3/16 inch in thickness.

Note: It is not contemplated that the above hoods will retain a thrown or broken knife.

4.7.1.2 Guards shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than the above.

4.7.2 Feed Rolls

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4.7.2.1 Feed rolls shall be guarded by a hood or a semicylindrical guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be fastened to the frame carrying the rolls so as to remain in adjustment for any thickness of stock.

4.7.2.2 Sectional in-feed top rolls shall be provided for planers.

4.7.2.3 Where solid feed rolls are used, the sectional finger devices shall be used to prevent kickbacks.

4.8 Profile and Swing-Head Lathes (including Wood Heel Turning Machines)

4.8.1 Guarding of Cutting Heads

4.8.1.1 Each profile and swing-head lathe shall have all cutting heads covered by a metal guard. If such guard is constructed of sheet metal, the material used shall be not less than 1/16 inch in thickness; and if cast iron is used, it shall not be less than 3/16 inch in thickness. The cutter head guard shall be designed so that the cutter head is covered during the loading and unloading of the work in the work centers.

Note: It is not contemplated that the above hoods will retain a thrown or broken knife.

4.8.1.2 Guards shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than the above.

4.9 Sanding Machines

4.9.1 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 in-running rolls at any point. The guard shall be constructed of heavy material, preferably metal, and firmly secured to the frame carrying the rolls so as 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.

4.9.2 Drum Sanding Machines. Each drum sanding machine shall have an exhaust hood or other guard so arranged as to enclose the revolving drum, except such portion of the drum above the table, if table is used, as may be necessary and convenient for the application of the material to be finished.

4.9.3 Disk Sanding Machines. Each disk sanding machine shall have the exhaust hood or other guard if no exhaust system is required, so arranged as to enclose the revolving disk, except such portion of the disk above the table, if table is used, as may be necessary for the application of the material to be finished. The clearance between the disk and table should not exceed 1/16 inch.

4.9.4 Belt Sanding Machines. Each belt sanding machine shall have both pulleys enclosed in such a manner as to guard the points where the sanding belt runs onto the pulleys. The unused run of the sanding belt shall be enclosed.

4.10 Miscellaneous Machines

4.10.1 Combination of Universal Woodworking Machines. For combination or universal woodworking machines each point of operation of any tool shall be guarded as required for such tool in a separate machine. Such machines shall be provided with a separate stopping and starting device for each point of operation.

4.10.2 Other Machine not Excluded. The mention of specific machines in 4.1 to 4.9 inclusive is not intended to exclude other woodworking machines from the requirements that suitable guards and exhaust hoods must be provided to reduce to a minimum the hazard due to the point of operation of such machines.

5. VENEER MACHINERY

5.1 Steaming Equipment and Soaking Pits

5.1.1 Steam Vats and Soaking Pits

5.1.1.1 Sides of steam vats shall extend to a height of not less than 36 inches above the floor, working platform, or ground.

5.1.1.2 Large steam vats divided into sections shall be provided with substantial walkways between sections. Each walkway shall be provided with a standard hand-rail on each exposed side. These hand-rails may be removable, if necessary.

Note: Provided the size of stock handled will permit, the size of the vat sections should not exceed 8 feet.

5.1.2 *Loading and Unloading.* One or more of the following means shall be used in loading and unloading vats and soaking pits:

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

5.1.2.2 The employee shall be provided with a safety belt attached to a life line. The life line shall be attached to a traveling trolley on a monorail or to a fixed anchorage or similar arrangement. The life line shall be permanently adjusted so that the employee, in the event of slipping, falling, or tripping cannot fall into the vat.

5.1.2.3 Mechanical handling or conveying equipment shall be provided and so designed that the logs are removed without requiring assistance from an employee at the edge of the vat.

5.1.2.4 Hydraulic equipment shall be provided for draining the liquid from the vat. 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.

5.1.3 *Ventilation.*

5.1.3.1 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.

5.1.3.2 Means shall be provided to ventilate 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.

5.2 *Log Handling Equipment*

5.2.1 *Cranes, Log Trolleys, etc.* All gears, sprockets, and other dangerous parts shall be enclosed with standard guards

Note: Except where the stock handled is very small, log trolleys or cranes should be used.

5.3 *Saws*

5.3.1 *Drag and Chain Saws.* Drag and Chain Saws shall be so located as to give at least a 4-foot clearance for passage when saw is at extreme end of stroke; or if such clearance is not obtainable, the saw and its driving mechanism shall be provided with a standard enclosure.

5.4 *Veneer Cutters and Wringers*

5.4.1 *Veneer Slicer and Rotary Veneer-Cutting Machines.* Guards should be provided to prevent accidental contact with knife edge.

5.4.2 *Veneer Clippers*

5.4.2.1 Veneer clippers shall have automatic feed or shall be provided with a guard which will make it impossible to place a finger or fingers under the knife while feeding stock.

5.4.2.2 Sprockets on chain or flat-belt conveyors shall be enclosed.

Note: Conveyors or traveling tables should be installed to remove material from clippers.

5.4.3 *Veneer Wringers.* In-running side of veneer wringer shall be enclosed, leaving only sufficient space to insert stock but not enough to permit fingers to enter the rolls.

5.4.4 *Operating Levers or Treadles.* Operating levers or treadles on all veneer machinery shall be so located or protected that they cannot be shifted or tripped accidentally.

6. COOPERAGE MACHINERY

6.1 *Saws*

6.1.1 *Heading Bolters*

6.1.1.1 Each heading bolter shall have the saw enclosed to prevent accidental contact. A hood shall be fastened to the back of block carrier to cover that portion of the saw which cannot be enclosed by a stationary housing.

6.1.1.2 The block carrier shall be provided with an effective device that will return the carrier automatically to a position in front of the saw. Such device shall not depend for its proper functioning upon any rope, cord, or spring. If a counterweight is used, a safety chain shall be attached to it to prevent dropping should the bar break or the weight become disengaged. All bolts supporting the bar, weight, and chain shall be provided with cotter pins or equally effective devices. A bolt shall be put through extreme end of counterweight bar to prevent dropping of weight.

6.1.1.3 A limit stop shall be provided to prevent the carrier from swinging too far back and thereby exposing to contact the unguarded portion of the saw.

6.1.2 *Swing Out-Off Saws.* For rules covering this equipment see 4.1.7

6.1.3 *Bolt, Stave, and Heading Equalizers.* Each bolt, stave, and heading equalizer shall have the saws guarded in accordance with the provisions of 4.1.3

6.1.4 *Barrel-Stave Saws (Cylindrical Saws).* Each machine of this type shall have the saw and the revolving part to which the saw blade is bolted enclosed to prevent accidental contact, except that part of saw immediately adjacent to the feeding device.

6.1.5 *Heading Saws, Variable-Feed Rip Saws, Flat-Stave Saws, Head Rounders, etc.*

6.1.5.1 All machines coming under this rule shall have the saws enclosed to prevent accidental contact.

6.1.5.2 Where sprocket feed device is used, it shall be enclosed in such a manner as to prevent the operators' fingers from getting between the feed sprocket and the stock.

6.1.5.3 Counterweights used to actuate feed shall operate in a stationary casing, designed to retain the weight.

6.2 *Single and Double-Stave Planers, Single and Double Heading Planers.*

6.2.1 *Guarding of Cutting Heads.* The exhaust hood or other guards shall be so arranged and maintained as to guard effectively all cutting heads and knives of single and double planers.

6.2.2 *Point of Operation*

6.2.2.1 Feed rolls, except such portion as may be necessary to admit stock, shall be completely enclosed. Sectional feed rolls should be provided for heading planers.

6.2.2.2 Where solid feed rolls are in use, a sectional finger device (or an equally effective safeguard) shall be used to prevent kickbacks.

6.3 *Stave and Heading Jointers (Matchers)*

6.3.1 *Guarding.* Each stave or heading jointer shall have an adjustable or automatic guard to cover all of the head except that portion where the stock is applied.

6.3.2 *Foot-Power Machines.* Foot-power machines for jointing staves shall be equipped with a guard which prevents the operators' fingers from coming in contact with the knife.

6.4 *Stave Croziers*

6.4.1 *Guarding.* The cutting heads shall be encased except that part which actually embeds itself in the stock.

6.4.2 *Feed Chains.* The feed chains and sprockets of stave croziers shall be completely enclosed.

6.4.3 *Counterweights.* A safety chain shall be attached to counterweights to prevent dropping should the counterweight bar break or the weight become disengaged. All bolts supporting the bar, weight, and chain shall be provided with cotterpins or other equally effective devices. A bolt shall be put through extreme end of counterweight rod to prevent dropping of weight.

6.5 *Barrel Sanding Machines*

6.5.1 *Sanding Belts.* Each belt sanding machine shall have both pulleys enclosed in such a manner as to guard the points where the sanding belt runs onto the pulley. The edges of the unused run of the sanding belts shall be enclosed.

6.6 *Power Windlass for Barrels*

6.6.1 *Counterweights.* Counterweights shall operate in a stationary casing, designed to retain the weight.

6.6.2 *Control Levers.* Control Levers shall be located within easy reach of the operator when standing in the usual operation position.

6.7 *Pail and Barrel Lathes*

6.7.1 *Guards.* The requirements of 4.8 for profile lathes, insofar as they are applicable, shall govern the guarding of pail and barrel lathes.

6.8 *Miscellaneous Cooperage Machinery.*

6.8.1 *Other Machines Not excluded.* The mention of specific machines under 6.1 to 6.7 inclusive, is not intended to exclude other woodworking machines from the requirements that safeguards be provided to reduce to a minimum the hazard due to the point of operation of such machines.

7. OPERATING RULES

7.1 *Inspection and Maintenance.*

7.1.1 *Inspection.* Emphasis is placed upon the importance of maintaining systematic inspection of all wood-working machines and safety equipment to insure the discovery of developing defects and permit their prompt correction.

7.1.2 *Maintenance*

7.1.2.1 Dull, badly set, improperly filed, or improperly tensioned saws shall be immediately removed from service. Saws to which gum has adhered on the sides shall be immediately cleaned.

7.1.2.2 All knives and cutting heads of woodworking machines shall be kept sharp, properly adjusted, and firmly secured. Where two or more knives are used in one head they shall be properly balanced.

7.1.2.3 Bearings shall be kept free from lost motion and shall be well lubricated.

7.1.2.4 Arbors of all circular saws shall be free from play.

7.1.2.5 Guards shall be installed wherever possible and their use enforced. If special operations require the removal of the guard, it shall be immediately replaced upon the completion of the work which required its removal. No employee shall be permitted to remove a guard or to operate the machine without the guard except with the consent of the foreman in each specific instance.

7.2 *Selection and Operation of Machines*

7.2.1 *Selection of Suitable Machines and Tools*

7.2.1.1 Machines should not be used for operation of such variety as to necessitate the removal of safeguards suitable for the usual service. The specific operations involving special hazards should be assigned to machines suitable for such work.

7.2.1.2 No saw, cutter head, or tool collar shall be placed or mounted on a machine arbor unless the tool has been accurately machined to size and shape to fit the arbor.

7.2.2 *Circular Rip and Cut-Off Saws*

7.2.2.1 No foreman or other person in charge should permit a circular rip saw to be operated with hood, spreader, or kickback device removed, or rendered inoperative, unless that nature of the operation renders it impossible of performance with such devices, or any of them, in position, in which case same shall be immediately replaced upon completion of such operation.

7.2.2.2 All cracked saws shall be removed from service.

7.2.2.3 Wobble saws shall not be permitted.

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7.2.3 *Band Saws, Band Resaws and Band Ripsaws*

7.2.3.1 Before starting a band-saw machine not equipped with a tension indicator, the blade should be tested with fingers and proper tension secured. Tension should be released from the blade when it is not in use.

7.2.3.2 The back thrust on band scroll saws using blades 2" or less in width should be adjusted carefully to the normal position of the saw blade.

7.2.3.3 To secure satisfactory operation, means should be provided for preventing the accumulation of dust on the face of band wheels.

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

7.2.3.5 Saws should not be stopped by thrusting a piece of wood against the cutting edge of teeth when power is off.

7.2.3.6 Twisted or kinked saws shall be promptly removed from operation.

7.2.3.7 To avoid vibration, brazed joints shall be the same thickness as the saw blade.

7.2.3.8 Each saw should be carefully examined as it is put on or taken off the band wheel to detect cracks or other defects. Cracked saws or saws which indicate probability of breakage should be promptly removed to avoid injury both to saw and to operator.

7.2.4 *Jointers.* The hazard of jointing too short pieces is excessive. Minimum length of piece jointed should be not less than 4 times the width of the bed opening. Neither half of the jointer table should be adjusted horizontally so that the clearance between the edge of the table and the revolving knives is more than 1/8 inch.

7.2.5 *Lathes.* Particular care should be taken to have all material fastened securely to face plates or held properly between centers.

7.3 *Veneer Machines and Equipment*

7.3.1 *Steam Vats*

7.3.1.1 Covers shall be removed only from that portion of steaming vats on which men are working and a portable railing shall be placed at this point to protect the operators.

7.3.1.2 Workmen shall not ride or step on logs in steam vats.

7.3.2 *Log Handling*

7.3.2.1 All cranes, log trolleys, and other hoisting equipment used in the veneer industry should be tested and inspected frequently.

7.3.2.2 When attaching dogs to log, care should be taken not to place hand or fingers where they might be caught between log and dog.

7.3.3 *Saws*

7.3.3.1 Particular attention should be given to inspection and maintenance of veneer saws.

7.3.3.2 Care should be taken to see that all material is securely fastened to the carriage.

7.3.4 *Veneer Cutters*

7.3.4.1 whenever veneer slicers or rotary veneer-cutting machines have been shut down for the purpose of inserting logs or to make adjustments, operators shall make sure that machine is clear and other workmen are not in a hazardous position before starting the machine.

7.3.4.2 Operators shall not ride the carriage of a veneer slicer.

7.4 *Clothing and Goggles Worn by Operators*

7.4.1 *Clothing*

7.4.1.1 Gloves should not be worn while operating machines.

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

7.4.2 *Goggles.* Where danger from dust, flying chips, etc. exists, proper eye protection shall be provided and used.

GENERAL INFORMATION

This appendix is not a part of these rules and regulations. It is included in recognition of the fact that widespread abuse and misuse of woodworking equipment exists and that this abuse and misuse is responsible for many of the accidents which have occurred for years. All discussion here is, of necessity, elementary. Certain precautions listed may seem too obvious to include in instructions either to a skilled woodworker or to the owner or manager of a woodworking shop or department. Each section below, however, is suggested by repeated accidental occurrences, indicative of widespread disregard of these elementary instructions.

The purchase and installation of no guard or mechanical device is a substitute for good practice in wood-working. In the first place, woodworking machines are used for such a variety of purposes that no single guard is of universal application. There are, however, no woodworking operations for which it is not possible to prescribe reasonably safe working practices.

A1.2.4 Push blocks or sticks should be used when required, of the proper design and made of hard wood.

A2.1.1 (a) In order for each operator to have 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) Rip and Crosscut Bench or Table Saws. The minimum distance or clearance on each working side of the saw table should be equal to 3 feet more than the longest material handled.

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 workmen.

(2) Band Saws. The minimum distance or clearance on 3 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) Jointers. The minimum distance or clearance should be at least 3 feet greater than the length of the longest material worked on the machine.

(4) Shapers. The minimum distance of clearance should be at least 3 feet greater than the longest 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.

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

(b) By locating heavy-duty machinery on the ground floor, most of the vibration due to high operating speed can be eliminated.

Undue vibration and noise caused by high-speed machinery can be a hazard to equipment, building structures and workers, may be eliminated to a large extent by cushioning the machine foundation. This can be done by inserting rubber, felt, cork, or other elastic material between the machine base and the floor beams or girders to which the machine is fastened. It must be borne in mind, however, that the bolts that hold the machine to the foundation must not pass through or touch the girders or floor beams of building. The cushioning material must be fastened to the floor beams or girders by bolts that are independent of the machine base.

(c) 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 is often as bad as insufficient illumination. Rules and regulations governing industrial lighting require compliance and contain values of minimum intensity of illumination. It is also important that proper attention is given to the maintenance of all lighting equipment, i.e., cleaning and adjustment of reflectors. Dust accumulated on the lamp bulbs quickly cuts down the intensity of the light. Make-shift 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 contrasting color in order that they will be seen easily.

(1) Hood Mounting. Saws are used for so many operations that it is doubtful if any one type of mounting will fit all possible conditions.

For efficiency and serviceability of the hood or guard, mountings are recommended as follows:

- a. Spreaders attached to frame, carriage, or table;
- b. Arm mounting attached to table or frame;

(2) Discussion of Mountings.

a. If hood or guard 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 rabbetting operations.

b. If hood or guard is mounted on an arm attached to the side of the table, it can be used on most grooving, dadoing, and rabbeting operations; but this arm will restrict the size of work that can be cut on the side of the table.

c. For tilting-arbor or tilting-table saws the hood or guard should be mounted on the saw frame or carriage so that the hood or guard will remain in line with the saw when the saw or table is tilted at an angle.

d. For multiple saws such as equalizer saws, hood or guard 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 or guard should be mounted to the same frame as the motor so that it will automatically move with each new location of the saw.

A2.2.2 Suggestions for treatment of smooth slippery floors about woodworking machines.

(a) Treat floor with a paint which includes an abrasive making it non-slip or provide other non-slip material.

(b) If a non-slip platform, mat, or other non-slip 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.

(c) Wood chips and sawdust, particularly on a floor, may in themselves cause a slipping or a tripping hazard. The continued rubbing or sliding of chips and sawdust over a 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.

A3.1.1 (a) It is recommended that the height of the table or point of operation above the floor for various machines for best efficiency should be as follows:

Circular Saws	36 inches
Band Saws	42 "
Shapers	36 "
Jointers	36 "

A3.1.2 Motor Drive. The initial expense of individual motor drive is frequently higher than that of other power-transmission equipment such as line shafting, etc. but has a great many advantages. It offers a better control of the individual machine. It also eliminates overhead shafting and belting, thereby improving lighting and general appearance of shop. Then, too, it eliminates injuries due to oiling and maintenance of overhead transmission equipment.

A3.1.3 (a) Where there is electrical control it is recommended that hand-fed circular saws, band saws, and machines of like operation be provided with an emergency stop switch which will make it possible for the operator to cut off the power without removing his hands from the work.

(b) All electrically operated equipment should be grounded in accordance with the Electrical Code.

A3.1.5 The following table shows revolutions per minute for various diameters of saws when the peripheral speed is 10,000 feet per minute.

Diameter of Saw (Inches)	RPM
8	4,774
10	3,819
12	3,183

14	2,728
16	2,387
18	2,122
20	1,910
22	1,736
24	1,592
26	1,469
28	1,364
30	1,273

A4.1.2 (a) Circular-Saw Spreaders. Each spreader should be so shaped on the side toward the saw that it will approximately follow the curve of the saw, and should be $3\frac{1}{2}$ inches wide at the level of the table and not less than two inches.

For grooving, dadoing, or rabbeting which does 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 as far as possible from the point of operation.

(b) Circular-Saw Kickbacks. Kickbacks on rip saws are usually caused by one of the following:

- (1) *In sufficient power to maintain the speed;*
- (2) *Failure to provide spreader;*
- (3) *Improperly conditioned saw allowing material to pinch on saw and rise from the table;*
- (4) *Improper alignment of gauge or fence;*
- (5) *Improperly conditioned or twisted grain lumber;*
- (6) *Improper design or mounting of kickback dogs.*

A4.1.3 (a) Fillister Piece or Auxiliary Guard. In order to use the hood guard effectively on circular rip saws when cutting narrow strips, a fillister 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 gauge.

(b) 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.

A4.6.1 Shapers

(a) 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.

(b) It is recommended that collars be provided with "stop-pins" and that knife blades have a recess cut in them for the pin. This is an added precaution to keep the blades from flying out.

(c) Attention is called to the desirability of incorporating an automatic brake in the design of shapers jointers, and similar machines in order to stop the revolving heads as soon as possible after the power is shut off.

A7.1.2 Maintenance. A large proportion of circular and band-saw accidents are caused by dull, badly set, improperly filed, and improperly tensioned saws and by gum adhering to saws. Such conditions cause the material to stick, jam, stall the saw, or kickback at the operator. It is strongly recommended that users obtain and follow instructions from the saw manufacturers for proper maintenance of all saws. Band-saw wheels should be kept clean and free from accumulations of sap, gum, or resins.

A7.2.1 (a) Selection of suitable Machines. Under 7.2.1 of this code, the statement is made that machines should not be used for operations of such variety as to necessitate the removal of safeguards suitable for the usual service. It is well to plan or route the work in such a way as to avoid too frequent adjustment of machines and altering of position of guards. The proper regard for this rule will increase production by reducing the time lost due to making adjustments, and will also reduce accidents by insuring continued use of safeguards suitable to the work.

A7.2.2 Cracked Circular Saws

To prevent cracking:

(1) The saw should be tensioned for the speed at which it is to operate. If not, the saw will wobble and vibrate causing it to heat, expand and crack.

- (2) The teeth must have sufficient clearance (set or hollow grinding) to prevent burning. If the saw gets hot and expands, then cracking results.
- (3) The saw should be in perfect round. In other words, the rim should be concentric with the bore.
- (4) The saw must be in perfect balance or cracking will result.
- (5) Saws must be kept sharp at all times; otherwise if the saw is not cutting, it will pound itself through the wood and thus cause heat and vibration, expansion and then cracking.

A7.2.3 Band Saws. Due to the increased breakage of cold saw blades, band saws should be operated at a temperature not less than 45 degrees Fahrenheit.